Totowa Public Schools

Mathematics (Algebra 1)

Grade 8

Aligned to NJSLS 2020 Standards

BOE Adopted: 8/31/2022

Units of Study & Pacing Guide

Unit of Study	Timeline	Notes
Unit 1: Relationships Between Quantities and Reasoning with Equations	4 Weeks	
Unit 2: Linear Relationships	6 Weeks	
Unit 3: Expressions and Equations	6 Weeks	
Unit 4: Quadratic Functions and Modeling	12 Weeks	
Unit 5: Functions and Descriptive Statistics	4 Weeks	
Unit 6: Radicals	16 Weeks	This unit is woven and integrated throughout the Algebra curriculum.

Title	Relationships Between Quantities and Reasoning with Equations
Unit Duration	4 Weeks
Unit Summary & Rationale	This unit focuses on manipulating expressions, writing, solving, and graphing linear equations. Expressions and equations will be solved algebraically. Functions will be used in a variety of ways to describe real world relationships and patterns. Skills learned from linear equations will be applied to both inequality and absolute value graphs.
Unit Goals	
Essential Questions	• How can you represent real-life situations into equations and inequalities? • How do you solve equations using algebra and other strategies? • How can linear equations be used to model real world situations? • How can we use linear graphing in order to predict outcomes? • How is function notation used to model real world situations? • How do you solve inequalities using algebra and other strategies? • How can we model real world situations using absolute value?
Enduring Understandings	• Equation solving is working backward and using inverse operations. • Function notation provides instructions to be applied to mathematical expressions. • Solving inequalities is similar to solving equations, working backward and applying inverse operations, the exception being when multiplying or dividing by a negative number. • The solution to an inequality is a set of numbers, not just a single solution. • Absolute value is the distance from zero.
Learning Outcomes	• Be able to identify the parts of an expression within the context of the situation. • Be able to solve multi-step equations given a specific variable. • Be able to graph a line given different forms of the equation and recognize the constraints of the equation as well as use appropriate scales. • Be able to describe patterns of change represented in different contexts.

- Be able to write the equation of a line given information about it.
- Be able to write, solve and graph inequalities in two variables.

Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative and Benchmark	LinkIt Benchmark Assessments, Totowa TPA Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, *Go Math Into Algebra 1*. Published 2020 Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards Approved Class Resource List
Content & Interdisciplinary Standards	
NJ 2020 SLS: Mathematics	
NJSLS	**Activity**

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. HSN-Q.A.2. Define appropriate quantities for the purpose of descriptive modeling. HSN-Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	• Create problems where students must convert between units of measurements to solve problems.
HSA-SSE.A.1. Interpret expressions that represent a quantity in terms of its context.	• Review parts of an equations and how they relate to the context of the problem.
HSA-CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. HSA-REI.B.4. Solve quadratic equations in one variable.	• Direct instruction on solving literal equations and explain how to justify each step within the process.
HSA-CED.A.1. Create equations and inequalities in one variable and use them to	• Give real world problems to create inequalities and linear equations.

solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. 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.	
HSA-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	• Provide linear equations that represent real world problems and instruct students how to correctly model these equations on the coordinate plane.
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.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the	• Have classroom discussion on why/how constraints should be represented for certain problems.

previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	

Mathematical Practices

- MP.1. Make sense of problems and persevere in solving them.
- MP.2. Reason abstractly and quantitatively.
- MP.3. Construct viable arguments and critique the reasoning of others.
- MP.4. Model with mathematics.
- MP.5. Use appropriate tools strategically.
- MP.6. Attend to precision.
- MP.7. Look for and make use of structure.
- MP.8. Look for and express regularity in repeated reasoning.

NJ: 2016 SLS: English Language Arts

- RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.
- 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
- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
- W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
- L.8.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking
- L.8.4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

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- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

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- Act as a responsible and contributing community members and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration, and communicate effectively.
- Work productively in teams while using cultural/global competence

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- 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.

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<tr><td>Connections and Skills</td><td>

- Creativity and Innovation
- Information and Media Literacy
- Critical Thinking and Problem Solving
- Technology Literacy

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Title	Linear Relationships
Unit Duration	6 Weeks
Unit Summary & Rationale	Within this unit, each lesson will focus on linear relationships by understanding linear functions through slopes, intercepts and transformations of linear functions. Students will use these concepts in order to model linear functions and solve systems of equations and inequalities. This unit will also explain and interpret the

	definition of functions including the domain and range and how they are related; they will correctly use function notation in a context and evaluate functions for inputs and their corresponding outputs.
Unit Goals	
Essential Questions	• How are functions and their graphs related? • How can patterns, relations, and functions be used as tools to best describe and help explain real world situations? • How can you solve systems of linear equations? • How can you solve systems of linear inequalities? • How can you model a real-world situation using a system of equations/inequalities and then solve the system and interpret the solution in the context of the problem?
Enduring Understandings	• Systems of linear equations/inequalities can be used to model problems and can be solved by graphing, substituting, or eliminating a variable. • Functional relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation if a given function is simply a different way of expressing the same idea. • A solution to a system of equations can be applied to man situations in the real world.
Learning Outcomes	• be able to solve system of equations algebraically. • be able to represent and solve equations and inequalities graphically. • be able to understand the concept of a function and use function notation. • be able to interpret functions that arise in applications in terms of the context. • be able to analyze functions using different representations. • be able to translate real world problems into a system.
Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning,

	Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
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Content & Interdisciplinary Standards	
NJ 2020 SLS: Mathematics	
NJSLS	**Activity**
HSA-REI.C.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. HSA-REI.C.6. Solve systems of linear equations exactly and approximately (e.g.,	• Use pencil and paper to show the different types of solutions for a system of linear equations, and have a class discussion on what each solution type represents.

with graphs), focusing on pairs of linear equations in two variables.	
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. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	• Direct instruction on how to use the graphing calculator, how to use the table of values to find the solution to a system of linear equations.
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, often forming a curve (which could be a line). 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. Include cases where $f(x)$ and/or $g(x)$ are linear,	• Use colored pencils to shade the solutions to a system of inequalities in order to find the solution set.

polynomial, rational, absolute value, exponential, and logarithmic functions. 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.	
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). HSF-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.	• Teacher driven modeling on function notation, domain and range values and how to correctly write function notation given a real-world problem.
HSF-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.	• Give direct instruction for geometric vs. arithmetic sequences and compare to linear functions and exponential functions.

HSF-IF.A.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	
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.	• Students will use graphs, tables and equations to determine the rate of change and interpret the rate of change in the context of the situation.
HSF-IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. HSF-IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes	• Students will graph and find solutions to real world situations of systems and we will discuss the findings.
HSF-IF.C.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HSF-IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	• Students will graph and find solutions to real world situations of systems and we will discuss the findings.

HSF-IF.C.7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. HSF-IF.C.7c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HSF-IF.C.7d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. HSF-IF.C.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. HSF-IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HSF-IF.C.8a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. HSF-IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically,	

numerically in tables, or by verbal descriptions).	
HSF-IF.A.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	• Students will use the graphing calculator to determine how changes to the parameters of a linear function affect its graph.
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. HSF-IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.	• Students will use their knowledge of inverses to try and determine what method could be used to find the inverse of a function.
Mathematical Practices	
• MP.1. Make sense of problems and persevere in solving them. • MP.2. Reason abstractly and quantitatively.	

- MP.3. Construct viable arguments and critique the reasoning of others.
- MP.4. Model with mathematics.
- MP.5. Use appropriate tools strategically.
- MP.6. Attend to precision.
- MP.7. Look for and make use of structure.
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NJ: 2016 SLS: English Language Arts

- RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.
- 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
- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
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2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
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2020 SLS: Career Readiness, Life Literacies, and Key Skills

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Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas	• Act as a responsible and contributing community members and employee. • Attend to financial well-being. • Consider the environmental, social and economic impacts of decisions

should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.	• Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management. • Plan education and career paths aligned to personal goals. • Use technology to enhance productivity, increase collaboration, and communicate effectively. • Work productively in teams while using cultural/global competence
• 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.	
Interdisciplinary Connections	
Connections and Skills	• Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving

Title	Polynomial Expressions and Equations
Unit Duration	6 Weeks
Unit Summary & Rationale	In this unit students will begin working with polynomials. After classifying and evaluating polynomial expressions, students will perform the basic operations such as adding, subtracting, and multiplying two or more polynomials. Students will also being to manipulate expressions using factoring, completing the square and properties of exponents to produce equivalent forms that highlight particular properties such as the zeros or the solutions of the function.
Unit Goals	
Essential Questions	What are the characteristics of quadratic functions? How can we model real world situations using quadratics? How are the properties of real numbers related to polynomials? Can two algebraic expressions that appear to be different be equivalent? What different methods can be used to solve quadratic equations? How many solutions does a quadratic have?

Enduring Understandings	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole. Rules of arithmetic and algebra can be used to transform and manipulate equations and inequalities so solutions can be found to solve problems. Quadratic equations can be solved by a variety of methods including graphing, taking square roots, factoring, or using the quadratic formula. Quadratic functions can model real-world situations such as falling objects, vertical motion, and area.
Learning Outcomes	be able to describe and identify monomials, polynomials, and degrees. be able to perform arithmetic operations with polynomials. be able to factor recognize and factor monomials out of a polynomial. be able to factor quadratic equations. be able to solve equations using factoring, completing the square and the quadratic formula.
Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
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Content & Interdisciplinary Standards	
NJ 2020 SLS: Mathematics	
NJSLS	**Activity**
HSA-SSE.A.1. Interpret expressions that represent a quantity in terms of its context. HSA-SSE.A.1a. Interpret parts of an expression, such as terms, factors, and coefficients. HSA-SSE.A.1b. Interpret complicated expressions by viewing one or more of their parts as a single entity. HSA-SSE.A.2. Use the structure of an expression to identify ways to rewrite it.	Teacher driven instruction on how to interpret the constant, linear and quadratic terms in equation given in the context of a situation.
HSA-SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. HSA-SSE.B.3a. Factor a quadratic expression to reveal the zeros of the function it defines.	Model factoring and completing the square in order to find the zeros of a function.

HSA-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.	Have class discussion on arithmetic operations and how they relate to the addition, subtraction and multiplication of polynomials.
HSF-BF.A.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	Arithmetic and Geometric sequences covered in Unit 2.
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. HSA-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Group work of creating and solving quadratic equations. Give real world problems where students must create and solve quadratics in two variables.

HSA-CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	
HSA-REI.B.4. Solve quadratic equations in one variable. HSF-IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	Direct instruction on different methods to solve a quadratic function. Class activity of deriving the quadratic formula by completing the square. Class discussion to follow.
Mathematical Practices	
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- 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.

Interdisciplinary Connections	
Connections and Skills	• Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving

Title	Quadratic Functions and Modeling
Unit Duration	12 Weeks
Unit Summary & Rationale	This unit builds on the previously learned unit by identifying key characteristics and transformations of quadratic functions. Students will also identify important parameters of other functions including absolute value and square/cube root functions. This unit also requires the students use properties of integer exponents to explain and convert between expressions involving radicals and rational exponents.
Unit Goals	
Essential Questions	How can you use the properties of real numbers to perform operations with radical expressions? How do we know if a radical expression is in simplest form? How can we compare situations using quadratic functions and linear functions? How can we solve quadratic equations using the quadratic formula, factoring, or the graph of a parabola? What is the best way to solve a quadratic equation? How do quadratic functions relate to their graphs
Enduring Understandings	Radical expressions with like-radicals can be added and subtracted. Radical expressions must be in simplest form. The graph of a square root function has unique characteristics. A quadratic equation can be solved by using a variety of techniques including using a graphing calculator. The graph of a quadratic function results in a parabola.
Learning Outcomes	be able to identify the parts of quadratics. be able to find the zeros of a quadratic both graphically and algebraically. be able to identify the nature of the roots of a quadratic using the discriminant.

	be able to solve application problem using methods for solving quadratic equations. be able to solve radical equations. be able to apply arithmetic operations to radical expressions and simplify radical expressions.
Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
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NJ 2020 SLS: Mathematics	

NJSLS	Activity
HSF-IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. HSF-IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. 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. SF-IF.C.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. HSF-IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima. HSF-IF.C.7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. HSF-IF.C.7c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. HSF-IF.C.7d. (+) Graph rational functions, identifying zeros and asymptotes when	• Investigate and compare the rate of change among different functions. • In class discussions of how the rate of change differs between quadratic, exponential and linear functions. • Investigate and compare the rate of change among different functions. • In class discussions of how the rate of change differs between quadratic, exponential and linear functions. • Analyze quadratic functions specifically using different representations. • Class activity of finding the key features of a quadratic function using a graphing calculator and by hand.

suitable factorizations are available, and showing end behavior. HSF-IF.C.7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. HSF-IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. HSF-IF.C.8a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. HSF-IF.C.8b. Use the properties of exponents to interpret expressions for exponential functions. HSF-IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	
HSA-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.	• Teacher driven instruction on how to find the zeros of polynomials and use these zeros to graph the function.

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. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	
HSN-RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. HSN-RN.A.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. 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	• Teacher modeling of how to simplify radical expressions and equations. • Teacher directed activity to show the properties of rational and irrational numbers, class will draw conclusions on the properties.

irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	
HSA-REI.C.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	• Students will be able to solve the system by solving algebraically and by using the graphing calculator.
Mathematical Practices	
• MP.1. Make sense of problems and persevere in solving them. • MP.2. Reason abstractly and quantitatively. • MP.3. Construct viable arguments and critique the reasoning of others. • MP.4. Model with mathematics. • MP.5. Use appropriate tools strategically. • MP.6. Attend to precision. • MP.7. Look for and make use of structure. • MP.8. Look for and express regularity in repeated reasoning.	
NJ: 2016 SLS: English Language Arts	
• RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts. • 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	

- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
- W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
- L.8.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking
- L.8.4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.	• Act as a responsible and contributing community members and employee. • Attend to financial well-being. • Consider the environmental, social and economic impacts of decisions • Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management. • Plan education and career paths aligned to personal goals. • Use technology to enhance productivity, increase collaboration, and communicate effectively. • Work productively in teams while using cultural/global competence

- 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.

Interdisciplinary Connections

Connections and Skills	• Creativity and Innovatio • Critical Thinking and Problem Solving

Title	Functions and Descriptive Statistics
Unit Duration	4 Weeks
Unit Summary & Rationale	The unit introduces the concepts and misconception of statistics. The unit reviews central tendencies and presents ways in which data can be displayed. Students will represent data on the real number line (i.e. dot plots, histograms, and box plots) and use statistics to compare and interpret differences in shape, center, and spread in the context of the data (account for effects of outliers). Data will also be summarized in two-way frequency tables by interpreting trends and associations between two categories. Students will other further their knowledge of linear models to draw conclusions about the relationship between two variables by interpreting the slope, y-intercept and the correlation coefficient of the line of best fit within a scatter plot. Students will also distinguish between correlation and causation.
Unit Goals	
Essential Questions	• How can the collection, organization, interpretation, and display of data be used to answer questions? • How can statistical methods be used to find and interpret relationships between sets of data? • How can two-way tables of categorical data be used to recognize associations and trends between the two categories of categorical data? • How can data be displayed and compared, and what information can be gathered from the displays? • How do the results of a statistical investigation used to support an argument?
Enduring Understandings	• The results of a statistical investigation can be used to support or refute an argument. • Data sets can be displayed and compared by using dot plots, scatter plots, box plots, histograms.

	• Mean, median, mode, IQR, range and standard deviation can be used in interpreting and understanding data
Learning Outcomes	• be able to calculate the mean, mode, median, IQR, range and standard deviation of a set of data. • be able to display data using frequency tables, histograms, stem-and-leaf plots, box-and-whisker plots, and scatter plots. • be able to graph the line of best fit of a scatter plot and write a prediction equation for the line. • be able to choose a data display. • be able to explain why a graph is misleading.
Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative and Benchmark	Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, *Go Math Into Algebra 1*. Published 2020 Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards Approved Class Resource List
Content & Interdisciplinary Standards	
NJ 2020 SLS: Mathematics	

NJSLS	Activity
HSS-ID.A.1. Represent data with plots on the real number line (dot plots, histograms, and box plots). HSS-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. HSS-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). HSS-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.	• Partner work of modeling and analyzing charts and graphs including, but not limited to, box and whisker plots, histograms and box plots. • Teacher modeling of statistical data using the normal distribution curve, followed by class discussion on data including mean, median, mode and range and quartiles.
HSS-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.	• Partner work of collecting data and constructing frequency tables, followed by class discussion of the trend of data. • Direct instruction of constructing scatter plots and fitting a function to the data (line of best fit).

HSS-ID.B.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. HSS-ID.B.6a. Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. HSS-ID.B.6b. Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology. HSS-ID.B.6c.Fit a linear function for a scatter plot that suggests a linear association.	
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. HSS-ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit. HSS-ID.C.9. Distinguish between correlation and causation.	• Use graphing calculators in order to construct a scatter plot to find the correlation coefficient. • Class discussion on using the correlation coefficient to draw conclusions on a set of data.
Mathematical Practices	

- MP.1. Make sense of problems and persevere in solving them.
- MP.2. Reason abstractly and quantitatively.
- MP.3. Construct viable arguments and critique the reasoning of others.
- MP.4. Model with mathematics.
- MP.5. Use appropriate tools strategically.
- MP.6. Attend to precision.
- MP.7. Look for and make use of structure.
- MP.8. Look for and express regularity in repeated reasoning.

NJ: 2016 SLS: English Language Arts

- RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.
- 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
- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- W.8.4. Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
- W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
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- L.8.4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.

2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.	• Act as a responsible and contributing community members and employee. • Attend to financial well-being. • Consider the environmental, social and economic impacts of decisions • Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management. • Plan education and career paths aligned to personal goals. • Use technology to enhance productivity, increase collaboration, and communicate effectively. • Work productively in teams while using cultural/global competence
• 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.	
Interdisciplinary Connections	
Connections and Skills	• Creativity and Innovation • Critical Thinking and Problem Solving • Technology Literacy

Title	Radicals
Unit Duration	16 Weeks
Unit Summary & Rationale	This unit teaches ideas and techniques for simplifying radicals, performing operations with radicals, simplifying expressions with rational exponents, and solving radical equations. All of which are critical to the successful completion of this course and subsequent courses such as Algebra 2 and Geometry. Students can master this material if they are reminded of their existing knowledge of factoring, radicals, and exponents, and if they are taken through the new procedures step by step, with a gradual increase in complexity.
Unit Goals	
Essential Questions	• How can you use the properties of real numbers to perform operations with radical expressions?

	• How do we know if a radical expression is in simplest form? • How are radicals and rational exponents related?
Enduring Understandings	• Radical expressions with like-radicals can be added and subtracted. • Radical expressions must be in simplest form. • Rationalize the denominator. • Use inverse operations in order to solve radical equations.
Learning Outcomes	• Be able to simplify radical expressions • Be able to perform operations with radical expressions • Be able solve radical equations • Be able to relate radicals and rational exponent
Assessment Evidence	
Formative	Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Digital Personal Math Trainer, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments, Interactive Notebooks
Summative	LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses
Alternative and Benchamrk	LinkIt Benchmark Assessments, Totowa TPA Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice Formative, Summative, Alternative and Benchmark Assessments
Resources to Promote Learning	
Resources & Equipment Needed	Smartboard, Computers, iPads, websites and digital interactives/models, Multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Go Math! Resources, *Go Math Into Algebra 1*.

	Published 2020 Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Whiteboards Approved Class Resource List
Content & Interdisciplinary Standards	
NJ 2020 SLS: Mathematics	
NJSLS	**Activity**
HSA-REI.A.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	• Encourage students to use prior knowledge of inverse operations to eliminate any radicals in order to solve.
HSN-RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. HSN-RN.A.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.	• Teacher modeling of how to simplify radical expressions. Students will also simplify expressions with rational exponents.
Mathematical Practices	
• MP.1. Make sense of problems and persevere in solving them. • MP.2. Reason abstractly and quantitatively. • MP.3. Construct viable arguments and critique the reasoning of others.	

- MP.4. Model with mathematics.
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2020 SLS: Computer Science & Design Thinking

NJSLS Performance Expectations (By the end of 8th Grade)

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2020 SLS: Career Readiness, Life Literacies, and Key Skills

NJSLS Performance Expectations (By the end of 8th Grade)

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to	• Act as a responsible and contributing community members and employee. • Attend to financial well-being. • Consider the environmental, social and economic impacts of decisions • Demonstrate creativity and innovation.

increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.	• Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management. • Plan education and career paths aligned to personal goals. • Use technology to enhance productivity, increase collaboration, and communicate effectively. • Work productively in teams while using cultural/global competence
• 9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.	
Interdisciplinary Connections	
Connections and Skills	• Creativity and Innovation • Information and Media Literacy • Critical Thinking and Problem Solving

Accommodations & Modifications		
Special Education Students, 504 students, English Language Learners, Students at-Risk Based on Students' Individual Needs		
Time/General	**Processing**	**Comprehension**
• Allow extra time • Repeat and clarify directions • Provide breaks in between tasks • Have student verbalize directions • Provide timelines/due dates for reports and projects	• Provide extra response time • Have student verbalize steps • Repeat directions • Provide small group instruction • Include partner work	• Provide reading material on student's level • Have student underline important points • Assist student on how to use context clues to identify words/phrases • Ensure short manageable tasks

Tests/Quizzes/Grading	Behavior/Attention	Organization
• Provide extended time • Provide study guides • Limit number of responses	• Establish classroom rules • Write a contract with the student specifying expected behaviors • Provide preferential seating • Re-focus student as needed • Reinforce student for staying on task	• Monitor the student and provide reinforcement of directions • Verify the accurateness of homework assignments • Display a written agenda

ELL, Enrichment, Gifted & Talented Strategies

Accommodations Based on Students' Individual Needs

ELL Strategies

- Provide explicit, systematic instruction in vocabulary.
- Ensure that ELLs have ample opportunities to talk with both adults and peers and provide ongoing feedback and encouragement.
- Expose ELLs to rich language input.
- Scaffolding for ELLs language learning.
- Encourage continued L1 language development.
- Alphabet knowledge
- Phonological awareness
- Print awareness
- Design instruction that focuses on all of the foundational literacy skills.
- Recognize that many literacy skills can transfer across languages.
- English literacy development by helping ELLs make the connection between what they know in their first language and what they need to know in English.
- Graphic organizers
- Modified texts
- Modified assessments

- Written/audio instruction
- Shorter paragraph/essay length
- Homogeneously grouped by level

Accommodations Based on Students' Individual Needs:

Enrichment Strategies

- Evaluate vocabulary
- Elevate Text Complexity
- Incorporate inquiry based assignments and projects
- Extend curriculum
- Balance individual, small group and whole group instruction
- Provide tiered/multi-level activities
- Include purposeful learning centers
- Provide open-ended activities and projects
- Offer opportunities for heterogeneous grouping to work with age and social peers as well as homogeneous grouping to provide time to work with individual peers
- Provide pupils with experiences outside the ‘regular’ curriculum
- Alter the pace the student uses to cover regular curriculum in order to explore topics of interest in greater depth/breadth within their own grade level
- Require a higher quality of work than the norm for the given age group
- Promote higher level of thinking and making connections.
- Focus on process learning skills such as brainstorming, decision making and social skills
- Use supplementary materials in addition to the normal range of resources.
- Encourage peer to peer mentoring
- Integrate cross-curricular lessons
- Incorporate real-world problem solving activities
- Facilitate student-led questioning and discussions

Gifted & Talented Strategies

- More elaborate, complex, and in-depth study of major ideas, problems, and themes that integrate knowledge within and across systems of thought.
- Development and application of productive thinking skills to enable students to reconceptualize existing knowledge and/or generate new knowledge.
- Explore constantly changing knowledge and information and develop the attitude that knowledge is worth pursuing in an open world.
- Encourage exposure to, selection, and use of appropriate and specialized resources.
- Promote self-initiated and self-directed learning and growth.
- Provide for the development of self-understanding and the understanding of one's relationship to persons, societal institutions, nature, and culture.
- Flexible pacing
- Use of more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace. If they master a particular unit, they need to be provided with more advanced learning activities, not more of the same activity.
- Questions that require a higher level of response and/or open-ended questions that stimulate inquiry, active exploration, and discovery.
- Encourage students to think about subjects in more abstract and complex ways
- Activity selection based on student interests, that encourage self-directed learning
- Group interaction and simulations
- Guided self-management
- Encourage students to demonstrate what they have learned in a wide variety of forms that reflect both knowledge and the ability to manipulate ideas.
- Engage students in active problem-finding and problem-solving activities and research.
- Provide students opportunities for making connections within and across systems of knowledge by focusing on issues, themes, and ideas.