Randolph Township Schools
Randolph High School
Algebra 1 Curriculum

"In modern mathematics, algebra has become so important that numbers will soon only have symbolic meaning." - Unknown

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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

The content of Algebra I is arranged around families of functions. Building on their study of linear functions in earlier grades, students delve into piecewise, absolute value, exponential, and quadratic 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. Students will also learn to model real-world situations using these functions.

Similarly, students learn to solve related linear, absolute value, and quadratic functions. As in earlier grades, students apply inverse operations of addition and subtraction and of multiplication and division to isolate variables. This understanding is then applied to squares and square roots. And whereas equations in earlier grades typically had one solution, students will explore absolute value and quadratic equations in which there may be two equations. This concept of multiple solutions is developed first by viewing graphs of functions and observing they can have multiple intersections.

In addition to Algebra topics, extensions will include data analysis and Geometry. An important real-world skill, data analysis includes descriptive statistics as well as lines of best fit and technology-based regression techniques. Prior to the study of quadratic equations, students are asked to recall the Pythagorean Theorem. Studied in prior grades to solve for missing side lengths in a right triangle, it is a familiar context in which quadratic equations are used.

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Curriculum Pacing Chart

SUGGESTED TIME ALLOTMENT	UNIT NUMBER	CONTENT - UNIT OF STUDY
6 weeks	I	Solving Linear Equations and Inequalities
6 weeks	II	Graphing and Writing Linear Functions
7 weeks	III	Polynomial Equations and Factoring
8 weeks	IV	Graphing and Solving Quadratic Functions
6 weeks	V	Exponential and Radical Functions
3 weeks	VI	Data Analysis

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Unit I: Solving Linear Equations and Inequalities

TRANSFER: Students will apply computation and process skills to find solutions to equations and inequalities.

STANDARDS / GOALS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
A-CED.A.1 Create equations and inequalities in one variable and use them t solve problems.	Representations of linear equations, linear inequalities, and systems are used to model and solve real-world problems.	• How can we utilize equations to solve problems? • How do you manipulate a formula to reveal a rule for a different quantity?
A-CED.A.2 Create equations in two or more variables to represent relationships between quantities.	Some mathematical statements have one or no solution, while others have an infinite number of solutions.	• What does it mean in a real-world context for an equation to have one solution, no solution, or infinitely many solutions?
	KNOWLEDGE **Students will know:**	**SKILLS** **Students will be able to:**
A-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. A-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	Variables can be isolated by performing inverse operations to both sides of the equation to maintain equality.	Extend understanding and use of operations to real numbers and algebraic procedures. Solve simple and multi-step equations, including with variables on both sides, using algebraic operations. Check answers using substitution and order of operations.

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Unit I: Solving Linear Equations and Inequalities

A-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. A-REI.A.2 Solve simple rational equations in one variable, and give examples showing how extraneous solutions may arise. A-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A-REI.C.6 Solve systems of linear equations exactly, focusing on pairs of linear equations in two variables.	Simple linear inequalities can be solved by isolating the variable, as with solving linear equations. Absolute value equations and inequalities use a number line to visually represent solutions. The solution to a system of linear equations is the ordered pair that is a solution to each of the equations in the system.	Solve linear inequalities algebraically. Identify and test intervals to verify solution sets. Graph solution sets on a number line. Write solution sets using set notation. Read set notation using 'and' and 'or' appropriately. Solve absolute value equations by writing/using related linear equations to identify critical points. Solve absolute value inequalities by writing/using related linear inequalities to identify critical points. Solve systems of linear equations using elimination. Solve systems of linear equations using substitution.

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Unit I: Solving Linear Equations and Inequalities

	VOCABULARY: expression, equation, absolute value, inequality, solving, compound inequality, absolute value inequality, systems of equations, elimination, substitution, graphing, rules, tables, graphs, relation, function, no solution, one solution, infinitely many solutions	

ASSESSMENT EVIDENCE: Students will show their learning by:

- Completing pre-assessment (H.S. only) and summer packet assessment.
- Posting completed work on the board.
- Engaging in peer evaluation and error analysis.
- Solving linear equations and inequalities by completing problem sets as formative assessments to reinforce algebraic concepts.
- Solving linear equations and inequalities by completing periodic quizzes and exit problems to guide instruction.
- Solving linear equations and inequalities by completing a summative exam at the conclusion of each chapter.

KEY LEARNING EVENTS AND INSTRUCTION:

- Simplifying and Evaluating Do Now – Students apply the order of operations and substitution to simplify and evaluate algebraic expressions.
- NJSLA Practice Do Now – Students review and apply concepts to prepare for the standardized test.
- Number Game Do Now – Students solve math riddles using inverse operations to reach specified targets.
- Linear Inequalities Project – Students model real-world scenarios using a system of linear inequalities.

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Unit I: Solving Linear Equations and Inequalities

SUGGESTED TIME ALLOTMENT	6 weeks
SUPPLEMENTAL UNIT RESOURCES	Big Ideas Chapter 1, Chapter 2, Chapter 5 Guided Notes (Algebra1B, as needed in Algebra1A) http://www.estimation180.com/ http://classzone.com Practice worksheets and video tutorials involving Linear Equations and Inequalities from the following resources: https://www.kutasoftware.com/free.html http://mrhilburtsclass.com/uploads/Pizzazz_Algebra1.pdf.path www.khanacademy.org https://www.teacherspayteachers.com/ http://illuminations.nctm.org https://www.ixl.com/

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Unit II: Graphing and Writing Linear Functions

TRANSFER: Students will communicate mathematical ideas, reasoning, and implications using multiple representations of linear functions.

STANDARDS / GOALS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
A-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. A-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. A-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.	There are multiple representations of functions/numerical relationships.	• How can a graph help you represent a situation? • Which representation of a function (table, graph, equation) offers a better comparison between variables?
	The intersection of two graphs represents the solution to the system.	• How can you determine the solution(s) from the graph of a system of equations or inequalities?
	There are multiple methods for solving a system of equations.	• When is it better to use one method of solving versus another?
	KNOWLEDGE **Students will know:**	**SKILLS** **Students will be able to:**
	The Cartesian Plane is defined by the vertical y-axis and horizontal x-axis.	Differentiate between vertical lines and horizontal lines. Write equations of vertical lines and horizontal lines. Graph vertical and horizontal lines. Identify points using ordered pairs. Plot ordered pairs in the coordinate plane.

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Unit II: Graphing and Writing Linear Functions

F-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 $y = f(x)$.	Many real-world situations can be modeled by equations of linear relationships.	Identify the slope of a line as a rate of change and find its y-intercept from equations and graphs. Write the equation of a line using the most appropriate form of a linear equation (i.e. standard form, slope-intercept form, point-slope form). Write equations of parallel and perpendicular lines.
F-IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	An arithmetic sequence represents a pattern of values that share a common difference.	Find the nth term in a given arithmetic sequence. Write an equation to represent an arithmetic sequence given the common difference and initial value.
F-IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	A relation that pairs each input with exactly one output is a function.	Differentiate between relations and functions. Write a linear equation in function notation and identify the domain and range. Determine whether a function is linear.

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F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-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. F-BF.A.2 Write arithmetic sequences with an explicit formula, use them to model situations. F-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.	Lines of fit can be used to model collected bivariate data. Graphs of all functions can be generated by first creating a table of values. Piecewise functions can be used to represent special graphs including absolute value functions.	Write equations to represent lines of fit for a specific scatter plot of data. Use technology to write, model, and graph linear equations and inequalities (compute and interpret correlation coefficients and residuals). Graph linear equations and inequalities on a coordinate plane from given data (i.e. tables of values, different forms of equations, word problems). Graph linear inequalities in two variables with constraints. Use test points to determine which region to shade. Apply knowledge of systems of equations to graph absolute value functions. Graph piecewise functions according to domain restrictions.

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Unit II: Graphing and Writing Linear Functions

Include recognizing even and odd functions from their graphs and algebraic expressions for them.	Graphing multiple equations on the same coordinate plane results in one, two, none, or an infinite number of intersecting points.	Determine if a system of linear equations has no solution, one solution, or infinitely many solutions. Justify the number of expected intersection(s) of the graphs of a given set of equations.
	The solution of a system of linear inequalities is the set of all points within the overlapping, shaded area.	Sketch the solution set for a system of linear inequalities by graphing. Identify solution point(s) for the system of linear inequalities.
	Transformations of a parent function affect the original characteristics, including changes in the domain and range, as well as translation, reflection, and/or stretch/shrink.	Determine the graph of the function when a transformation is applied. Determine the transformation(s) applied when given two graphs.
	Key characteristics of graphs can be gleaned from each of the function's representations.	Compare linear and exponential functions in different representations – graphically, numerically, and algebraically.

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Unit II: Graphing and Writing Linear Functions

	Special cases of systems of equations or inequalities will result in unique graphs in the coordinate plane. **VOCABULARY:** function, linear function, function notation, standard form, slope-intercept form, transformations, absolute value functions, parallel, perpendicular, scatter plot, line of best fit, arithmetic sequences, piecewise functions, step functions, infinite solutions, stretch, shrink, reflect, translate, horizontal, vertical, domain, range	Determine the domain and range from an equation. Determine the domain and range from graphs of functions.

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Unit II: Graphing and Writing Linear Functions

ASSESSMENT EVIDENCE: Students will show their learning by:

- Posting completed work on the board.
- Engaging in peer evaluation and error analysis.
- Graphing and writing linear equations by completing problem sets as formative assessments to reinforce algebraic concepts.
- Graphing and writing linear equations by completing a summative exam at the conclusion of each chapter.
- Graphing and writing linear equations by completing periodic quizzes and exit problems to guide instruction.

KEY LEARNING EVENTS AND INSTRUCTION:

- NJSLA Practice Do Now – Students review and apply concepts to prepare for the standardized test.
- Systems of Inequalities Scavenger Hunt – Students match systems of linear inequalities to their graphs.
- Function Machine Activity – Students write equations for given input and outputs.
- Graphing Inequalities Card Sort – Students categorize graphs by their inequality symbols.
- Piecewise Function Puzzle – Students organize and match functions to their corresponding graphs, descriptions, and equations.
- Saving for Six Flags Linear Equations – Students apply given parameters to a real-world application of linear equations.
- Graphing/Writing Linear Equations Take-Home Assignment – Students independently apply knowledge of linear equations to take-home assignment.
- Standard to Slope-Intercept Dominoes – Students rewrite equations in different forms to match domino pieces.

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Unit II: Graphing and Writing Linear Functions

SUGGESTED TIME ALLOTMENT	6 weeks
SUPPLEMENTAL UNIT RESOURCES	Big Ideas Chapter 3, Chapter 4 http://www.estimation180.com/ http://classzone.com Practice worksheets and video tutorials involving Graphing and Writing Linear Functions from the following resources: https://www.kutasoftware.com/free.html http://mrhilburtsclass.com/uploads/Pizzazz_Algebra1.pdf.path www.khanacademy.org https://www.teacherspayteachers.com/ http://illuminations.nctm.org https://www.ixl.com/

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Unit III: Polynomial Equations and Factoring

TRANSFER: Students will manipulate polynomial expressions and equations to solve real-world problems.

STANDARDS / GOALS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. A-APR.B.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. A-SSE.B.3.A Factor a quadratic expression to reveal the zeros of the function it defines. A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it.	A relationship exists between polynomial factors, roots, zeros, and x-intercepts.	• In what ways are polynomial functions like linear and absolute value functions?
	Special patterns can be used to factor polynomials more efficiently.	• How does the recognition of patterns aid in problem solving?
	KNOWLEDGE **Students will know:**	**SKILLS** **Students will be able to:**
	Properties of exponents can be applied to simplify expressions.	Develop properties of exponents using repeated multiplication. Simplify exponential expressions using zero and negative exponent properties, the product and quotient of power properties, and the power of a power, product, and quotient properties.
	Polynomial expression can be simplified along the four mathematical operations.	Simplify polynomial expressions by combining like terms using addition and subtraction. Multiply polynomials by using the distributive property. Square binomial expressions by applying exponent properties (repeated multiplication).

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Unit III: Polynomial Equations and Factoring

	Factoring is the reversal of the Distributive property.	Use the greatest common factor (GCF) to remove common factors from polynomial terms. Factor trinomials in standard form using guess and check. Factor trinomials in standard form using the ac method. Factor special product patterns of squares, cubes, and perfect square trinomials into the product of two binomials.
	Polynomials equations can be solved. **VOCABULARY:** exponents, zero exponent, negative exponent, product of powers, quotient of powers, power of a power, power of a product, power of a quotient, add polynomials, subtract polynomials, multiply polynomials, FOIL, factored form, factor a=1, factor a≠1, factor special products, factor completely, AC factoring	Solve factoring polynomial equations using the zero-product property.

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Unit III: Polynomial Equations and Factoring

ASSESSMENT EVIDENCE: Students will show their learning by:

- Posting completed work on the board.
- Engaging in peer evaluation and error analysis.
- Completing problem sets as formative assessments to reinforce algebraic concepts.
- Completing a summative exam at the conclusion of each chapter.
- Completing periodic quizzes and exit problems to guide instruction.

KEY LEARNING EVENTS AND INSTRUCTION:

- Properties of Exponents Do Now – Students apply repeated multiplication to reinforce exponent rules.
- Binomial Multiplication Do Now – Students practice multiplying binomials to aid their understanding of factoring.
- NJSLA Practice Do Now – Students review and apply concepts to prepare for the standardized test.
- Steppingstone Exponents – Students simplify exponential expression including numbers and variables.
- Polynomial Sort Do Now – Students sort polynomials according to the coefficients from standard form.
- Factoring Homework Problems (152) – Students factor and solve polynomial problems of all types through comprehensive review.
- Factoring Shell – Students follow *ac* factoring process to solve polynomials.
- Polynomial Passport – Students circulate room to complete stations for review of operations with polynomials.
- Chapter 9 Review Index Cards – Students will simplify and solve polynomial expressions on index cards.
- Math Train Factoring Polynomials – Students circulate room to collaborate with classmates on different factoring techniques.
- Factoring Polynomials Scavenger Hunt – Students circulate room to match equivalent polynomial expressions.

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Unit III: Polynomial Equations and Factoring

SUGGESTED TIME ALLOTMENT	7 weeks
SUPPLEMENTAL UNIT RESOURCES	Big Ideas Chapter 6.1, Chapter 7 http://www.estimation180.com/ http://classzone.com Practice worksheets and video tutorials involving Polynomial Equations and Factoring from the following resources: https://www.kutasoftware.com/free.html http://mrhilburtsclass.com/uploads/Pizzazz_Algebra1.pdf.path www.khanacademy.org https://www.teacherspayteachers.com/ http://illuminations.nctm.org https://www.ixl.com/

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Unit IV: Graphing and Solving Quadratic Functions

TRANSFER: Students will examine and apply a variety of methods to accurately and efficiently solve quadratic functions.

STANDARDS / GOALS:	**ENDURING UNDERSTANDINGS**	**ESSENTIAL QUESTIONS**
A-SSE.B.3.A Factor a quadratic expression to reveal the zeros of the function it defines.	Determine what a quadratic equation is and be able to recognize it in a table, graph, equation, and situation.	• How do you decide the best method to solve a quadratic equation?
A-SSE.B.3.B Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	Each coefficient in a quadratic polynomial function determines unique characteristics of the graph of the function.	• How do graphs of quadratic equations relate to the real world?
	KNOWLEDGE **Students will know:**	**SKILLS** **Students will be able to:**
A-REI.B.4 Solve quadratic equations in one variable.	Characteristics of transformations of the parent graphs in functional notation (vertical and horizontal shifts, vertical stretch/shrink, reflection).	Determine the graph of the function when a transformation is applied.
A-REI.B.4.A Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.	Functional notation for all the following functions: linear, quadratic, absolute value, square root, exponential and step.	Compare linear and nonlinear functions in different representations – graphically, numerically, and algebraically. Determine the domain and range from function notation representations. Determine domain and range from graphs of functions.

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Unit IV: Graphing and Solving Quadratic Functions

A-REI.B.4.B Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.	Quadratic equations can be solved using several methods.	Solve quadratic equations by graphing. Solve quadratic equations using the solve functions of a graphing calculator. Solve quadratic equations by inspections (mental math). Solve quadratic equations using square roots. Solve quadratic equations by completing the square. Solve quadratic equations using the quadratic formula. Determine the best method for solving quadratic equations.
	The discriminant can be used to determine the number of solutions of a quadratic equation.	Write an explanation of the discriminant and its significance. Evaluate the discriminant and use the value to determine the number and type of solutions of a quadratic equation.

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Unit IV: Graphing and Solving Quadratic Functions

	The solution(s) (if any) to a nonlinear system of equations is the point(s) of intersection. **VOCABULARY:** graph, domain, range, function notation, parent function, standard form, vertex form, intercept form, zeroes, factors, solutions, stretch, shrink, reflect, translate, radicals, square roots, completing the square, quadratic formula, discriminant, solving non-linear systems	Solve nonlinear systems of equations algebraically. Solve nonlinear systems of equations graphically.

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Unit IV: Graphing and Solving Quadratic Functions

ASSESSMENT EVIDENCE: Students will show their learning by:

- Posting completed work on the board.
- Engaging in peer evaluation and error analysis.
- Graphing and solving quadratic functions by completing problem sets as formative assessments to reinforce algebraic concepts.
- Demonstrate proficiency in graphing and solving quadratic functions by completing a summative exam at the conclusion of each chapter.
- Demonstrate proficiency in graphing and solving quadratic functions by completing periodic quizzes and exit problems to guide instruction.

KEY LEARNING EVENTS AND INSTRUCTION:

- Transformation of Functions Do Now – Students review absolute value transformations in preparation for quadratic transformations.
- Simplifying Square Roots Do Now – Students review simplifying square root expressions in preparation for solving quadratic equations.
- Pythagorean Theorem Do Now – Students practice a familiar application of quadratic equations, finding missing side lengths by taking the square root of both sides of an equation.
- NJSLA Practice Do Now – Students review and apply concepts to prepare for the standardized test.
- Quadratic Equation Assessment Activity – Students create pictures using pieces of parabolas and writing equations of those parabolas using the domain restrictions.
- Quadratic Function Chain Activity – Students match graph descriptions with the corresponding equations.
- Graphing Parabolas Graphic Organizer – Students organize key terms in a one-page graphic organizer for notes and review.
- Mini Poster Project Graphing Parabolas – Students graph parabolas in all three forms (intercept, standard, and vertex), noting key features (AOS, intercepts, minimum, maximum, etc.)

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Unit IV: Graphing and Solving Quadratic Functions

SUGGESTED TIME ALLOTMENT	8 weeks
SUPPLEMENTAL UNIT RESOURCES	Big Ideas Chapter 8, Chapter 9 Quadratic formula song: https://www.youtube.com/watch?v=O8ezDEk3qCg http://www.estimation180.com/ http://classzone.com Practice worksheets and video tutorials involving Graphing and Solving Quadratic Functions from the following resources: https://www.kutasoftware.com/free.html http://mrhilburtsclass.com/uploads/Pizzazz_Algebra1.pdf.path www.khanacademy.org https://www.teacherspayteachers.com/ http://illuminations.nctm.org https://www.ixl.com/

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Unit V: Exponential and Radical Functions

<table>
<tr><td colspan="3">TRANSFER: Students will use their knowledge of functions to describe, interpret, and solve exponential and radical functions.</td></tr>
<tr><td>STANDARDS / GOALS:</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td rowspan="6">A-SSE.B.3.C
Use the properties of exponents to transform expressions for exponential functions.

F-LE.A.1
Distinguish between situations that can be modeled with linear functions and with exponential functions.

F-LE.A.2
Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).</td><td>Recognize which functions are linear or exponential equations.</td><td>• How can you determine the differences between linear and exponential equations?</td></tr>
<tr><td>There are various representations of non-linear functions.</td><td>• What ways can you translate a situation into a mathematical model?</td></tr>
<tr><td>Non-linear functions are used in real-world applications.</td><td>• Why are most real-world functions non-linear?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>A radical expression is in simplest form when no radicands have perfect nth powers as factors other than 1, no radicands contain fractions, and no radicals appear in the denominator of a fraction.

Two powers with the same base are equivalent if and only if the exponent is equivalent.</td><td>Simplify radical expressions using prime factorization.

Simplify radical expressions using multiples of perfect squares.

Rationalize the denominator.

Solve exponential equations with like bases.</td></tr>
</table>

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Unit V: Exponential and Radical Functions

F-LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.	Square root and cube root functions have unique, recognizable graphs. A geometric sequence is generated by repeatedly multiplying by the same number, called the common ratio.	Use square root and cube root functions to model real world problems. Graph square root and cube root functions by making a table of values. Graph square root and cube root functions using transformations. Describe transformations of square root and cube root functions. Determine the domain and range of square root and cube root functions from graphs and equations. Identify the common ratio of a geometric sequence. Use the common ratio to determine the n^{th} term in a geometric sequence. Generate and rewrite a finite geometric series into an exponential function.

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Unit V: Exponential and Radical Functions

	Growth and decay functions are inversely related. Inverse functions are functions that undo each other. **VOCABULARY:** exponents, radicals, simplify, rational exponents, exponential functions, exponential growth and decay, solving exponential equations, geometric sequences, graph square root functions, graph cube root functions, solve radical equations, inverse of a function	Identify characteristics of exponential growth and decay functions including initial value, time elapsed, growth/decay rate, growth/decay factor. Write exponential growth and decay models. Use growth and decay exponential functions to model real-world problems. Find the inverse of linear and nonlinear functions algebraically.

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Unit V: Exponential and Radical Functions

ASSESSMENT EVIDENCE: Students will show their learning by:

- Posting completed work on the board.
- Engaging in peer evaluation and error analysis.
- Completing problem sets as formative assessments to reinforce algebraic concepts.
- Completing a summative exam at the conclusion of each chapter.
- Completing periodic quizzes and exit problems to guide instruction.

KEY LEARNING EVENTS AND INSTRUCTION:

- Function Transformation Do Now – Students review transformations of absolute value and quadratic functions in preparation for square root and cube root function transformation.
- Properties of Exponents Do Now – Students review simplifying and evaluating expressions with exponents in preparation for study of exponential functions.
- NJSLA Practice Do Now – Students review and apply concepts to prepare for the standardized test.
- Graphing Square Root Functions Discovery Lesson – Students explore parent function and transformations including, stretch, shrink, reflections, and translations.
- Balloon Activity – Students perform experiment using balloons dropped from varying heights to gather data involving fall time to graph and analyze results.
- Review Cascade Organizer – Students create and populate a tabbed organizer with key topics and sample problems designed for review before assessment.
- 5-Point Exit Slip – Students complete formative assessment on current topics to guide instruction.

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Unit V: Exponential and Radical Functions

SUGGESTED TIME ALLOTMENT	6 weeks
SUPPLEMENTAL UNIT RESOURCES	Big Ideas Chapter 6.2-6.7, Chapter 10 http://www.estimation180.com/ http://classzone.com Practice worksheets and video tutorials involving Exponential and Radical Functions from the following resources: https://www.kutasoftware.com/free.html http://mrhilburtsclass.com/uploads/Pizzazz_Algebra1.pdf.path www.khanacademy.org https://www.teacherspayteachers.com/ http://illuminations.nctm.org https://www.ixl.com/

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Unit VI: Data Analysis

<table>
<tr><td colspan="3">TRANSFER: Investigate and find patterns in data and model them mathematically.</td></tr>
<tr><td>STANDARDS / GOALS:</td><td>ENDURING UNDERSTANDINGS</td><td>ESSENTIAL QUESTIONS</td></tr>
<tr><td rowspan="8">S-ID.A.1
Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID.A.2
Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S-ID.A.3
Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</td><td>Range and standard deviation are used to describe the variation, or spread, of a data set.</td><td>• How can you describe the variation of a data set?</td></tr>
<tr><td>Box-and-whisker plots display the quartiles of a data set visually.</td><td>• What does a box-and-whisker plot display about a data set?</td></tr>
<tr><td>Unlike bar graphs, histograms group numerical data into equal intervals to display frequency of values.</td><td>• How are histograms and bar graphs alike and different?</td></tr>
<tr><td>Two-way tables are best used when data is collected from one source and belongs to two different categories.</td><td>• When is it appropriate to use a two-way table to organize data?</td></tr>
<tr><td>Data can be described and displayed using multiple representations, depending on the features of the data set.</td><td>• How can you display data in a way that helps you make decisions?</td></tr>
<tr><td><u>KNOWLEDGE</u>
Students will know:</td><td><u>SKILLS</u>
Students will be able to:</td></tr>
<tr><td>Many types of sampling methods exist.</td><td>Identify population sampling methods.

Identify sources of bias and assess their impact on study outcomes.

Distinguish between correlation and causation.</td></tr>
</table>

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S-ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. S-ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. S-ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	Descriptive statistics are used to provide a summary of the data beyond the central tendency. A box-and-whisker plot shows the variability of a data set by division into quartiles.	Calculate the mean, median, mode, and range for a given data set. Determine which measure of center is most appropriate for a given data set. Calculate the mean and standard deviation of a data set. Identify outliers within a data set. Analyze the impact of outliers on the measures of center and spread. Calculate the median and inner quartiles for a given data set. Use the min, max, median, and inner quartiles to create a box-and-whisker plot. Interpret, create, and compare box-and-whisker plots.

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Unit VI: Data Analysis

S-ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	Data can be visually represented in different forms. **VOCABULARY:** measures of center, variation, box -and-whisker plots, shapes of distributions, two-way tables, choosing a data display, mean, median, mode, outlier, range, standard deviation, quartile, interquartile range, histogram, frequency table, qualitative/categorical data, quantitative data	Choose and construct the best representation of a given data set (i.e., line-plot, histogram and box-and-whisker). Write an explanation of the factors determining your choice of representation. Compare data distribution by shape (skew or symmetrical). Compare and contrast the center and spread of multiple data sets in the same format. Recognize associations in data using two-way tables.

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Unit VI: Data Analysis

ASSESSMENT EVIDENCE: Students will show their learning by:

- Posting completed work on the board.
- Engaging in peer evaluation and error analysis.
- Completing problem sets as formative assessments to reinforce algebraic concepts.
- Completing a summative exam at the conclusion of each chapter.
- Completing periodic quizzes and exit problems to guide instruction.

KEY LEARNING EVENTS AND INSTRUCTION:

- Probability Do Now – Students review simple probability cases.
- NJSLA Practice Do Now – Students review and apply concepts to prepare for the standardized test.
- Measures of Central Tendency Challenge – Students create real-world situations that can be used to represent given measures of center.
- Survey Project – Students create question to survey classmates, then display and analyze results by hand and using Microsoft Excel.
- Two-Way Table Logic Puzzle – Students organize given information into a table to determine the solution to a logic puzzle.

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Unit VI: Data Analysis

SUGGESTED TIME ALLOTMENT	3 weeks
SUPPLEMENTAL UNIT RESOURCES	Big Ideas Chapter 11 http://www.estimation180.com/ http://classzone.com Practice worksheets and video tutorials involving Data Analysis from the following resources: https://www.kutasoftware.com/free.html http://mrhilburtsclass.com/uploads/Pizzazz_Algebra1.pdf.path www.khanacademy.org https://www.teacherspayteachers.com/ http://illuminations.nctm.org https://www.ixl.com/

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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.

Pre-Requisites:

Students should have successfully completed Pre-Algebra or be determined ready by district placement matrix (middle school).