### Pacing Guide

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Created by: Kristen Flynn
Unit Overview 1

**Content Area:** Mathematics

**Unit Title:** Relationships Between Quantities and Reasoning with Equations

**Target Course/Grade Level:** Grade 8 Algebra 1

**Unit Summary:** 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.

**Interdisciplinary connections:**

**ELA:**
NJSLS.W.9-10.1.A Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence
NJSLS.W.9-10.1.C Use transitions (e.g. words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

**Technology:**
NJSLS 8.1.12.B.2: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
NJSLS 8.2.12.E.4: Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).
8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

**21st Century Life & Careers:**
CRP2: Apply appropriate academic and technical skills
CRP4: Communicate clearly and effectively and with reason.
CRP6: Demonstrate creativity and innovation.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
9.2.12.C.1: Review career goals and determine steps necessary for attainment.

**Unit Rationale:** Many of the concepts presented in Algebra 1 are progressions of the concepts that were started in grades 6 through 8; the content presented in the course is intended to extend and deepen the previous understandings. Students in Algebra 1 need to understand these properties in order to be prepared for Geometry.

**Learning Targets**

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<thead>
<tr>
<th>SLO</th>
<th>NJSLSG</th>
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</thead>
<tbody>
<tr>
<td>1. Solve multi-step problems that can be represented algebraically with accurate and appropriately defined units, scales, and models (such as graphs, tables, and data displays).</td>
<td>N-Q.1, N-Q.2, N-Q.3</td>
<td>Create problems where students must convert between units of measurements in order to solve problems.</td>
</tr>
<tr>
<td>2. Interpret terms, factors, coefficients and expressions (including complex linear and exponential expressions) in terms of context.</td>
<td>A-SSE.A.1</td>
<td>Review parts of an equation and how they relate to the context of the problem.</td>
</tr>
<tr>
<td>4. Create linear equations and inequalities in one variable and use them to solve problems. Justify each step in the process and the solution.</td>
<td>A-CED.A.1 A-REI.A.1 A-REI.B.3</td>
<td>Give real world problems in order to create inequalities and linear equations.</td>
</tr>
<tr>
<td>5. Create linear equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</td>
<td>A-CED.2</td>
<td>Provide linear equations that represent real world problems, and instruct students how to correctly model these equations on the coordinate plane.</td>
</tr>
<tr>
<td>6. Model and describe constraints with linear equations and inequalities and systems of equations and/or inequalities to determine if solutions are viable or non-viable.</td>
<td>A-CED.3, A-REI.1</td>
<td>Have classroom discussion on why/how constraints should be represented for certain problems.</td>
</tr>
</tbody>
</table>

**Unit 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?

**Unit 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.

**Unit Learning Targets**
*Students will...*
- 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 are 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.

**Evidence of Learning**

**Summative Assessment** - Standardized assessments at the unit halfway point at the end. Intent is to provide a summary of student’s acquired skills and educator reflection of programs. Including, but not limited to the assessments listed below:

- NJDOE Model Curriculum Assessments
- Annual Benchmark exams
- Teacher generated assessments using curriculum development resources
- Report Cards

**Formative Assessments**

- Teacher created assessments using Study Island and other curriculum resources listed.
- Pre-assessments – What do you know and what you want to review from a previous lesson?
- Do Now – Warm up

- Pop Quizzes
- Classroom Polling
- Graphic Organizers
- Teacher Observations
- Homework
- Classwork (worksheet/activity)

**Equipment Needed:** Whiteboards, Dry Erase Markers, SmartBoard, Textbook

**Teacher Resources:**


**Integration of Technology:**

- SmartBoard
- Computers
- Internet
- Calculator

**Curriculum Development Resources** - Including, but not limited to the resources available below. Click the links below to access additional resources used to design this unit:

- [www.kutasoftware.com](http://www.kutasoftware.com)
- [www.khanacademy.com](http://www.khanacademy.com)
- [www.njctl.org](http://www.njctl.org)
- [www.studyisland.com](http://www.studyisland.com)
- [http://www.state.nj.us/education/](http://www.state.nj.us/education/)
## Unit Overview 2

**Content Area:** Mathematics  

**Unit Title:** Linear Relationships  

**Target Course/Grade Level:** Grade 8 Algebra 1  

**Unit Summary:** 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.  

**Interdisciplinary connections:**  

**ELA:**  

W.9-10.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.  

NJSLSA. L4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.  

NJSLSA.L5. Demonstrate understanding of word relationships and nuances in word meanings.  

NJSLSA.L6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.  

**Technology:**  

NJSLS 8.1.12.B.2: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.  

NJSLS 8.2.12.E.4: Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).  

8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.  

**21st Century Life & Careers:**
CRP2: Apply appropriate academic and technical skills
CRP4: Communicate clearly and effectively and with reason.
CRP6: Demonstrate creativity and innovation.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.
9.1.12.B.8 Describe and calculate interest and fees that are applied to various forms of spending, debt, and saving.
9.1.12.D.9 Relate savings and investment results to achievement of financial goals.
NJSLS 9.2.12.C.1: Review career goals and determine steps necessary for attainment.

Unit Rationale: The work in unit 2 will build on the grade 8 concepts for linear and exponential relationships. Unit 2 will set the foundation for the following units where students will be extending their knowledge to quadratic and exponential functions.

<table>
<thead>
<tr>
<th>SLO #</th>
<th>NJSLS</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A-REI.5, A-REI.6</td>
<td>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.</td>
</tr>
<tr>
<td>2.</td>
<td>A-REI.11</td>
<td>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.</td>
</tr>
<tr>
<td>3.</td>
<td>A-REI.10, A-REI.11, A-REI.12</td>
<td>Use colored pencils to shade the solutions to a system of inequalities in order to find the solution set.</td>
</tr>
<tr>
<td>4.</td>
<td>F-IF.1, F-IF.2</td>
<td>Teacher driven modeling on function notation, domain and range values and how to correctly write function notation given a real world problem.</td>
</tr>
<tr>
<td>context and evaluate functions for inputs and their corresponding outputs</td>
<td>F-IF.3, F-BF. 2</td>
<td>Give direct instruction for geometric vs. arithmetic sequences and compare to linear functions and exponential functions.</td>
</tr>
<tr>
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</tr>
<tr>
<td>5. Write a function for a geometric sequence defined recursively, whose domain is a subset of the integers.</td>
<td>F-IF. 6</td>
<td>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.</td>
</tr>
<tr>
<td>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</td>
<td>F-IF.4, F-IF.5,F-IF.7, F-IF.9, A-REI.11</td>
<td>Students will graph and find solutions to real world situations of systems and we will discuss the findings.</td>
</tr>
<tr>
<td>7. Graph functions by hand (in simple cases) and with technology (in complex cases) to describe linear relationships between two quantities and identify, describe, and compare domain and other key features in one or multiple representations.</td>
<td>F-IF.9</td>
<td>Partner work to investigate the different representations of systems of equations and how they compare.</td>
</tr>
<tr>
<td>8. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).</td>
<td>F-BF.3</td>
<td>Students will use the graphing calculator to determine how changes to the parameters of a linear function affect its graph.</td>
</tr>
<tr>
<td>8. 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.</td>
<td>F-BF.4</td>
<td>Students will use their knowledge of inverses to try and determine what method could be used to find the inverse of a function.</td>
</tr>
<tr>
<td>9. Solve an equation of the form f(x) = c for a simple function that has an inverse and write an expression for the inverse. Verify the functions are inverses and use a table of values to find the inverse.</td>
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</tr>
</tbody>
</table>

**Unit 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 system of linear equations?
- How can you solve system of linear inequalities?

**Unit 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
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? A given function is simply a different way of expressing the same idea.

A solution to a system of equations can be applied to many situations in the real world.

Unit Learning Targets
Students will...

- 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 problem into a system.

Evidence of Learning

Summative Assessment - Standardized assessments at the unit halfway point at the end. Intent is to provide a summary of student’s acquired skills and educator reflection of programs. Including, but not limited to the assessments listed below:

- NJDOE Model Curriculum Assessments
- Annual Benchmark exams
- Teacher generated assessments using curriculum development resources
- Report Cards

Formative Assessments

- Teacher created assessments using Study Island and other curriculum resources listed.
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- Homework
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Equipment Needed: Whiteboards, Dry Erase Markers, SmartBoard, Textbook

Teacher Resources:


Integration of Technology:

- SmartBoard
- Computers
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- Calculator
Curriculum Development Resources- Including, but not limited to the resources available below. Click the links below to access additional resources used to design this unit:

- www.kutasoftware.com
- www.khanacademy.com
- www.njctl.org
- www.studyisland.com
- http://www.state.nj.us/education/
- https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf
- https://www.state.nj.us/education/cccs/2016/math/hs.pdf

Unit Overview 3

**Content Area:** Mathematics

**Unit Title:** Polynomial Expressions and Equations

**Target Course/Grade Level:** Grade 8 Algebra 1

**Unit Summary:** 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 be learning 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.

**Interdisciplinary connections:**

**ELA:**
NJSLSA.R9. Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
SL.9-10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

**Technology:**
NJSLS 8.1.12.B.2: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
NJSLS 8.2.12.E.4: Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).
8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
### 21st Century Life & Careers:

- **CRP2**: Apply appropriate academic and technical skills
- **CRP4**: Communicate clearly and effectively and with reason.
- **CRP6**: Demonstrate creativity and innovation.
- **CRP8**: Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP11**: Use technology to enhance productivity.
- **CRP12**: Work productively in teams while using cultural global competence.

9.1.12.B.8 Describe and calculate interest and fees that are applied to various forms of spending, debt, and saving.
9.1.12.D.9 Relate savings and investment results to achievement of financial goals.

**NJSLS 9.2.12.C.1**: Review career goals and determine steps necessary for attainment.
**NJSLS 9.2.12.C.4**: Analyze how economic conditions and societal changes influence employment trends and future education.

### Unit Rationale:
The standards in unit 3 blend the conceptual understandings of expressions and equations with procedural fluency and problem solving. The students will not encounter solutions to quadratic equations that are complex.

### Learning Targets

<table>
<thead>
<tr>
<th>SLO #</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Interpreting parts of expressions in terms of context including those that represent square and cube roots; use the structure of an expression to identify ways to rewrite it.</td>
<td>A-SSE.1, A-SSE.2</td>
<td>Teacher driven instruction on how to interpret the constant, linear and quadratic terms in equation given in the context of a situation.</td>
</tr>
<tr>
<td>2. Manipulating expressions using factoring, completing the square and properties of exponents to produce equivalent forms that highlight particular properties such as the zeros or the maximum or minimum value of the function.</td>
<td>A-SSE.3</td>
<td>Model factoring and completing the square in order to find the zeros of a function.</td>
</tr>
<tr>
<td>3. Performing addition, subtraction and multiplication with polynomials and relate it to arithmetic operations with integers.</td>
<td>A-APR.1</td>
<td>Have class discussion on arithmetic operations and how they relate to the addition, subtraction and multiplication of polynomials.</td>
</tr>
<tr>
<td>4. Writing linear and exponential functions (e.g. growth/decay and arithmetic and geometric sequences) from graphs, tables, or a description of the relationship, recursively and with an explicit formula, and describe how quantities increase linearly and exponentially over equal intervals.</td>
<td>F-BF.2</td>
<td>Arithmetic and Geometric sequences covered in Unit 2.</td>
</tr>
</tbody>
</table>
5. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, simple rational and exponential functions and highlighting a quantity of interest in a formula.  

| A- CED.1, A-CED.4, | Group work of creating and solving quadratic equations. |

6. Create linear and quadratic equations that represent a relationship between two or more variables. Graph equations on the coordinate axes with labels and scale.  

| A-CED.2 | Give real world problems where students must create and solve quadratics in two variables. |

7. Derive the quadratic formula by completing the square and recognize when there are no real solutions.  

| A-REI.4 | Class activity of deriving the quadratic formula by completing the square. Class discussion to follow. |

8. Solve quadratic equations in one variable using a variety of methods including inspection (e.g. \(x^2 = 81\)), factoring, completing the square, and the quadratic formula.  

| A-REI.4, F-IF.8 | Direct instruction on different methods to solve a quadratic function. |

**Unit 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?

**Unit 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.

**Unit Learning Targets**
*Students will ...*
- 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.

**Evidence of Learning**
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<td>• Report Cards</td>
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</table>

**Equipment Needed:** Whiteboards, Dry Erase Markers, SmartBoard, Textbook

**Teacher Resources:**

**Integration of Technology:**
- SmartBoard
- Computers
- Internet
- Calculator

**Curriculum Development Resources**- Including, but not limited to the resources available below. Click the links below to access additional resources used to design this unit:
- [www.kutasoftware.com](http://www.kutasoftware.com)
- [www.khanacademy.com](http://www.khanacademy.com)
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- [www.studyisland.com](http://www.studyisland.com)
- [https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf](https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf)
- [https://www.state.nj.us/education/cccs/2016/math hs.pdf](https://www.state.nj.us/education/cccs/2016/math hs.pdf)
# Unit Overview 4

**Content Area:** Mathematics  
**Unit Title:** Functions and Modeling  
**Target Course/Grade Level:** Grade 8 Algebra 1

**Unit Summary:** 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.

**Interdisciplinary connections:**  
**ELA:**  
NJSLSA.R9. Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.  
SL.9-10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

**Technology:**  
8.1.12.B.2: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.  
8.2.12.E.4: Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).  
8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

**21st Century Life & Careers:**  
CRP2: Apply appropriate academic and technical skills  
CRP4: Communicate clearly and effectively and with reason.  
CRP6: Demonstrate creativity and innovation.  
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.  
CRP11. Use technology to enhance productivity.  
CRP12. Work productively in teams while using cultural global competence.  
9.1.12.B.8 Describe and calculate interest and fees that are applied to various forms of spending, debt, and saving.  
9.1.12.D.9 Relate savings and investment results to achievement of financial goals.  
9.2.12.C.1: Review career goals and determine steps necessary for attainment.  
**Unit Rationale:** The standards presented in unit 4 involve functions and extending the concepts of integer exponents to concepts of rational exponents. The understandings will be applied to other types of equations in future courses.

<table>
<thead>
<tr>
<th>SLO #</th>
<th>NJSLS</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A-APR.3, A-REI.11</td>
<td>Teacher driven instruction on how to find the zeros of polynomials, and use these zeros to graph the function.</td>
</tr>
<tr>
<td>2.</td>
<td>N-RN.1, N-RN.2</td>
<td>Teacher modeling of how to simplify radical expressions and equations.</td>
</tr>
<tr>
<td>3.</td>
<td>N-RN.3</td>
<td>Teacher directed activity to show the properties of rational and irrational numbers, class will draw conclusions on the properties.</td>
</tr>
<tr>
<td>4.</td>
<td>F-IF.4, F-IF.5, F.1F.7</td>
<td>Class activity of finding the key features of a quadratic function using a graphing calculator and by hand.</td>
</tr>
<tr>
<td>5.</td>
<td>F-IF.9</td>
<td>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.</td>
</tr>
<tr>
<td>6.</td>
<td>F-IF.6,</td>
<td>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.</td>
</tr>
<tr>
<td>Interpret the average rate of change of a function.</td>
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</tr>
<tr>
<td>7. Write functions in different but equivalent forms by manipulating quadratic expressions using methods such as factoring and completing the square.</td>
<td>F-IF. 8</td>
<td>Analyze quadratic functions specifically using different representations.</td>
</tr>
<tr>
<td>8. Write a function that describes a linear or quadratic relationship between two quantities given in context using an explicit expression, a recursive process, or steps for calculation and relate these functions to the model.</td>
<td>F-BF.1</td>
<td>Partner activity to build a linear or quadratic function that models a relationship between two quantities involving a real world example.</td>
</tr>
<tr>
<td>9. Identify the effects of translations [ f(x) + k, k f(x), f(kx), \text{ and } f(x + k) ] on a function, find the value of k given the graphs.</td>
<td>F-BF.3</td>
<td>Model translations of quadratic functions on the graph and class will draw conclusions.</td>
</tr>
<tr>
<td>10. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.</td>
<td>A-REI.7</td>
<td>Students will be able to solve the system by solving algebraically and by using the graphing calculator.</td>
</tr>
</tbody>
</table>

**Unit 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?

**Unit 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.

**Unit Learning Targets**
*Students will ...*
- 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.

**Evidence of Learning**

Created for New Jersey school districts through a project of the New Jersey Department of Education, Office of Academic Standards, in partnership with the N.J Association for Supervision and Curriculum Development and the N.J. Principals and Supervisors Association.
## Summative Assessment
Standardized assessments at the unit halfway point at the end. Intent is to provide a summary of student’s acquired skills and educator reflection of programs. Including, but not limited to the assessments listed below:
- NJDOE Model Curriculum Assessments
- Annual Benchmark exams
- Teacher generated assessments using curriculum development resources
- Report Cards

## Formative Assessments
- Teacher created assessments using Study Island and other curriculum resources listed.
- Pre-assessments – What do you know and what you want to review from a previous lesson?
- Do Now – Warm up
- Pop Quizzes
- Classroom Polling
- Graphic Organizers
- Teacher Observations
- Homework
- Classwork (worksheet/activity)

## Equipment Needed:
Whiteboards, Dry Erase Markers, SmartBoard, Textbook

## Teacher Resources:

## Integration of Technology:
- SmartBoard
- Computers
- Internet
- Calculator

## Curriculum Development Resources
Including, but not limited to the resources available below. Click the links below to access additional resources used to design this unit:
- [www.kutasoftware.com](http://www.kutasoftware.com)
- [www.khanacademy.com](http://www.khanacademy.com)
- [www.njctl.org](http://www.njctl.org)
- [www.studyisland.com](http://www.studyisland.com)
- [https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf](https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf)
- [https://www.state.nj.us/education/cccs/2016/math/hs.pdf](https://www.state.nj.us/education/cccs/2016/math/hs.pdf)
## Unit Overview 5

<table>
<thead>
<tr>
<th><strong>Content Area:</strong></th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit Title:</strong></td>
<td>Functions and Descriptive Statistics</td>
</tr>
<tr>
<td><strong>Target Course/Grade Level:</strong></td>
<td>Grade 8 Algebra 1</td>
</tr>
<tr>
<td><strong>Unit Summary:</strong></td>
<td>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 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.</td>
</tr>
</tbody>
</table>

### Interdisciplinary connections:

**ELA:**
- W.9-10.3.E Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.
- SL.9-10.1.C: Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

**Technology:**
- 8.1.12.B.2: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
- 8.2.12.E.4: Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).
- 8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

**21st Century Life & Careers:**
- CRP2: Apply appropriate academic and technical skills
- CRP4: Communicate clearly and effectively and with reason.
- CRP6: Demonstrate creativity and innovation.
- CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence.
- 9.1.12.B.8 Describe and calculate interest and fees that are applied to various forms of spending, debt, and saving.
- 9.2.12.C.1: Review career goals and determine steps necessary for attainment.

**Unit Rationale:** Unit 5 will build on previous work with descriptive statistics. Linear models will be used to assess how a model fits data.

<table>
<thead>
<tr>
<th>Learning Targets</th>
<th>NJSLS</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SLO #</strong></td>
<td><strong>Activity</strong></td>
<td></td>
</tr>
<tr>
<td>1. Write linear and exponential functions (e.g. growth/decay and arithmetic and geometric sequences) from graphs, tables, or a description of the relationship, recursively and with an explicit formula, and describe how quantities increase linearly and exponentially over equal intervals</td>
<td>F-LE.1 F-LE.2</td>
<td>Use graphing calculator to create a function given a set of data.</td>
</tr>
<tr>
<td>2. 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).</td>
<td>S-ID.1 S-ID.2 S-ID.3</td>
<td>Partner work of modeling and analyzing charts and graphs including, but not limited to, box and whisker plots, histograms and box plots.</td>
</tr>
<tr>
<td>3. Use the mean and standard deviation of a data set to fit it to a normal distribution, estimate population percentages, and 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).</td>
<td>S-ID.4</td>
<td>Teacher modeling of statistical data using the normal distribution curve, followed by class discussion on data including mean, median, mode and range and quartiles.</td>
</tr>
<tr>
<td>4. Summarize and interpret categorical data for two categories in two-way frequency tables; recognize associations and trends in the data.</td>
<td>S-ID.5</td>
<td>Partner work of collecting data and constructing frequency tables, followed by class discussion of the trend of data.</td>
</tr>
<tr>
<td>5. Represent and describe data for two variables on a scatter plot, fit a function to the data, analyze residuals (in order to informally assess fit), and use the function to solve problems. a) Uses a given function or choose a function suggested by the context. Emphasize linear and exponential models.</td>
<td>S-ID.6</td>
<td>Direct instruction of constructing scatter plots and fitting a function to the data (line of best fit).</td>
</tr>
<tr>
<td>6. Interpret the slope, intercept and correlation coefficient (compute using technology) of a linear model.</td>
<td>S-ID.7 S-ID.8</td>
<td>Use graphing calculators in order to construct a scatter plot to find the correlation coefficient.</td>
</tr>
</tbody>
</table>
### Unit 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 be used to support an argument?

### Unit 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 used in interpreting and understanding data.

### Unit Learning Targets
**Students will ...**

- 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.

### Evidence of Learning

#### Summative Assessment
Standardized assessments at the unit halfway point at the end. Intent is to provide a summary of student’s acquired skills and educator reflection of programs. Including, but not limited to the assessments listed below:

- NJDOE Model Curriculum Assessments
- Annual Benchmark exams
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#### Formative Assessments

- Teacher created assessments using Study Island and other curriculum resources listed.
- Pre-assessments – What do you know and what you want to review from a previous lesson?
- Do Now – Warm up

- Pop Quizzes
- Classroom Polling
- Graphic Organizers
- Teacher Observations
- Homework
- Classwork (worksheet/activity)

### Equipment Needed:
Whiteboards, Dry Erase Markers, SmartBoard, Textbook
### Teacher Resources:

### Integration of Technology:
- SmartBoard
- Computers
- Internet
- Calculator

### Curriculum Development Resources
- Including, but not limited to the resources available below. Click the links below to access additional resources used to design this unit:
  - [www.kutasoftware.com](http://www.kutasoftware.com)
  - [www.khanacademy.com](http://www.khanacademy.com)
  - [www.njctl.org](http://www.njctl.org)
  - [www.studyisland.com](http://www.studyisland.com)
  - [https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf](https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf)
  - [https://www.state.nj.us/education/cccs/2016/math/hs.pdf](https://www.state.nj.us/education/cccs/2016/math/hs.pdf)

### Unit Overview 6

**Content Area:** Mathematics  
**Unit Title:** Radicals  
**Target Course/Grade Level:** Grade 8 Algebra 1

**Unit Summary:** 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.

**Interdisciplinary connections:**
ELA:
W.9-10.3.E Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.
SL.9-10.1.C: Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
Technology:
8.1.12.B.2: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
8.2.12.E.4: Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).
8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

21st Century Life & Careers:
CRP2: Apply appropriate academic and technical skills
CRP4: Communicate clearly and effectively and with reason.
CRP6: Demonstrate creativity and innovation.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.
9.1.12.B.8 Describe and calculate interest and fees that are applied to various forms of spending, debt, and saving.
9.1.12.D.9 Relate savings and investment results to achievement of financial goals.
9.2.12.C.1: Review career goals and determine steps necessary for attainment.

Unit Rationale: Unit 6 will build on previous work with radical and exponential functions.

<table>
<thead>
<tr>
<th>SLO #</th>
<th>NJSLS</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use properties of integer exponents to explain and convert between expressions involving radicals and rational exponents, using correct notation.</td>
<td>N-RN.1, N-RN.2</td>
<td>Teacher modeling of how to simplify radical expressions. Students will also simplify expressions with rational exponents.</td>
</tr>
<tr>
<td>2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.</td>
<td>A-REI.2</td>
<td>Encourage students to use prior knowledge of inverse operations to eliminate any radicals in order to solve.</td>
</tr>
</tbody>
</table>

Unit Essential Questions
- How can you use the properties of real numbers to perform operations with radical expressions?

Unit Enduring Understandings
- Radical expressions with like-radicals can be added and subtracted.
How do we know if a radical expression is in simplest form?

- Rationalize the denominator.
- Use inverse operations in order to solve radical equations.

### Unit Learning Targets

**Students will ...**

- Simplify radical expressions
- Perform operations with radical expressions
- Solve radical equations
- Relate radicals and rational exponents

### Evidence of Learning

**Summative Assessment**

Standardized assessments at the unit halfway point at the end. Intent is to provide a summary of student’s acquired skills and educator reflection of programs. Including, but not limited to the assessments listed below:

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**Formative Assessments**

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- Classwork (worksheet/activity)

### Equipment Needed:

- Whiteboards, Dry Erase Markers, SmartBoard, Textbook

### Teacher Resources:


### Integration of Technology:

- SmartBoard
- Computers
- Internet
- Calculator
Curriculum Development Resources- Including, but not limited to the resources available below. Click the links below to access additional resources used to design this unit:

- www.kutasoftware.com
- www.khanacademy.com
- www.njctl.org
- www.studyisland.com
- http://www.state.nj.us/education/
- https://www.state.nj.us/education/cccs/2016/ela/g0910.pdf
- https://www.state.nj.us/education/cccs/2016/math.hs.pdf
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
### MODIFICATIONS
**Based on Students’ Individual Needs**
(Special Education Students, English Language Learners, Students at-Risk)

<table>
<thead>
<tr>
<th>Time/General</th>
<th>Processing</th>
<th>Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Allow extra time</td>
<td>• Provide extra response time</td>
<td>• Provide reading material on student’s level</td>
</tr>
<tr>
<td>• Repeat and clarify directions</td>
<td>• Have student verbalize steps</td>
<td>• Have student underline important points</td>
</tr>
<tr>
<td>• Provide breaks in between tasks</td>
<td>• Repeat directions</td>
<td>• Assist student on how to use context clues to identify words/phrases</td>
</tr>
<tr>
<td>• Have student verbalize directions</td>
<td>• Provide small group instruction</td>
<td>• Ensure short manageable tasks</td>
</tr>
<tr>
<td>• Provide timelines/due dates for reports and projects</td>
<td>• Include partner work</td>
<td></td>
</tr>
<tr>
<td>Tests/Quizzes/Grading</td>
<td>Behavior/Attention</td>
<td>Organization</td>
</tr>
<tr>
<td>• Provide extended time</td>
<td>• Establish classroom rules</td>
<td>• Monitor the student and provide reinforcement of directions</td>
</tr>
<tr>
<td>• Provide study guides</td>
<td>• Write a contract with the student specifying expected behaviors</td>
<td>• Verify the accurateness of homework assignments</td>
</tr>
<tr>
<td>• Limit number of responses</td>
<td>• Provide preferential seating</td>
<td>• Display a written agenda</td>
</tr>
</tbody>
</table>

Created for New Jersey school districts through a project of the New Jersey Department of Education, Office of Academic Standards, in partnership with the N.J. Association for Supervision and Curriculum Development and the N.J. Principals and Supervisors Association.
## Enrichment

Accommodate Based on Students Individual Needs: 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