Randolph Township Schools
Middle School
Algebra 1 Part 1 Curriculum

"Mathematics, even in its present and most abstract state, is not detached from life. It is just the ideal handling of the problems of life."
-Cassius Jackson Keyser

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Curriculum Developed:
July 2020

Date of Board Approval:
September 15, 2020

Randolph Township Schools
Middle School
Algebra 1 Part 1 Curriculum

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Mission Statement

We commit to inspiring and empowering all students in Randolph schools to reach their full potential as unique, responsible and educated members of a global society.

Affirmative Action Statement
Equality and Equity in Curriculum

The Randolph Township School district ensures that the district's curriculum and instruction are aligned to the state's standards. The curriculum provides equity in instruction, educational programs and provides all students the opportunity to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

N.J.A.C. 6A:7-1.7(b): Section 504, Rehabilitation Act of 1973; N.J.S.A. 10:5; Title IX, Education Amendments of 1972

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EDUCATIONAL GOALS
VALUES IN EDUCATION

The statements represent the beliefs and values regarding our educational system. Education is the key to self-actualization, which is realized through achievement and self-respect. We believe our entire system must not only represent these values, but also demonstrate them in all that we do as a school system.

We believe:

- The needs of the child come first
- Mutual respect and trust are the cornerstones of a learning community
- The learning community consists of students, educators, parents, administrators, educational support personnel, the community and Board of Education members
- A successful learning community communicates honestly and openly in a non-threatening environment
- Members of our learning community have different needs at different times. There is openness to the challenge of meeting those needs in professional and supportive ways
- Assessment of professionals (i.e., educators, administrators and educational support personnel) is a dynamic process that requires review and revision based on evolving research, practices and experiences
- Development of desired capabilities comes in stages and is achieved through hard work, reflection and ongoing growth

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Introduction

In this course students will have the opportunity to develop a meaningful foundation in algebra. The content of Algebra 1 Part 1 is arranged around families of functions, with special focus on linear functions. As students compare and analyze families of functions, they will learn to represent them in different ways as verbal descriptions, in function notation, equations, tables and graphs. In addition to algebra topics, extensions will include data analysis and geometry. Students will learn how to utilize and analyze algebraic concepts leading to a deeper understanding of math and stronger critical-thinking skills. They will also learn to model real-world problems using functions. This course will ultimately prepare students for Algebra 1 Part 2. This course will be guided by the current New Jersey Learning Standards in Mathematics.

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Curriculum Pacing Chart

SUGGESTED TIME ALLOTMENT	UNIT NUMBER	CONTENT - UNIT OF STUDY
2 weeks	I	The Number System
5 weeks	II	Solving Equations
4 weeks	III	Solving Inequalities
2 weeks	IV	Solving Absolute Value Equations and Absolute Value Inequalities
4 weeks	V	Graphing Linear Functions
2 weeks	VI	Graphing Transformations
4 weeks	VII	Writing Linear Functions
5 weeks	VIII	Solving Systems of Linear Equations
4 weeks	IX	Solving Systems of Linear Inequalities
2 weeks	X	Pythagorean Theorem
2 weeks	XI	Data Analysis

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Unit I: The Number System

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently apply mathematical knowledge to analyze and model mathematical relationships in order to make decisions, draw conclusions, and solve problems.</td></tr>
<tr><td rowspan="5">STANDARDS / GOALS:

NJ 2016 SLS: Math
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.

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., π^2).</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>All numbers, rational and irrational, have a location on a number line.</td><td>How can rational and irrational numbers be represented?</td></tr>
<tr><td>There are many ways to represent a number.</td><td>How do I determine the best numerical representation for a given situation?</td></tr>
<tr><td>In certain situations, an estimate is as useful as an exact answer.</td><td>How important are estimations in real-world situations?

How do I make a reasonable estimate?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Rational numbers can be written in decimal (repeating) and fraction form.</td><td>Convert a decimal expansion which repeats eventually into a rational number.</td></tr>
</table>

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Unit I: The Number System

HSN-RN.B.3: Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. **NJ 2016 SLS: Mathematical Practices** MP1 Make sense of problems & persevere in solving them. MP2 Reason abstractly & quantitatively. MP3 Construct viable arguments & critique the reasoning of others. MP6 Attend to precision. MP7 Look for & make use of structure.	Irrational numbers are not repeating decimals and cannot be written in fraction form. The sum or product of two rational numbers is rational. You can add or multiply rational and irrational numbers. Irrational numbers can be represented through rational approximations. Many operations can be used in one algebraic expression. Rulers and calculators can help solve problems.	Identify irrational numbers. Categorize numbers as rational or irrational. Analyze why the sum or product of two rational numbers is rational. Recognize that the sum of a rational number and an irrational number is irrational. Recognize that the product of a nonzero rational number and an irrational number is irrational. Compare the size of irrational numbers by using rational approximations of irrational numbers. Apply order of operations to simplify algebraic expressions to solve real-world problems. Utilize rulers and calculators to make computations.

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Unit I: The Number System

	VOCABULARY: the number line, variables, constants **KEY TERMS:** order of operations, whole numbers, integers, rational numbers, irrational numbers, expressions, variables	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Retrieving their prior knowledge on number sense to estimate, calculate and evaluate problems
- Understanding how numbers and problems represent real-world scenarios
- Utilizing math tools and technology to help problem solve
- Demonstrating understanding of key concepts by successfully completing a summative assessment on rational and irrational numbers

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities

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Unit I: The Number System

SUGGESTED TIME ALLOTMENT	2 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit II: Solving Equations

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently use their learning to model and analyze relationships that occur in the real world.</td></tr>
<tr><td rowspan="6">STANDARDS / GOALS:

NJ 2016 SLS: Math
8.EE.C.7: Solve linear equations in one variable.

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).

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.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>Variables can represent an unknown number or any number in a specific set.</td><td>How can the value of an unknown variable be found?</td></tr>
<tr><td>A linear equation is one where representations of linear equations are used to model and solve real-world problems.</td><td>How can you use simple equations to solve real-world problems?</td></tr>
<tr><td>Linear equations in one variable have one or no solution, while others have an infinite number of solutions.</td><td>How do you verify that your solution is correct?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Linear equations are equivalent statements between two expressions and include numbers, variables, and an equal sign.</td><td>Identify the variables and coefficients in a linear equation in order to combine like terms.</td></tr>
</table>

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Unit II: Solving Equations

HSA-CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	Number properties and properties of equality can be used to justify equation solving.	Evaluate linear equations using addition, subtraction, multiplication, and division.
HSA-CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	Order of operations can be used in reverse to solve linear equations.	Solve two-step and multi-step equations.
HSA-REI.A.1: Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	Linear equations in one variable can exist with the same variable shown multiple times on one or both sides of the equal sign.	Apply the appropriate properties to combine like terms in order to isolate the variable while solving equations.
		Compare and solve equations with a variable on one side and variables on both sides.
HSA-REI.B.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Each step in solving a linear equation can be evaluated by combining like terms to isolate the variable and solve the equation.	Justify and explain the solution method being used to isolate the variable.
		Construct linear equations to solve real-world problems.
	Linear equations may have one solution, no solution, or infinitely many solutions.	Examine equations that have one solution, no solution, or infinitely many solutions.

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Unit II: Solving Equations

HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **NJ 2016 SLS: Mathematical Practices** MP1 Make sense of problems & persevere in solving them. MP2 Reason abstractly & quantitatively. MP3 Construct viable arguments & critique the reasoning of others. MP4 Model with mathematics. MP5 Use appropriate tools strategically. MP6 Attend to precision. MP7 Look for & make use of structure. **NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects** RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.	An equation that includes two or more variables is known as a literal equation. Literal equations can be solved for any variable. **VOCABULARY:** rule, theorem, equation, solution, inverse operations, identity, linear relationship, common term **KEY TERMS:** linear equation in one variable, constants, coefficients, equivalent equations, no solution, infinitely many solutions, literal equation	Identify special cases when solving linear equations, such as no solution or infinitely many solutions and understand their meaning. Classify literal equations by identifying all of its variables. Rearrange literal equations, including formulas for area, perimeter, and volume.

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Unit II: Solving Equations

NJ 2020 SLS: Career Readiness, Life Literacies, and Key Skills 9.1.8.CP.1: Compare prices for the same goods or services.		

ASSESSMENT EVIDENCE: Students will show their learning by:

- Demonstrating understanding of key concepts by successfully completing a summative assessment on solving linear equations
- Developing examples of equations that work out to have one solution, no solution, and infinitely many solutions
- Evaluating in peer evaluation and error analysis
- Modeling real-world problems with linear equations

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Solving equations riddle

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Unit II: Solving Equations

SUGGESTED TIME ALLOTMENT	5 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Electronic Flashcards on solving inequalities http://www.quia.com/jfc/906428.htm • Students must solve equations and find pairs of equations that "match" http://www.bbc.co.uk/education/mathsfile/shockwave/games/equationmatch.html • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit III: Solving Inequalities

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently apply computation and process skills to find solutions to problems.</td></tr>
<tr><td rowspan="6">STANDARDS / GOALS:

NJ 2016 SLS: Math
HSA-CED.A.1: Create equations and inequalities in one variable and use them to solve problems.

HSA-REI.B.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

NJ 2016 SLS: Mathematical Practices
MP1 Make sense of problems & persevere in solving them.
MP2 Reason abstractly & quantitatively.
MP3 Construct viable arguments & critique the reasoning of others.
MP6 Attend to precision.
MP7 Look for & make use of structure.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>Linear inequalities can be represented in multiple ways and can be used to model and solve problems in a real-world context.</td><td>How do we use systems of linear inequalities to model real-world problems?</td></tr>
<tr><td>Linear inequalities can have solution sets of one or no solution, while others have an infinite number of solutions.</td><td>What is the best way to represent solutions to systems of inequalities?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Variables, represented by letters, can be isolated by performing inverse operations to both sides of the inequality to maintain equality.

Simple linear inequalities can be solved by isolating the variable, as with solving linear equations.</td><td>Apply understanding and use of operations to real numbers and algebraic procedures.

Solve simple and multi-step inequalities, including with variables on both sides, using algebraic operations.</td></tr>
</table>

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Unit III: Solving Inequalities

NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects RST.6-8.4**:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. **NJ 2020 SLS: Career Readiness, Life Literacies, and Key Skills** 9.1.8.CP.1: Compare prices for the same goods or services.	Linear inequalities have an infinite number of solutions that can be shown as a solution set. Linear inequalities can be modeled using a graph on a number line. Combinations of linear inequalities using "and" and "or" are known as compound inequalities. Linear inequalities and equations can be used to solve real-world problems.	Identify and test intervals to verify solution sets. Justify answers using substitution and order of operations. Graph solution sets on a number line. Create solution sets using set notation. Depict set notation using 'and' and 'or' appropriately. Solve compound inequalities and model their solutions on a number line. Create and solve linear inequalities and equations that represent real-world scenarios.

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Unit III: Solving Inequalities

	VOCABULARY: solution, no solution, infinitely many solutions, variable, intervals, equality **KEY TERMS:** inequality, linear inequality, compound inequality, inverse operation, graph, solution set, number line, set notation, algebraic operations, algebraic procedures, coefficient	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Applying knowledge of solving linear equations to solve linear inequalities
- Creating linear inequalities to represent and solve real-world scenarios
- Understanding that a solution set can be demonstrated on a number line
- Demonstrating understanding of key concepts by successfully completing a summative assessment on solving inequalities

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Guided practice problems
- Graphing Inequalities Card Sort – Students categorize graphs by their inequality symbols

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Unit III: Solving Inequalities

SUGGESTED TIME ALLOTMENT	4 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit IV: Solving Absolute Value Equations & Inequalities

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently articulate how mathematical concepts relate to one another in the context of a problem or abstract relationship.</td></tr>
<tr><td rowspan="5">STANDARDS / GOALS:

NJ 2016 SLS: Math
6.NS.C.7.C: Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

7.NS.A.1.B: Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>Absolute value is used in real-world concepts where the values must be positive.</td><td>How is absolute value applied to real-world concepts?</td></tr>
<tr><td>Absolute value inequalities show a range/interval of solutions that will satisfy the problem.</td><td>How do absolute value equations and inequalities make use of structure to engage in solving real-world problems?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Absolute value represents a measurement of distance from a given value.

Absolute value equations can be solved for zero, one, or two solutions.</td><td>Identify the absolute value of a number or expression.

Solve absolute value equations.

Identify special solutions of absolute value equations.</td></tr>
</table>

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Unit IV: Solving Absolute Value Equations & Inequalities

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).	Absolute value inequalities have a unique solution set that can be represented graphically.	Solve absolute value inequalities.
	Absolute value inequalities have results of compound inequalities which include "and" and "or."	Construct graphs of solutions to absolute value inequalities.
HSA-REI.B.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.		Construct absolute value inequalities to solve real-world problems.
	Linear equations may have one solution, no solution, or infinitely many solutions.	Examine equations that have one solution, no solution, or infinitely many solutions.
NJ 2016 SLS: Mathematical Practices MP1 Make sense of problems & persevere in solving them. MP2 Reason abstractly & quantitatively. MP4 Model with mathematics. MP5 Use appropriate tools strategically.		Identify special cases when solving linear equations, such as no solution or infinitely many solutions and understand their meaning.
	Simple linear inequalities can be solved by isolating the variable, as with solving linear equations.	Solve simple and multi-step inequalities, including with variables on both sides, using algebraic operations.

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Unit IV: Solving Absolute Value Equations & Inequalities

NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.		

ASSESSMENT EVIDENCE: Students will show their learning by:

- Calculating the absolute value of equations and inequalities to find solution sets
- Analyzing and articulate unique solution sets
- Understanding that a solution set can be demonstrated on a number line
- Demonstrating understanding of key concepts by successfully completing a summative assessment on absolute value equations and inequalities

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Guided lessons that allow students to create reference sheets to assist in problem solving

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Unit IV: Solving Absolute Value Equations & Inequalities

SUGGESTED TIME ALLOTMENT	2 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit V: Graphing Linear Functions

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently communicate and apply mathematical ideas, reasoning, and implications to graph data.</td></tr>
<tr><td rowspan="5">STANDARDS / GOALS:

NJ 2016 SLS: Math
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.

8.F.A.2: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

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.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>Graphs show the relationship between variables.</td><td>How can a graph help you represent a situation?</td></tr>
<tr><td>Use function notation to graph real-world problems.</td><td>How does the relationship between variables impact graphs of a real-world problem?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Estimate properties of two functions each represented in a different way.

Many real-world situations can be modeled by equations of linear relationships.</td><td>Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Explain how a given equation illustrates a real-world situation.</td></tr>
</table>

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Unit V: Graphing Linear Functions

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.	Linear equations can be written using any of three different forms: standard form, slope-intercept form, point-slope form.	Construct the equation of a line using the most appropriate form of a linear equation (i.e. standard form, slope-intercept form, point-slope form).
	Parallel lines have equivalent slopes and perpendicular lines have opposite reciprocal slopes.	Write equations of parallel and perpendicular lines.
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.	A relation that pairs each input with exactly one output is a function.	Differentiate between relations and functions.
	Domain is the set of all input values of a function and range is the set of all output values in a function.	Interpret the domain and range of a function.
HSA-REI.D.10: Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	Linear equations that are functions can be written using function notation [$f(x)$=].	Record a linear equation in function notation and identify the domain and range.
	Functions that have a constant rate of change are linear functions.	Determine whether a function is linear.
	Relationship between two quantities is determined by analyzing a graph.	Interpret graphs in order to make predictions.

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Unit V: Graphing Linear Functions

HSA-REI.D.11: Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. HSF-IF.B.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. HSF-IF.A.1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). **NJ 2016 SLS: Mathematical Practices** MP1 Make sense of problems & persevere in solving them. MP2 Reason abstractly & quantitatively. MP4 Model with mathematics. MP5 Use appropriate tools strategically.	**VOCABULARY:** relationship, variables, relation, rate of change, input, output **KEY TERMS:** domain, range, function, function notation, slope, ordered pair, vertical, horizontal, parallel, perpendicular, coordinate plane, y-intercept, linear equation, standard form, slope-intercept form, point-slope form	

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Unit V: Graphing Linear Functions

NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **NJ 2020 SLS: Computer Science and Design Thinking** 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).		

ASSESSMENT EVIDENCE: Students will show their learning by:

- Facilitating different forms of linear equations to create graphs of linear functions
- Modeling linear relationships through graphs of linear functions
- Determining the relationship between variables
- Demonstrating understanding of key concepts by successfully completing a summative assessment at the culmination of the unit

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Model real-world problems to allow students to see mathematical functions

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Unit V: Graphing Linear Functions

- Piecewise functions puzzle
- Provide multiple opportunities for graphing practice

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Unit V: Graphing Linear Functions

SUGGESTED TIME ALLOTMENT	4 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit VI: Graphing Transformations

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently use their learning to accurately describe and model transformations that occur in the real world.</td></tr>
<tr><td rowspan="5">STANDARDS / GOALS:

NJ 2016 SLS: Math
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.

HSF.IF.C.7.A: Graph linear and quadratic functions and show intercepts, maxima, and minima.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>Graphing with transformations can generate images on a host of parent functions.</td><td>How can I use the equation of a function to graph the function without using ordered pairs?</td></tr>
<tr><td>Graphs allow data to be represented visually and opportunities to find and compare trends, to make logical inferences.</td><td>How does the equation of a function affect its graphical representation?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Transformation is a function that changes the position or direction of the axes of a coordinate system using one of four methods (translations, reflections, stretches, and shrinks).</td><td>Identify characteristics in equations that result in translations, reflections, stretches, and shrinks.</td></tr>
</table>

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Unit VI: Graphing Transformations

HSF.BF.B.3: Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **NJ 2016 SLS: Mathematical Practices** MP1 Make sense of problems & persevere in solving them. MP2 Reason abstractly & quantitatively. MP4 Model with mathematics. MP5 Use appropriate tools strategically. **NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects** RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.	Functions f(x) + k, kf(x), f(kx), and f(x + k) can be graphed using the characteristics from their transformations. Graphing calculators can be used as a visual aid to show transformations. Transformations can be used to compare equations and graphs. Graphs of absolute value functions can be identified and represented using transformations. **VOCABULARY:** coordinate grid, x-axis, y-axis, x-intercept, y-intercept, origin, ordered pair	Construct graphs of transformations using equations written in function form. Explain the transformation that is occurring from given information; both in graphs and equations. Utilize graphing calculators to model transformations. Compare equations and graphs using translations, reflections, stretch, and shrink. Combine transformations of graphs of absolute value functions. Combine transformations of graphs of linear functions and absolute value functions to model real-world problems.

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Unit VI: Graphing Transformations

RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**KEY TERMS:** linear function**,** family of functions, parent function, transformation, translation, reflection, horizontal shrink, horizontal stretch, vertical stretch, vertical shrink	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Demonstrating understanding of key concepts by successfully completing a summative assessment at the culmination of the unit
- Constructing pictures using transformations of parent functions
- Articulating the differences between parent functions and their transformation on a graph
- Comparing and contrasting vertical and horizontal stretches and shrinks

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Transformations graphic organizer
- Student-led modeling
- Small-group instruction
- Differentiated station activities

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Unit VI: Graphing Transformations

SUGGESTED TIME ALLOTMENT	2 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit VII: Writing Linear Functions

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently apply functions to solve real-world problems.</td></tr>
<tr><td rowspan="4">STANDARDS / GOALS:

NJ 2016 SLS: Math
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.

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.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>Functions are a mathematical way to describe relationships between two quantities that vary.</td><td>How can functions describe real-world situations, model predictions, and solve problems?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Graphs of linear equations will result in straight lines.

Linear functions can be represented using tables, graphs, or equations.</td><td>Create equations of horizontal and vertical lines.

Create graphs from the equations of horizontal and vertical lines.

Identify linear functions using graphs, tables, and functions.

Graph linear equations on a coordinate plane from given data (i.e. tables of values, different forms of equations, word problems).</td></tr>
</table>

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Unit VII: Writing Linear Functions

HSF-IF.B.6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **NJ 2016 SLS: Mathematical Practices** MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP4 Model with mathematics. MP5 Use appropriate tools strategically. MP6 Attend to precision. MP7 Look for and make use of structure. **NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects** RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	Rate of change of a function explains how a quantity changes in relation to another. Linear functions can be used to solve real-world problems. There are three written formats of linear equations. Lines of fit can be used to model collected bivariate data. **VOCABULARY:** scatter plots, correlation, functions **KEY TERMS:** linear model, point-slope form, parallel lines, perpendicular lines, line of fit, linear regression, line of best fit, interpolation, extrapolation, causation, term, piecewise function, step function	Calculate and interpret the average rate of change of a function. Model real-world problems with graphs of linear functions. Construct linear equations in slope-intercept form, point-slope form, and standard form. Construct equations to represent lines of fit for a specific scatter plot of data. Apply technology to write, model, and graph linear equations.

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Unit VII: Writing Linear Functions

NJ 2020 SLS: Computer Science and Design Thinking 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model.		

ASSESSMENT EVIDENCE: Students will show their learning by:

- Articulating and writing linear functions that represent real-world scenarios
- Correlating data points to show the relationship through a linear function
- Comparing and contrasting the different linear functions forms
- Demonstrating understanding of key concepts by successfully completing a summative assessment at the culmination of the unit

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Function machine activity: students write equations for given inputs and outputs

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Unit VII: Writing Linear Functions

SUGGESTED TIME ALLOTMENT	4 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit VIII: Solving Systems of Linear Equations

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently apply mathematical knowledge to analyze mathematical relationships in order to make decisions and solve problems.</td></tr>
<tr><td rowspan="6">STANDARDS / GOALS:

NJ 2016 SLS: Math
8.EE.C.8: Analyze and solve pairs of simultaneous linear equations.

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.

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.

8.EE.C.8.C: Solve real-world and mathematical problems leading to two linear equations in two variables.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>The graph of a linear equation in two variables is a line, and you can write the equation of the line in slope-intercept form.</td><td>What information can we infer from the relationship between two variables of a graphed equation?</td></tr>
<tr><td>Several representations of linear equations and systems are used to model and solve real-world problems.</td><td>How can someone determine the best method for solving a system of linear equations?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>There are three methods (graphing, substitution, and elimination) in solving systems of linear equations.

Systems of linear equations can be solved by graphing.</td><td>Analyze systems of equations to solve using the best method.

Evaluate systems of linear equations by graphing.</td></tr>
</table>

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Unit VIII: Solving Systems of Linear Equations

HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities. HSA-CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. HSA-REI.C.6: Solve systems of linear equations exactly, focusing on pairs of linear equations in two variables. **NJ 2016 SLS: Mathematical Practices** MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP4 Model with mathematics. MP5 Use appropriate tools strategically. MP6 Attend to precision. MP7 Look for and make use of structure. MP8 Look for and express regularity in repeated reasoning.	Systems of linear equations can be solved by the substitution method. Systems of linear equations can be solved by the elimination method. Special types of systems of linear equations can have zero solutions or infinitely many solutions. Systems of linear equations can be used to solve real-world problems. Solutions of systems of linear equations can be verified through substitution of values. **VOCABULARY:** solution, variables, graphing, substitution, elimination	Evaluate simple cases by inspecting the point of intersection on a graph. Evaluate systems of linear equations by substitution. Evaluate systems of linear equations by elimination. Determine the number of solutions of linear systems. Construct systems of equations to represent real-world problems and situations in order to solve. Interpret solutions as viable or nonviable options in a modeling context.

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Unit VIII: Solving Systems of Linear Equations

NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **NJ 2020 SLS: Career Readiness, Life Literacies, and Key Skills** 9.1.8.CP.1: Compare prices for the same goods or services.	**KEY TERMS:** system of linear equations, solution of a system of linear equations	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Creating and solving systems of equations that model real-world problems
- Evaluating the best method to solve problems based upon the system of equations
- Demonstrating understanding of key concepts by successfully completing a summative assessment on solving systems of linear equations using various methods (graphing, substitution, and elimination)

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities

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Unit VIII: Solving Systems of Linear Equations

SUGGESTED TIME ALLOTMENT	5 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit IX: Solving Systems of Linear Inequalities

<table>
<tr><td colspan="3">TRANSFER: Students will be able to independently use their mathematical knowledge to make informed decisions in everyday life.</td></tr>
<tr><td rowspan="5">STANDARDS / GOALS:

NJ 2016 SLS: Math
HSA-CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

HSA-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

HSA-REI.D.12: Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td>Representations of linear equations, linear inequalities, and systems are used to model and solve real-world problems.</td><td>Why do certain real-world situations require the modeling of two distinct quantities that vary at a constant rate?</td></tr>
<tr><td>Useful information about equations and inequalities (including solutions) can be found by analyzing graphs.</td><td>How does explaining my process help to understand a problem’s solution better?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Solutions of linear inequalities in two variables must be graphed and shaded.

The shaded section of a system of linear inequalities represents all the possible solutions of the system.</td><td>Confirm solutions of linear inequalities.

Construct and analyze a graph of linear inequalities in two variables as a half-plane.

Interpret solutions of linear inequalities.</td></tr>
</table>

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Unit IX: Solving Systems of Linear Inequalities

NJ 2016 SLS: Mathematical Practices MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP4 Model with mathematics. MP5 Use appropriate tools strategically. MP6 Attend to precision. MP7 Look for and make use of structure. MP8 Look for and express regularity in repeated reasoning. **NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects** RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **NJ 2020 SLS: Computer Science and Design Thinking** 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.	Solutions of systems of linear inequalities can be verified through substitution of values. Systems of linear inequalities can be used to solve real-world problems. **VOCABULARY:** graph, system, variable **KEY TERMS:** linear inequality in two variables, half-planes, system of linear inequalities, graph of system of linear inequalities.	Confirm solutions of systems of linear inequalities. Graph and write systems of linear inequalities. Analyze linear inequalities to solve real-world problems.

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Unit IX: Solving Systems of Linear Inequalities

ASSESSMENT EVIDENCE: Students will show their learning by:

- Creating and solving systems of inequalities that model real-world problems
- Identifying and applying the best method to use to solve system of inequalities
- Demonstrating understanding of key concepts by successfully completing a summative assessment at the culmination of the unit

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Linear Inequalities Project: Students model real-world scenarios using a system of linear inequalities
- Systems of Inequalities Scavenger Hunt: Students match systems of linear inequalities to their graphs

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Unit IX: Solving Systems of Linear Inequalities

SUGGESTED TIME ALLOTMENT	4 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit X: Pythagorean Theorem

TRANSFER: Students will be able to independently use the Pythagorean Theorem and distance formula to solve everyday problems.

STANDARDS / GOALS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
NJ 2016 SLS: Math 8.G.B: Understand and apply the Pythagorean Theorem. 8.G.B.6: 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. 8.G.B.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. **NJ 2016 SLS: Mathematical Practices** MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP4 Model with mathematics. MP6 Attend to precision. MP7 Look for and make use of structure.	The area of the square whose side is the hypotenuse is equal to the sum of the areas of the squares of the other two sides of a right triangle.	What are real-world applications of the Pythagorean Theorem?
	An algebraic proof shows the logical arguments behind an algebraic solution.	How do you know when something is true?
	<u>KNOWLEDGE</u> **Students will know:**	**<u>SKILLS</u>** **Students will be able to:**
	The Pythagorean Theorem applies to right triangles.	Apply the Pythagorean Theorem to find unknown side lengths in real-world problems.
	If the square of the length of the longest side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle.	Apply the converse of the Pythagorean Theorem to determine if the triangle is a right triangle.
	The converse of the Pythagorean Theorem determines whether a triangle is a right triangle.	Use the converse of the Pythagorean Theorem to determine if a triangle is a right triangle.

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Unit X: Pythagorean Theorem

NJ 2016 SLS: Literacy in History, Social Studies, & Technical Subjects RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **NJ 2020 SLS: Computer Science and Design Thinking** 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.	The Pythagorean Theorem can be proved using a variety of verified proofs. Right triangles exist in three-dimensional figures. The distance formula can be used to find the distance between two points. Rulers and calculators can help solve problems involving distance. **VOCABULARY:** diagonal, distance, theorem, converse **KEY TERMS:** Pythagorean Theorem, hypotenuse, leg, right triangle, Distance Formula, points	Reconstruct and summarize proofs of the Pythagorean Theorem. Outline where right triangles exist in three-dimensional figures. Apply the Pythagorean Theorem to solve for missing dimensions in three-dimensional figures. Compute the distance between two points using the distance formula. Utilize rulers and calculators to make computations.

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Unit X: Pythagorean Theorem

ASSESSMENT EVIDENCE: Students will show their learning by:

- Demonstrating understanding of key concepts by successfully completing a summative assessment at the culmination of the unit
- Applying knowledge of distance formula to solve real-world problems
- Articulate the differences between a hypothesis, theorem, and its converse
- Comparing and contrasting the Pythagorean Theorem and the distance formula

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Real-world Pythagorean Theorem project

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Unit X: Pythagorean Theorem	
SUGGESTED TIME ALLOTMENT	2 Weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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Unit XI: Data Analysis

TRANSFER: Students will be able to independently apply knowledge to analyze mathematical relationships in the context of a situation in order to make decisions, draw conclusions, and solve problems.

STANDARDS / GOALS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
NJ 2016 SLS: Math 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. 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. 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.	Data analysis often reveals patterns and enables predictions.	How can predications be made from data?
	Choices in data collection and representation affect their interpretation and use.	How is data analysis used to make informed decisions about uncertain events?
	A line of best fit can be used to model the linear association of bivariate and quantitative data.	How can a line of best fit model the relationship between variables?
	<u>KNOWLEDGE</u> **Students will know:**	**<u>SKILLS</u>** **Students will be able to:**
	Scatter plots can be used to show and investigate the patterns of association between bivariate data.	Construct a scatter plot given two sets of quantitative data. Identify patterns of association (clustering, outliers, positive or negative association, linear association, and nonlinear association) between two sets of quantitative data.

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Unit XI: Data Analysis

HSS-ID.B.6a: Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.	An equation for the line of best fit can help to estimate unknown values in a situation to make predictions.	Write an equation for the line of best fit.
HSS-ID.B.6b: Informally assess the fit of a function by plotting and analyzing residuals.		Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data and use it to make predictions.
HSS-ID.B.6c: Fit a linear function for a scatter plot that suggests a linear association.	Appropriate data displays can enhance data.	Select and create appropriate data displays.
HSS-ID.C.7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	Information in data displays can be used to solve real-world problems.	Analyze various components of misleading graphs.
HSS-ID.C.8: Compute (using technology) and interpret the correlation coefficient of a linear fit.	Graphing calculators can be used to model scatter plots	Utilize graphing calculators to model scatter plots.
		Identify correlation coefficients.
NJ 2016 SLS: Mathematical Practices MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP5 Use appropriate tools strategically. MP6 Attend to precision.		Formulate a problem-solving strategy in order to solve real-world problems that involve data representations.
	VOCABULARY: diagonal, distance, theorem, converse	

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Unit XI: Data Analysis

NJ 2020 SLS: Career Readiness, Life Literacies, and Key Skills 9.1.8.CP.1: Compare prices for the same goods or services. **NJ 2020 SLS: Computer Science and Design Thinking** 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).	**KEY TERMS:** Pythagorean Theorem, hypotenuse, leg, right triangle, distance formula, points	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Applying mathematical knowledge to analyze and model real-world data
- Analyzing data points and variables to draw conclusions and solve problems
- Creating scatter plots and lines of best fit to describe data distribution
- Demonstrating understanding of key concepts by successfully completing a summative assessment at the culmination of the unit

KEY LEARNING EVENTS AND INSTRUCTION:

- Teacher-led demonstration
- Student-led modeling
- Small-group instruction
- Differentiated station activities
- Capstone project

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Unit XI: Data Analysis	
SUGGESTED TIME ALLOTMENT	2 weeks
SUPPLEMENTAL UNIT RESOURCES	**Required Resources:** • Big Ideas Algebra 1 Textbook www.bigideasmath.com/students **Suggested Resources:** • Illuminations Activities http://illuminations.nctm.org • Brain Pop Videos http://www.brainpop.com/math/ • Holt Mathematics Course 3 Textbook • STEM Worksheets www.superteacherworksheets.com • Interactive math practice www.ixl.com • Khan Academy Videos www.khanacademy.com • Kahoot www.kahoot.com • Quizziz www.quizziz.com • ScootPad https://www.scootpad.com/ • Interactive Math Practice www.illustrativemathematics.org • Model Curriculum https://www.nj.gov/education/modelcurriculum/math/

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APPENDIX A

Textbook:

Big Ideas Math Algebra1, Ron Larson, Laurie Boswell, Copyright 2015, Big Ideas Learning, LLC

Math in Focus, Course 3, Volume A, Holt-McDougal, Copyright 2012, Marshall Cavendish Education

NJSLA Crosswalk - Evidence Statements, Standards, and Released Test Items – Spreadsheet that links the released PARCC/NJSLA test items to individual evidence statements and standards.

Big Ideas Correlation to the Common Core State Standards – PDF that provides page and problem numbers for specific standards within Algebra 1.

iXL Correlation to Evidence Statements – Spreadsheet that links content from iXL to PARCC/NJSLA evidence statements.

Additional Learning Resources:

Common Core State Standards Initiative: http://www.corestandards.org/

NJ Student Learning Standards: https://www.state.nj.us/education/cccs/2016/math/standards.pdf

Model Curriculum: https://www.nj.gov/education/modelcurriculum/math/

Khan Academy Videos: www.khanacademy.org

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APPENDIX B

Resource: Systems of Equations (Unit II Project)

Name: _____ Date: _____ Per: _____

Systems of Equations

21 Points

Directions: *The following real world problem relates to your classwork on linear equations and solving systems of linear equations. In your group, you will have 20 minutes to read through, discuss each question, and determine which strategies to use. After discussing with your group, you will have the rest of the hour today and tomorrow to complete the performance task. The rubric for grading is provided on the back.*

You are working as a representative for a cell phone company. Part of your job requires you to visually display the available cell phone plans. This way you can easily point out the advantages of each plan to the customers.

Part A:

There are three cell phone plans. All plans include unlimited calling, free nights and weekends, and free long distance. Write an equation for each cell phone plan.

Plan A costs $40 a month and $0.10 per text message. _____

Plan B costs $100 a month and has unlimited text messaging. _____

Plan C costs $50 a month and $0.05 per text message. _____

Part B:

On the next paper provided, graph the three cell phone plans. Each cell phone plan should be clearly labeled with an equation. The graph should be labeled and neat.

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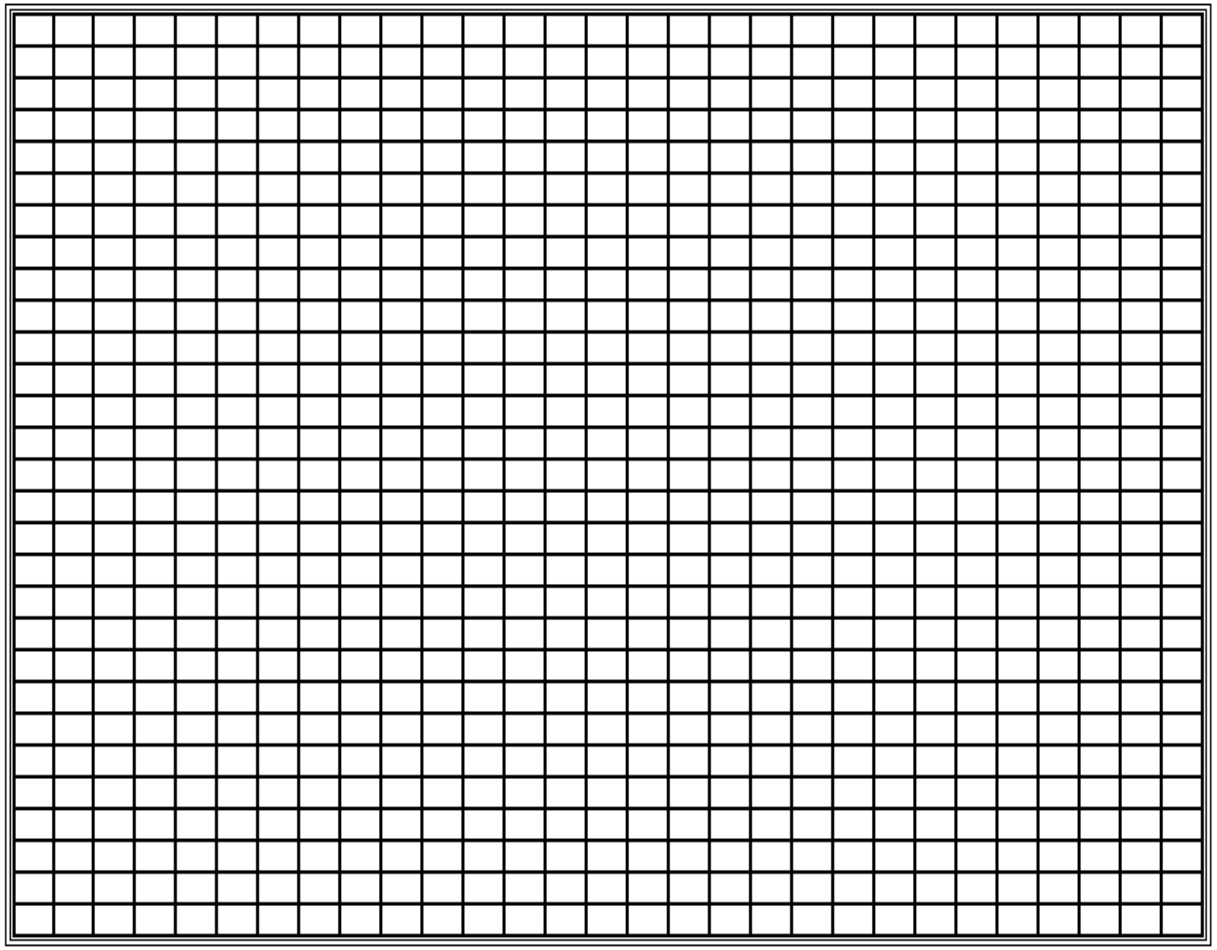
Title: _____



APPENDIX B – Continued

Part C:

A customer would like to know which cell phone plan will be the cheapest choice. Show your math work below. Then, in 4 – 5 Sentences, explain which phone plan would be the cheapest choice for the customer and why.

Part D:

A customer explains that she typically sends an average of 400 text messages per month. Which cell phone plan would be the best choice for the customer? Show your math work below. Then, in 4 – 5 sentences, explain which cell phone plan would be the best choice for the customer.

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APPENDIX B – Continued

Rubric:

Equations (Part A):

3 – 3/3 equations are correctly written in y=mx+b form.

2 – 2/3 equations are correctly written in y=mx+b form.

1 – 1/3 equations are correctly written in y=mx+b form.

0 – 0/3 equations are correctly written in y=mx+b form.

Graphing (Part B) Equations:

3 – Equations are correctly graphed and labeled.

2 – Equations are correctly graphed and labeled with minor errors.

1 – Equations are correctly graphed but not labeled, or equations are incorrectly graphed but labeled.

0 – Equations are incorrectly graphed and not labeled.

Graph (Part B):

3 – The graph is neat and all parts are labeled.

2 – The graph is neat and most parts are labeled.

1 – The graph is neat and not labeled, or the graph is not legible and labeled.

0 – The graph is not legible and not labeled.

Solving Systems (Part C):

3 – Shows understanding of the problems mathematical understandings and principles.

2 – Shows understanding of the problems mathematical understanding and principles with minor errors.

1 – Show little understanding of the problems mathematical understanding and principles.

0 – Shows no understanding of the problems mathematical understanding and principles.

Written Explanation for Customer (Part C):

3 – Shows understanding of the problems mathematical understandings and principles.

2 – Shows understanding of the problems mathematical understanding and principles with minor errors.

1 – Show little understanding of the problems mathematical understanding and principles.

0 – Shows no understanding of the problems mathematical understanding and principles.

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APPENDIX B – Continued

Solve Equations (Part D):

3 – Shows understanding of the problems mathematical understandings and principles.

2 – Shows understanding of the problems mathematical understanding and principles with minor errors.

1 – Show little understanding of the problems mathematical understanding and principles.

0 – Shows no understanding of the problems mathematical understanding and principles.

Written Explanation for Customer (Part D):

3 – Shows understanding of the problems mathematical understandings and principles.

2 – Shows understanding of the problems mathematical understanding and principles with minor errors.

1 – Show little understanding of the problems mathematical understanding and principles.

0 – Shows no understanding of the problems mathematical understanding and principles.

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APPENDIX C

Names _____ Date _____

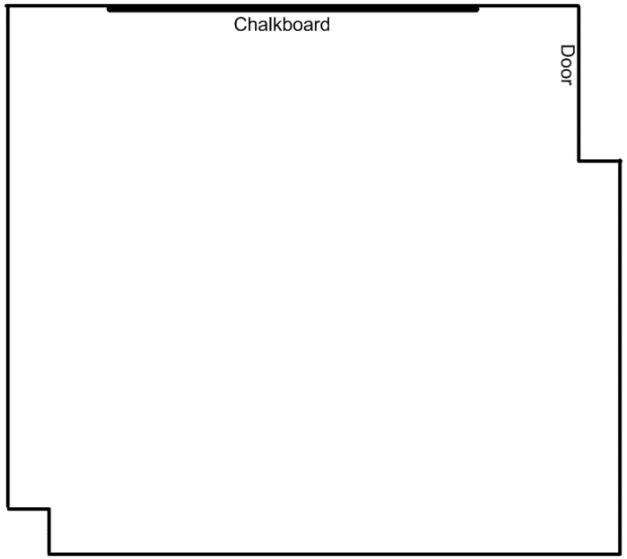
Classroom Activity Period _____

Follow the directions below to find the correct distance from your two points in the classroom.

1.) The two points that you are connecting are _____ & _____

2.) Label the two points in the classroom diagram below *(2 points*). Then connect the two points using your ruler. *(2 Points)*

3.) Using your ruler as the only measurement tool, find the distance between your two points. Show any and all work in the classroom diagram below *(6 Points).*



APPENDIX C

Distance:_____

4.) In a one paragraph summary, describe how you and your group member(s) found this distance using only one ruler, and why you know it is correct. (*10 Points)*

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX C

Rubric:

Points (Part 2):

2 – Both points are labeled on the diagram.
1 – Only one point is labeled on the diagram.
0 – Points are not labeled on the diagram.

Line (Part 2):

2 – The line is draw connecting the two points using a ruler.
1 – The line is draw connecting the two points without using a ruler.
0 – There is no line drawn connecting the two points using a ruler.

Work (Part 3):

6 – The exact distance is given with the correct work given to support solution.
5 – The exact distance is given with most of the work provided to support solution.
4 – The exact distance is given with very little work provided to support solution.
3 – The exact distance is incorrect with sufficient work provided to support solution.
2 – The exact distance is incorrect with little work provided to support solution.
1 – The exact distance is incorrect with no work provided to support solution.
0 – The exact distance not given and no work is provided to support solution.

Paragraph (Part 4):

2 – Conclusion is written in a full paragraph with proper sentence structure.
1 – Conclusion is not written in a full paragraph with proper sentence structure.
0 – There is no sentence structure in conclusion.

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Summary (Part 4):

5 – Shows understanding of the problems mathematical understandings and principles.
4 – Shows understanding of the problems "m.u." and principles with minor errors.
3 – Shows little understanding of the problems "m.u." and principles.
2 – Shows little understanding of the problems "m.u." and principles with minor errors.
1 – Show little understanding of the problems "m.u." and principles with major errors.
0 – Shows no understanding of the problems "m.u." understanding and principles.

Grammar and Punctuation (Part 4):

3 – Correct grammar and punctuation is evident in summary.
2 – Minor errors in grammar and punctuation is evident in summary.
1 – Major errors in grammar and punctuation is evident in summary.
0 – Excessive errors in grammar and punctuation is evident in summary.