# Washington Township School District

***The mission of the Washington Township Public Schools*** *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

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| **Course Title:** | **Algebra 1** |
| **Grade Level(s):** | 8 |

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| **Duration:** | *Full Year:* | **X** | *Semester:* | | *Marking Period:* | |
| **Course Description:** | The 8th grade Algebra program course features interwoven strands of algebra and functions, statistics and probability, geometry, and discrete mathematics. Each of these strands is developed within focused units connected by fundamental ideas such as symmetry, functions, matrices, data analysis, radicals, and curve fitting. Mathematical connections between strands and ways of thinking mathematically that are common across strands are emphasized. These mathematical habits of mind include visual thinking, recursive thinking, searching for and explaining patterns, making and checking conjectures, reasoning with multiple representations, and providing convincing arguments and proofs. Graphing calculators will be used in this course where applicable. | | | | | |
| **Grading Procedures:** | Each semester will be a composite of quiz scores, test scores, homework, and participation reflecting a student's mastery of the areas outlined above. The student can pass the course with an overall average of 70%. The individual teacher will explain the grading system to the student. | | | | | |
| **Primary Resources:** | New Jersey Student Learning Standards<br>McGraw Hill Reveal Math, Algebra 1 | | | | | |

## Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

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| **Designed by:** | Jennifer Reilly and Deanna Petito |
| **Under the Direction of:** | Carole English (2022) and Allison Krzyminski (2024) |

**Written:** July 2022

**Revised:** July 2024

**BOE Approval:** _____

**Unit Title:** Expressions and Equations in One Variable

**Unit Description:**
In this unit, students will take what they have learned about whole numbers and apply that to algebraic expressions. Students will begin by writing and evaluating numerical and algebraic expressions. They will simplify expressions using the Distributive Property. They will also evaluate absolute value expressions. After mastering these concepts, students will write and solve equations in one variable. Included in this unit, students will solve proportions and use formulas to solve real-world problems. This will prepare students to construct equations in two variables.

**Unit Duration: 28 days**

## Desired Results

**Standard(s):**
**N.RN.B.** Use properties of rational and irrational numbers
**N.Q.A.** Reason quantitatively and use units to solve problems
**A.SSE.A.** Interpret the structure of expressions
**A.CED.A.** Create equations that describe numbers or relationships
**A.REI.A.** Understand solving equations as a process of reasoning and explain the reasoning
**A.REI.B.** Solve equations and inequalities in one variable

**Indicators:**
**N.RN.B.3 –** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. (Moved to Grade 8)
**N.Q.A.1** – Use units as a way to understand problems and to guide the solution of a multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Climate Change Example: Students may use units to guide the solution of multi-step problems about how variations in the flow of energy into and out of the Earth's systems result in climate change. Note: Changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
**N.Q.A.2 –** Define appropriate quantities for the purpose of descriptive modeling.
Climate Change Example: Students may define appropriate quantities for a descriptive model of how variations in the flow of energy into and out of Earth's systems result in climate change. Note: changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
**N.Q.A.3 –** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Climate Change Example: Students may**,** when reporting quantities related to how variations in the flow of energy into and out of the Earth's systems result in climate change, choose a level of accuracy appropriate to limitations on how quantities were measured.
**A.SSE.A.1 –** Interpret expressions that represent a quantity in terms of its context.
a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P(1+r)^n as the product of P and a factor not depending on P.*
**A.SSE.A.2 –** Use the structure of an expression to identify ways to rewrite it. For example, see x^4-y^4 as (x2)^2-(y2)2, thus recognizing it as a difference of squares that can be factored as (x2-y2)(x2+y2).
**A.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.*
Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.

**A.CED.A.3 –** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

Climate Change Example: Students may represent constraints describing the economic impact of climate change by equations, inequalities, and/or by systems of inequalities, and interpret solutions as viable or nonviable options.

**A.CED.A.4 –** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance $R$.

Climate Change Example: Students may rearrange formulas related to the economic impact of climate change to highlight a quantity of interest, using the same reasoning as in solving equations.

**A.REI.A.1 –** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

**A.REI.B.3 –** Solve linear equations and inequalities in one variable including equations with coefficients represented by letters.

| **Understandings:**<br>*Students will understand…* | **Essential Questions:** |
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| ● How to write and evaluate numerical and algebraic expressions<br>● How to apply the properties of real numbers to simplify expressions<br>● How to simplify expressions by using the Distributive Property<br>● How to evaluate absolute value expressions<br>● How to use quantities for the purpose of descriptive modeling and report solutions with an appropriate level of accuracy<br>● How to create and interpret equations that describe relationships<br>● How to solve equations by using addition, subtraction, multiplication, and division<br>● How to solve multi-step equations and equations for specific lettered coefficients by applying properties of equality<br>● How to solve absolute value equations<br>● How to solve equations involving proportions<br>● How to solve equations for specific variables and convert units of measure by applying the properties of equality | 1. How can mathematical expressions be represented and evaluated?<br>2. How are algebraic expressions useful in the real world?<br>3. Why is it important to use a variable in a real world situation?<br>4. Why may we need to evaluate algebraic expressions?<br>5. Why is it helpful to reorder or regroup terms when evaluating an expression?<br>6. How can you find the distance between any two values x and y on a number line?<br>7. When can absolute value model real-life situations?<br>8. How can writing and solving equations help you solve problems in the real world?<br>9. Why is it important for you to be able to write equations to help solve problems in the real world? |

## Assessment Evidence

| **Performance Tasks:** | **Other Evidence:** |
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| ● Warm-ups<br>● Exit Tickets<br>● Reveal Practice Assignments<br>● Quiz: Lessons 1.1 – 1.4<br>● Quiz: Lessons 2.1 – 2.4<br>● Quiz: Lessons 2.5 – 2.7<br>● GoFormative Assignments | ● Independent Work<br>● Class Discussions<br>● Online Activities<br>● Practice and Homework<br>● Kahoot<br>● Quizizz<br>● Quizlet<br>● Blooket |

**Benchmarks:**
Departmental assessments for Modules 1 and 2 will be developed from the following resources:

On-Level Assessments (Form A)- Three versions of the on-level assessment are available, Form A1, Form A2, and Form A3.

Differentiated Assessments (Form C): Form C represents the beyond-level (BL) assessment.

## Learning Plan

**Learning Activities:**
**Module 1 Lesson 1: Numerical Expressions**
*Students write and evaluate numerical expressions.*
-Launch the Lesson
-Explore – Order of Operations
-Learn – Writing Numerical Expressions
-Example 1 – Translate a Verbal Expression
-Example 2 – Translate a Verbal Expression with Grouping Symbols
-Example 3 – Write a Numerical Expression
-Example 4 – Evaluate Expressions
-Example 5 – Order of Operations
-Example 6 – Write and Evaluate a Numerical Expression
-Example 7 – Expressions with Grouping Symbols
-Example 8 – Write and Evaluate Expressions
-Learn – Plan for Problem Solving

**Module 1 Lesson 2: Algebraic Expressions**
*Students write and evaluate algebraic expressions.*
-Learn – Writing Algebraic Expressions
-Example 1 – Write a Verbal Expression
-Example 2 – Write a Verbal Expression with Grouping Symbols
-Example 3 – Write an Algebraic Expression
-Example 4 – Write an Expression
-Explore – Using Algebraic Expressions in the Real World
-Learn – Evaluating Algebraic Expressions
-Example 5 – Evaluate an Algebraic Expression
-Example 6 – Write and Evaluate an Algebraic Expression

**Module 1 Lesson 3: Properties of Real Numbers**
*Students apply the properties of real numbers to simplify expressions.*
-Learn – Properties of Equality
-Example 1 – Identify Properties of Equality
-Example 2 – Interpret Properties of Equality
-Example 3 – Use Properties of Equality
-Learn – Identities and Inverses
-Example 4 – Evaluate Using the Addition Properties
-Example 5 – Evaluate Using the Multiplicative Identity and Multiplicative Inverse
-Example 6 – Evaluate Using the Multiplicative Property of Zero
-Explore – Testing the Associative Property
-Learn – Commutative and Associative Properties
-Example 7 – Evaluate Using the Associative Property
-Example 8 – Evaluate Using the Commutative Property
-Example 9 – Evaluate Using the Associative and Commutative Properties

-Expand – Operations with Rational Numbers

**Module 1 Lesson 4: Distributive Property**
*Students simplify expressions by using the Distributive Property.*
-Explore – Using Rectangles with the Distributive Property
-Explore – Modeling the Distributive Property
-Learn – Distributive Property with Numerical Expressions
-Example 1 – Use the Distributive Property
-Example 2 – Mental Math
-Learn – Distributive Property with Algebraic Expressions
-Example 3 – Distribute and Algebraic Expression from the Left
-Example 4 – Distribute an Algebraic Expression from the Right
-Example 5 – Combine Like Terms
-Example 6 – Write and Simplify Expressions

**Module 1 Lesson 5: Expressions Involving Absolute Value**
*Students evaluate absolute value expressions.*
-Explore – Distance Between Points on a Number Line
-Learn – Evaluating Expressions Involving Absolute Value
-Example 1 - Write an Absolute Value Expression
-Example 2 – Evaluate the Absolute Value of an Algebraic Expression
-Example 3 – Evaluate an Expression Involving Absolute Value

**Module 1 Lesson 6: Descriptive Modeling and Accuracy**
*Students use quantities for the purpose of descriptive modeling and report solutions with an appropriate level of accuracy.*
-Learn – Descriptive Modeling
-Example 1 – Use Descriptive Modeling
-Example 2 – Compare Metrics
-Learn – Accuracy
-Example 4 – Find an Appropriate Level of Accuracy
-Example 5 – Determine Accuracy

**Module 2 Lesson 1: Writing and Interpreting Equations**
*Students create and interpret equations that describe relationships.*
-Launch the Lesson
-Explore – Writing Equations by Modeling a Real-World Situation
-Learn – Writing Equations
-Example 1 – Write an Equation for a Sentence
-Example 2 – Write an Equation
-Example 3 – Write an Equation with Multiple Variables
-Learn – Interpreting Equations
-Example 4 – Write a Sentence for an Equation
-Example 5 – Write a Sentence for an Equation with Grouping Symbols
-Example 6 – Interpret an Equation

**Module 2 Lesson 2: Solving One-Step Equations**
*Students solve equations by using addition, subtraction, multiplication, and division.*
-Explore – Using Algebra Tiles to Solve One-Step Equations Involving Addition or Subtraction
-Explore – Using Algebra Tiles to Solve One-Step Equations Involving Multiplication
-Example 1 – Solve by Adding
-Example 2 – Solve by Subtracting
-Example 3 – Write a One-Step Equation
-Learn – Solving One-Step Equations Involving Multiplication or Division

-Example 4 – Solve Equations by Multiplying or Dividing
-Apply Example 5 – Solve by Multiplying

**Module 2 Lesson 3: Solving Multi-Step Equations**
*Students solve multi-step equations and equations for specific lettered coefficients by applying properties of equality.*
-Explore – Using Algebra Tiles to Model Multi-Step Equations
-Learn – Solving Multi-Step Equations
-Example 1 – Solve Multi-Step Equations
-Example 2 – Write and Solve a Multi-Step Equation
-Example 3 – Solve Multi-Step Equations with Letters as Coefficients

**Module 2 Lesson 4: Solving Equations with the Variable on Each Side**
*Students solve equations with the variable on each side by applying the properties of equality and the Distributive Property.*
-Explore – Modeling Equations with the Variable on Each Side
-Learn – Solving Equations with the Variable on Each Side
-Example 1 – Solve an Equation with the Variables on Each Side
-Example 2 – Write an Equation with the Variable on Each Side
-Learn – Solving Equations Involving the Distributive Property
-Example 3 – Solve an  Equation with Grouping Symbols
-Example 4 – Solve an Equation with a Fraction Bar
-Example 5 – Write an Equation with Grouping Symbols
-Learn – Identities and Equations with No Solutions
-Example 6 – Solve an Equation with No Solutions
-Example 7 – Solve an Identity

**Module 2 Lesson 5: Solving Equations Involving Absolute Value**
*Students solve absolute value equations.*
-Explore – Modeling Absolute Value
-Learn – Solving Equations Involving Absolute Value
-Example 1 – Solve an Absolute Value Equation When $n>0$
-Example 2 – Solve an Absolute Value Equation When $n<0$
-Example 3 – Solve an Absolute Value Equation
-Example 4 – Write an Absolute Value Equation

**Module 2 Lesson 6: Solving Proportions**
*Students solve equations involving proportions.*
-Explore – Comparing Two Quantities
-Learn – Solving Proportions
-Example 1 – Solve a Proportion
-Example 2 – Solve a Proportion with Two Missing Quantities
-Example 3 – Solve a Proportion by Using a Constant Rate
-Example 4 – Solve a Percent Problem by Using a Proportion

**Module 2 Lesson 7: Using Formulas**
*Students solve equations for specific variables and convert units of measure by applying the properties of equality.*
-Explore – Centripetal Force
-Explore – Using Dimensional Analysis
-Learn – Solving Equations for Given Variables
-Example 1 – Solve for a Specific Variable
-Example 2 – Solve for a Specific Variable When the Variable is on Each Side
-Example 3 – Solve Literal Equations for a Given Variable

-Example 4 – Use Literal Equations
-Learn – Dimensional Analysis
-Example 5 – Multiply by a Conversion Factor
-Example 6 – Use Dimensional Analysis to Convert Units
-Example 7 – Use Dimensional Analysis to Convert Rates

**Resources:**

- Textbook: McGraw Hill Reveal Math, Algebra 1
- Student Workbooks: McGraw Hill Reveal Math, Algebra 1
- Technology: McGraw Hill Online Platform, Teacher 2 in 1 Device, Projector, Student Laptops, Calculators

| Unit Modifications for Special Population Students | |
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| **Advanced Learners** | - Refer to green BL (Beyond Level) indicators in Teacher Edition and assign corresponding activities: Beyond Level Differentiated Activities, Extension Activities<br>- Use IXL to enhance targeted skills |
| **Struggling Learners** | - Refer to orange AL (Approaching Level) indicators in Teacher Edition and assign corresponding activities: Remediation Activities, Extra Examples, Arrive Math Take Another Look Mini Lessons<br>- Use IXL to enhance targeted skills |
| **English Language Learners** | Refer to purple ELL (English Language Learner) indicators in Teacher Edition and assign corresponding activities |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:<br>• Variation of time: adapting the time allotted for learning, task completion, or testing<br>• Variation of input: adapting the way instruction is delivered<br>• Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete<br>• Modifying the content, process or product |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**

**English Language Arts Grade 8**

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text
NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone
NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
L.8.6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression

## Integration of 21st Century Skills

**Indicators:**

*9.1.8.CP.1: Compare prices for the same goods or services.*
*9.1.8.CP.2: Analyze how spending habits affect one's ability to save*
*9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.*
*9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.*
*9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.*
*9.1.8.PB.3: Explain how to create a budget that aligns with financial goals.*
*9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life (e.g. teenager, young adult, family).*
*9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business.*
*9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.*
*9.3.12.AC-DES.2 Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.*
*9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.*
*9.3.12.BM.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision-making in business.*
*9.3.12.FN.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry.*
*9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.*
*9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.*
*9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.*
*9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.*
*9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).*
*9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal*
*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.*

**Unit Title:** Relations, Linear and Nonlinear Functions

**Unit Description:**
In this unit, students will apply their prior understanding of the concept of a function to graph linear and nonlinear functions and interpret key features of their graphs. Graphs will include piecewise-defined, step, and absolute value functions. Throughout this unit, students will use function notation and find function values. Students will find and interpret the rate of change and slope of lines. They will identify the effects of transformations on the graphs of linear and absolute value functions. This will prepare students to build linear and nonlinear functions to model real-world data and relationships.

**Unit Duration: 29 days**

## Desired Results

**Standard(s):**
**N.Q.A.** Reason quantitatively and use units to solve problems
**A.REI.D.** Represent and solve equations and inequalities graphically
**F.IF.A.** Understand the concept of a function and use function notation
**F.IF.B.** Interpret functions that arise in applications in terms of the context
**F.IF.C**. Analyze functions using different representations
**F.LE.A.** Construct and compare linear and exponential models and solve problems
**F.LE.B.** Interpret expressions for functions in terms of the situation they model
**F.BF.A.** Build a function that models a relationship between two quantities
**F.BF.B** Build new functions from existing functions
**A.CED.A.** Create equations that describe numbers or relationships

**Indicators:**
**N.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.
Climate Change Example: Students may use units to guide the solution of multi-step problems about how variations in the flow of energy into and out of the Earth's systems result in climate change. Note: Changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
**A.REI.D.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
**F.IF.A.1** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*).
**F.IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Climate Change Example: Students may use function notation to determine the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline), m, where c(m) is the number of molecules of carbon dioxide.
**F.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.
**F.IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.
★ Climate Change Example: Students may relate the domain of a function c(m) representing the amount of carbon dioxide produced by burning m molecules of ethane (gasoline), to its graph in order to determine the appropriate domain for c(m).

**F.IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
**F.IF.B.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
★ Climate Change Example: Students may calculate the average rate of change of a function c(m) presented symbolically or as a table, where c(m) represents the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline).
**F.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.
a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
**F.BF.A.1** Write a function that describes a relationship between two quantities
a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
**F.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.
**F.BF.B.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.
**F.LE.A.1a** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
**F.LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
**F.LE.B.5** Interpret the parameters in a linear or exponential function in terms of a context.
**A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

| **Understandings:**<br>*Students will understand…* | **Essential Questions:** |
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| ● That a relation can be represented with graphs, ordered pairs, tables, and mappings<br>● How to determine whether a relation is a function and find function values<br>● How to identify linear and nonlinear functions and continuous and discrete functions<br>● How to identify intercepts of functions and solve equations by graphing<br>● How to identify symmetry, extrema, and end behavior of functions<br>● How to sketch graphs of functions and compare two or more functions<br>● How to graph linear functions by using tables and intercepts<br>● How to find and interpret the rate of change and slopes of lines<br>● How to graph equations in slope-intercept form<br>● How to identify the effects of transformations of the graphs of linear functions<br>● How to write and graph equations of arithmetic sequences<br>● How to graph piecewise-defined and step functions | 1. Why are representations and functions useful?<br>2. How can you tell if an appropriate scale is being used to represent a relationship?<br>3. How can you tell whether a relation is a function?<br>4. How can you use the graph of a function to determine whether it is discrete?<br>5. How can you use the graph of a function to determine whether it is symmetric?<br>6. How can you use key features to approximate the graphs of functions?<br>7. What can a function tell you about the relationship that it represents?<br>8. How is the graph of a linear equation related to its solutions?<br>9. How does slope help to describe a line?<br>10. How do the quantities m and b affect the graph of a linear function in slope-intercept form?<br>11. How does performing an operation on a linear function change its graph?<br>12. How can you tell if a set of numbers models a linear function?<br>13. When can real-world data be described using a step function?<br>14. How does performing an operation on an absolute vale function change its graph? |

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| ● How to identify the effects of transformations of the graphs of absolute value functions | |

## Assessment Evidence

| **Performance Tasks:** | **Other Evidence:** |
|---|---|
| ● Warm-ups<br>● Exit Tickets<br>● Reveal Practice Assignments<br>● Quiz: Lessons 3.1 – 3.4<br>● Quiz: Lessons 4.1 – 4.4<br>● Quiz: Lessons 4.5 – 4.7<br>● GoFormative Assignments | ● Independent Work<br>● Class Discussions<br>● Online Activities<br>● Practice and Homework<br>● Kahoot<br>● Quizizz<br>● Quizlet<br>● Blooket |

**Benchmarks:**
Departmental assessments for Modules 3 and 4 will be developed from the following resources:

On-Level Assessments (Form A)- Three versions of the on-level assessment are available, Form A1, Form A2, and Form A3.

Differentiated Assessments (Form C): Form C represents the beyond-level (BL) assessment.

## Learning Plan

**Learning Activities:**
**Module 3 Lesson 1: Representing Relations**
*Students represent relations with graphs, ordered pairs, tables, and mappings*
-Launch the Lesson
-Learn – Relations
-Example 1 – Representations of a Relation
-Learn – Analyzing Graphs of Relations
-Example 2 – Analyze Graphs
-Explore – Choosing Scales
-Learn – The Coordinate System
-Example 3 – Use Appropriate Scales
-Example 4 – Choose an Appropriate Origin
-Example 5 – Interpret Scales and Origins

**Module 3 Lesson 2: Functions**
*Students determine whether a relation is a function and find function values.*
-Explore – Vertical Line Test
-Learn – Functions
-Example 1 – Identify Functions
-Example 2 – Analyze Data
-Example 3 – Equations as Functions
-Learn – Function Values
-Example 4 – Find Function Values
-Example 5 – Evaluate Functions
-Example 6 – Interpret Function Values

**Module 3 Lesson 3: Linearity and Continuity of Graphs**
*Students identify linear and nonlinear functions and continuous and discrete functions.*
-Explore – Representing Discrete and Continuous Functions
-Learn – Discrete and Continuous Functions

-Example 1 – Determine Continuity
-Example 2 – Determine Continuity by Using Graphs
-Example 3 – Apply Discrete and Continuous Functions
-Learn – Linear and Nonlinear Functions
-Example 4 – Linear and Nonlinear Functions
-Example 5 – Identify Linear and Nonlinear Functions
-Example 6 – Functions in Table Form
-Example 7 – Identify Linear Functions by Graphing

**Module 3 Lesson 4: Intercepts of Graphs**
*Students identify intercepts of functions and solve equations by graphing.*
-Learn – Intercepts of Graphs of Functions
-Example 1 – Intercepts of the Graph of a Linear Function
-Example 2 – Intercepts of the Graph of a Nonlinear Function
-Example 3 – Find Intercepts from a Graph
-Example 4 – Find Intercepts from a Table
-Learn – Solving Equations by Graphing
-Example 5 – Solve a Linear Equation by Graphing
-Example 6 – Solve a Nonlinear Equation by Graphing
-Example 7 – Solve an Equation of a Horizontal Line by Graphing
-Apply Example 8 – Estimate Solutions by Graphing

**Module 3 Lesson 5: Shapes of Graphs**
*Students identify symmetry, extrema, and end behavior of functions.*
-Explore – Line Symmetry
-Explore – Relative High and Low Points
-Learn – Symmetry and Graphs of Functions
-Example 1 – Line Symmetry
-Example 2 – Interpret Symmetry
-Learn – Extrema of Graphs of Functions
-Example 3 – Determine Increasing and Decreasing Parts of the Graph of a Function
-Example 4 – Determine Extrema of the Graph of a Function
-Example 5 – Interpret Extrema of the Graph of a Function
-Learn – End Behavior of Graphs of Functions
-Example 6 – Determine End Behavior of the Graph of a Linear Function
-Example 7 – Determine End Behavior of the Graph of a Nonlinear Function

**Module 3 Lesson 6: Sketching Graphs and Comparing Functions**
*Students sketch graphs of functions and compare two or more functions.*
-Explore – Modeling Relationships by Using Functions
-Learn – Sketching Graphs of Functions
-Example 1 – Sketch the Graph of a Linear Function
-Example 2 – Sketch the Graph of a Symmetric Function
-Example 3 – Sketch the Graph of a Nonlinear Function
-Example 4 – Compare Properties of Functions

**Module 4 Lesson 1: Graphing Linear Functions**
*Students graph linear functions by using tables and intercepts*
-Launch the Lesson
-Explore – Points on a Line
-Explore – Lines Through Two Points
-Learn – Graphing Linear Functions by Using Tables
-Example 1 – Graph by Making a Table
-Example 2 – Choose Appropriate Domain Values

-Example 3 – Graph y=a
-Example 4 – Graph x=a
-Example 5 – Graph by Using Intercepts
-Example 6 – Use Intercepts

**Module 4 Lesson 2: Rate of Change and Slope**
*Students find and interpret the rate of change and slopes of lines.*
-Learn – Rate of Change of a Linear Function
-Example 1 – Find the Rate of Change
-Example 2 – Compare Rates of Change
-Example 3 – Constant Rate of Change
-Example 4 – Rate of Change
-Explore – Investigating Slope
-Learn – Slope of a Line
-Example 5 – Positive Slope
-Example 6 – Negative Slope
-Example 7 – Slopes of Horizontal Lines
-Example 8 – Slopes of Vertical Lines
-Example 9 – Find Coordinates Given the Slope
-Example 10 – Use Slope

**Module 4 Lesson 3: Slope-Intercept Form**
*Students graph equations in slope-intercept form.*
-Learn – Writing Linear Equations in Slope-Intercept Form
-Example 1 – Write Linear Equations in Slope-Intercept Form
-Example 2 – Rewrite Linear Equations in Slope-Intercept Form
-Example 3 – Write Linear Equations
-Explore – Graphing Linear Functions by Using the Slope-Intercept Form
-Learn – Graphing Linear Functions in Slope-Intercept Form
-Example 4 – Graph Linear Functions in Slope-Intercept Form
-Example 5 – Graph Linear Functions
-Example 6 – Graph Constant Functions
-Apply Example 7 – Use Graphs of Linear Functions
-Expand – Linear Growth Patterns

**Module 4 Lesson 4: Transformations of Linear Functions**
*Students identify the effects of transformations of the graphs of linear functions.*
-Explore – Transforming Linear Functions
-Learn – Translations of Linear Functions
-Example 1 – Vertical Translations of Linear Functions
-Example 2 – Horizontal Translations of Linear Functions
-Example 3 – Multiple Translations of Linear Functions
-Example 4 – Translations of Linear Functions
-Learn – Dilations of Linear Functions
-Example 5 – Vertical Dilations of Linear Functions
-Example 6 – Horizontal Dilations of Linear Functions
-Learn – Reflections of Linear Functions
-Example 7 – Reflections of Linear Functions Across the x-Axis
-Example 8 – Reflections of Linear Functions Across the y-Axis

**Module 4 Lesson 5: Arithmetic Sequences**
*Students write and graph equations of arithmetic sequences.*
-Learn – Arithmetic Sequences
-Example 1 – Identify Arithmetic Sequences

-Example 2 – Find the Next Term
-Explore – Common Differences
-Learn – Arithmetic Sequences as Linear Functions
-Example 3 – Find the nth Term
-Example 4 – Apply Arithmetic Sequences as Linear Functions

**Module 4 Lesson 6: Piecewise and Step Functions**
*Students graph piecewise-defined functions.*
-Learn – Graphing Piecewise-Defined Functions
-Example 1 – Graph a Piecewise-Defined Function
-Explore – Age as a Function
-Learn – Graphing Step Functions
-Example 2 – Graph a Greatest Integer Function
-Example 3 – Graph a Step Function

**Module 4 Lesson 7: Absolute Value Functions**
*Students identify the effects of transformations of the graphs of absolute value functions.*
-Explore – Parameters of an Absolute Value Function
-Learn – Graphing Absolute Value Functions
-Learn – Translations of Absolute Value Functions
-Example 1 – Vertical Translations of Absolute Value Functions
-Example 2 – Horizontal Translations of Absolute Value Functions
-Example 3 – Multiple Translations of Absolute Value Functions
-Example 4 – Identify Absolute Value Functions from Graphs
-Example 5 – Identify Absolute Value Functions from Graphs (Multiple Translations)
-Learn – Dilations of Absolute Value Functions
-Example 6 – Dilations of the Form a|x| When a>1
-Example 7 – Dilations of the Form |ax|
-Example 8 – Dilations When 0<a<1
-Learn – Reflections of Absolute Value Functions
-Example 9 – Graphs of Reflections with Transformations
-Example 10 – Graphs of y=-a|x|
-Example 11 – Graphs of y=|-ax|
-Learn – Transformations of Absolute Value Functions
-Example 12 – Graph an Absolute Value Function with Multiple Translations
-Example 13 – Graph an Absolute Value Function with Translations and Dilation
-Example 14 – Graph an Absolute Value Function with Translations and Reflection
-Example 15 – Applying Graphs of Absolute Value Functions

**Resources:**
- Textbook: McGraw Hill Reveal Math, Algebra 1
- Student Workbooks: McGraw Hill Reveal Math, Algebra 1
- Technology: McGraw Hill Online Platform, Teacher 2 in 1 Device, Projector, Student Laptops, Calculators

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | - Refer to green BL (Beyond Level) indicators in Teacher Edition and assign corresponding activities: Beyond Level Differentiated Activities, Extension Activities<br>- Use IXL to enhance targeted skills |

| | |
|---|---|
| **Struggling Learners** | - Refer to orange AL (Approaching Level) indicators in Teacher Edition and assign corresponding activities: Remediation Activities, Extra Examples, Arrive Math Take Another Look Mini Lessons<br>- Use IXL to enhance targeted skills |
| **English Language Learners** | Refer to purple ELL (English Language Learner) indicators in Teacher Edition and assign corresponding activities |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:<br>• Variation of time: adapting the time allotted for learning, task completion, or testing<br>• Variation of input: adapting the way instruction is delivered<br>• Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete<br>• Modifying the content, process or product |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**

**English Language Arts Grade 8**

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text

NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone

NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

L.8.6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression

## Integration of 21st Century Skills

**Indicators:**

*9.1.8.CP.1: Compare prices for the same goods or services.*

*9.1.8.CP.2: Analyze how spending habits affect one's ability to save*

*9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.*

*9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.*

*9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.*

*9.1.8.PB.3: Explain how to create a budget that aligns with financial goals.*
*9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life (e.g. teenager, young adult, family).*
*9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business.*
*9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.*
*9.3.12.AC-DES.2 Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.*
*9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.*
*9.3.12.BM.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision-making in business.*
*9.3.12.FN.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry.*
*9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.*
*9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.*
*9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.*
*9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.*
*9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).*
*9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal*
*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.*

**Unit Title:** Creating Linear Equations and Linear Inequalities

**Unit Description:**
In this unit, students will apply their prior understanding of the connections between proportional relationships, lines, and linear equations. They will begin by learning how to create linear equations and analyze data to make predictions. This will allow students to use their knowledge of linear equations to build linear functions to model linear relationships. Later in this unit, students will learn how to write, solve, and graph inequalities. This will prepare them for future lessons involving systems of inequalities.

**Unit Duration: 24 days**

## Desired Results

**Standard(s):**
**A.CED.A** Create equations that describe numbers or relationships
**F.BF.B** Build new functions from existing functions
**S.ID.B** Summarize, represent, and interpret data on two categorical and quantitative variables
**S.ID.C** Interpret linear models
**A.REI.B** Solve equations and inequalities in one variable
**A.REI.D** Represent and solve equations and inequalities graphically

**Indicators:**
**A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems.

Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.

**A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

**A.CED.A.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

Climate Change Example: Students may represent constraints describing the economic impact of climate change by equations, inequalities, and/or by systems of inequalities, and interpret solutions as viable or nonviable options.

**F.BF.B.4a** Solve an equation of the form $f(x) = c$ for a simple function $f$ that has an inverse and write an expression for the inverse.

**S.ID.B.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Climate Change Example: Students may represent geoscience data on two quantitative variables on a scatter plot and describe how the variables are related in order to analyze the data and the results from global climate models.

**S.ID.B.6a** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

Climate Change Example: Students may use linear or exponential functions fitted to geoscience data to solve problems and analyze the results from global climate models to make an evidence-based forecast of the current rate of global climate change.

**S.ID.B.6c** Fit a linear function for a scatter plot that suggests a linear association.

**S.ID.C.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

**S.ID.C.8** Compute (using technology) and interpret the correlation coefficient of a linear fit.

**S.ID.C.9** Distinguish between correlation and causation.

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

**A.REI.D.12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

| Understandings: | Essential Questions: |
|---|---|
| *Students will understand…*<br>● How to create linear equations in slope-intercept, point-slope, and standard forms<br>● How to use scatter plots to make and evaluate predictions, and use best-fit lines and correlation coefficients to determine how well linear functions fit sets of data<br>● How to determine whether a situation illustrates correlation or causation<br>● How to find inverses of functions<br>● How to write and solve linear inequalities<br>● How to graph linear inequalities in two variables<br>● How to apply linear inequalities in problem-solving situations | 1. What can a function tell you about the relationship that it represents?<br>2. How does changing the coordinates of two points on a line affect the slope of the line?<br>3. How are the point-slope and slope-intercept forms of a linear equation related?<br>4. How can you use a scatter plot to estimate unknown data?<br>5. What is the difference between correlation and causation?<br>6. How can you graph the inverse of a function?<br>7. How can writing and solving inequalities help you solve problems in the real world?<br>8. How can you model and solve a multi-step inequality?<br>9. How is solving an absolute value inequality similar to solving an absolute value equation?<br>10. How is graphing a linear inequality on the coordinate plane similar to and different from graphing on the number line? |

## Assessment Evidence

| Performance Tasks: | Other Evidence: |
|---|---|
| ● Warm-ups<br>● Exit Tickets<br>● Reveal Practice Assignments<br>● Quiz: Lessons 5.1 – 5.2<br>● Quiz: Lessons 6.1 – 6.3<br>● GoFormative Assignments | ● Independent Work<br>● Class Discussions<br>● Online Activities<br>● Practice and Homework<br>● Kahoot<br>● Quizizz<br>● Quizlet<br>● Blooket |

**Benchmarks:**
Departmental assessments for Modules 5 and 6 will be developed from the following resources:

On-Level Assessments (Form A)- Three versions of the on-level assessment are available, Form A1, Form A2, and Form A3.

Differentiated Assessments (Form C): Form C represents the beyond-level (BL) assessment.

## Learning Plan

**Learning Activities:**
**Module 5 Lesson 1: Writing Equations in Slope-Intercept Form**
*Students create linear equations in slope-intercept form.*
-Launch the Lesson
-Explore – Slope-Intercept Form
-Learn – Creating Linear Equations in Slope-Intercept Form Given the Slope and a Point
-Example 1 – Write an Equation Given the Slope and a Point
-Example 2 – Write an Equation in Slope-Intercept Form

-Learn – Creating Equations in Slope-Intercept Form Given Two Points
-Example 3 – Write Equations Given Two Points
-Apply Example 4 – Write an Equation Given Real-World Data

**Module 5 Lesson 2: Writing Equations in Standard and Point-Slope Form**
*Students create linear equations in point-slope form and standard form.*
-Explore – Forms of Linear Equations
-Learn – Creating Linear Equations in Point-Slope Form
-Example 1 – Equation in Point-Slope Form Given Slope and a Point
-Example 2 – Equation in Point-Slope Form Given Two Points
-Example 3 – Change to Slope-Intercept Form
-Example 4 – Apply Point-Slope Form
-Example 5 – Change to Standard Form
-Example 6 – Standard Form Given Two Points
-Learn – Equations of Parallel and Perpendicular Lines
-Example 7 – Parallel Line Through a Given Point
-Example 8 – Perpendicular Line Through a Given Point
-Example 9 – Determine Line Relationships

**Module 5 Lesson 3: Scatter Plots and Lines of Fit**
*Students use scatter plots to make and evaluate predictions.*
-Learn – Scatter Plots
-Example 1 – Evaluate Correlation
-Explore – Making Predictions by Using a Scatter Plot
-Learn – Lines of Fit
-Example 2 – Write an Equation for a Line of Fit

**Module 5 Lesson 4: Correlation and Causation**
*Students determine whether a situation illustrates correlation or causation.*
-Explore – Collecting Data to Determine Correlation and Causation
-Learn – Correlation and Causation
-Example 1 – Correlation and Causation by Graphing
-Example 2 – Causation and Correlation by Situation

**Module 5 Lesson 5: Linear Regression**
*Students use best-fit lines and correlation coefficients to determine how well linear functions fit sets of data.*
-Learn – Linear Regression and Best-Fit Lines
-Example 1 – Find a Best-Fit Line
-Example 2 – Use a Best-Fit Line
-Learn – Residuals
-Example 3 – Graph and Analyze a Residual Plot

**Module 5 Lesson 6: Inverses of Linear Functions**
*Students find inverses of functions.*
-Learn – Inverses of Relations
-Example 1 – Inverse Relations
-Example 2 – Find Inverse Relations from a Table
-Example 3 – Graph Inverse Relations
-Explore – Comparing a Function and its Inverse
-Learn – Inverses of Linear Functions
-Example 4 – Find an Inverse Linear Function
-Example 5 – Find Inverses of Linear Functions
-Example 6 – Apply Inverse Linear Functions

**Module 6 Lesson 1: Solving One-Step Inequalities**
*Students solve inequalities by using addition, subtraction, multiplication, and division.*
-Launch the Lesson
-Explore – Graphing Inequalities
-Explore – Properties of Inequalities
-Learn – Graphing Inequalities
-Example 1 – Graph Inequalities
-Example 2 – Write Inequalities from a Graph
-Learn – Solving Inequalities by Using Addition and Subtraction
-Example 3 – Solve Inequalities by Adding
-Example 4 – Solve Inequalities by Subtracting
-Example 5 – Add or Subtract to Solve Inequalities with Variables on Each Side
-Example 6 – Use an Inequality to Solve a Problem
-Learn – Solving Inequalities by Using Multiplication and Division
-Apply Example 7 – Write and Solve an Inequality
-Example 8 – Solve an Inequality by Multiplying
-Example 9 – Solve an Inequality by Dividing
-Example 10 – Solve an Inequality with a Negative Coefficient

**Module 6 Lesson 2: Solving Multi-Step Inequalities**
*Students solve inequalities by using more than one step.*
-Explore – Modeling Multi-Step Inequalities
-Learn – Solving Inequalities Involving More Than One Step
-Example 1 – Apply Multi-Step Inequalities
-Example 2 – Write and Solve a Multi-Step Inequality
-Example 3 – Solve an Inequality with the Distributive Property

**Module 6 Lesson 3: Solving Compound Inequalities**
*Students write and solve combinations of two inequalities joined by "and" or "or."*
-Explore – Guess the Range
-Learn – Solving Compound Inequalities Using the Word "and"
-Example 1 – Solve and Graph an Intersection
-Example 2 – Apply Compound Inequalities
-Learn – Solving Compound Inequalities Using the Word "or"
-Example 3 – Solve and Graph a Union
-Example 4 – Overlapping Intervals
-Example 5 – Write a Compound Inequality for an Intersection
-Example 6 – Write a Compound Inequality for a Union

**Module 6 Lesson 4: Solving Absolute Value Inequalities**
*Students solve absolute value inequalities.*
-Explore – Solving Absolute Value Inequalities
-Learn – Solving Inequalities Involving < and Absolute Value
-Example 1 – Solve Absolute Value Inequalities (<)
-Example 2 – Absolute Value Inequalities (<)
-Example 3 – Use Absolute Value Inequalities
-Learn – Solving Inequalities Involving > and Absolute Value
-Example 4 – Solve Absolute Value Inequalities (>)
-Example 5 – Absolute Value Inequalities (>) with Overlapping Case Solutions

**Module 6 Lesson 5: Graphing Inequalities in Two Variables**
*Students graph linear inequalities on the coordinate plane.*
-Explore – Graphing Linear Inequalities on the Coordinate Plane
-Learn – Graphing Linear Inequalities in Two Variables

-Example 1 – Graph an Inequality with an Open Half-Plane
-Example 2 – Graph an Inequality with a Closed Half-Plane
-Example 3 – Apply Graphing Inequalities in Two Variables
-Example 4 – Solve Linear Inequalities

**Resources:**

- Textbook: McGraw Hill Reveal Math, Algebra 1
- Student Workbooks: McGraw Hill Reveal Math, Algebra 1
- Technology: McGraw Hill Online Platform, Teacher 2 in 1 Device, Projector, Student Laptops, Calculators
- Graph Paper

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | - Refer to green BL (Beyond Level) indicators in Teacher Edition and assign corresponding activities: Beyond Level Differentiated Activities, Extension Activities<br>- Use IXL to enhance targeted skills |
| **Struggling Learners** | - Refer to orange AL (Approaching Level) indicators in Teacher Edition and assign corresponding activities: Remediation Activities, Extra Examples, Arrive Math Take Another Look Mini Lessons<br>- Use IXL to enhance targeted skills |
| **English Language Learners** | Refer to purple ELL (English Language Learner) indicators in Teacher Edition and assign corresponding activities |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:<br>• Variation of time: adapting the time allotted for learning, task completion, or testing<br>• Variation of input: adapting the way instruction is delivered<br>• Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete<br>• Modifying the content, process or product |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**

**English Language Arts Grade 8**

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text

NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone

NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

L.8.6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression

## Integration of 21st Century Skills

**Indicators:**
*9.1.8.CP.1: Compare prices for the same goods or services.*
*9.1.8.CP.2: Analyze how spending habits affect one's ability to save*
*9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.*
*9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.*
*9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.*
*9.1.8.PB.3: Explain how to create a budget that aligns with financial goals.*
*9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life (e.g. teenager, young adult, family).*
*9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business.*
*9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.*
*9.3.12.AC-DES.2 Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.*
*9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.*
*9.3.12.BM.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision-making in business.*
*9.3.12.FN.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry.*
*9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.*
*9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.*
*9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.*
*9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.*
*9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).*
*9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal*
*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.*

**Unit Title:** Systems of Linear Equations and Inequalities

**Unit Description:**
In this unit, students will apply their prior understanding of analyzing and solving linear equations to write and solve systems of two equations in two variables. Students will begin by solving systems graphically. Then, they will learn how to solve a system of equations using the Substitution and Elimination Methods. Once they have mastered these skills, they will write and solve systems of two inequalities in two variables. This unit will prepare students for solving systems including linear and quadratic equations in the future.

**Unit Duration: 11 days**

## Desired Results

**Standard(s):**
**A.CED.A** Create equations that describe numbers or relationships
**A.REI.C.** Solve systems of equations
**A.REI.D.** Represent and solve equations and inequalities graphically

**Indicators:**
**A.CED.A.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
Climate Change Example: Students may represent constraints describing the economic impact of climate change by equations, inequalities, and/or by systems of inequalities, and interpret solutions as viable or nonviable options.
**A.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.
**A.REI.C.6** Solve systems of linear equations algebraically (including using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
**A.REI.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.
**A.REI.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.

**Understandings:**
*Students will understand…*
- How to solve systems of equations using a variety of methods including graphing, substitution, and elimination
- How to solve systems of equations using graphing technology
- How to graph solution sets of systems of linear inequalities

**Essential Questions:**
1. How are systems of equations useful in the real world?
2. How can you solve a system of linear equations by graphing?
3. How can you rewrite a system of equations as a single equation with only one variable?
4. How can you produce a new system of equations with the same solution as a given system?
5. How are the solutions of a system of inequalities represented on a graph?

## Assessment Evidence

**Performance Tasks:**
- Warm-ups
- Exit Tickets
- Reveal Practice Assignments
- Quiz: Lessons 7.1 – 7.3
- GoFormative Assignments

**Other Evidence:**
- Independent Work
- Class Discussions
- Online Activities
- Practice and Homework
- Kahoot

| | |
|---|---|
| | • Quizizz<br>• Quizlet<br>• Blooket |

**Benchmarks:**
Departmental assessment for Module 7 will be developed from the following resources:

On-Level Assessments (Form A)- Three versions of the on-level assessment are available, Form A1, Form A2, and Form A3.

Differentiated Assessments (Form C): Form C represents the beyond-level (BL) assessment.

## Learning Plan

**Learning Activities:**
**Module 7 Lesson 1: Graphing Systems of Equations**
*Students solve systems of equations by graphing.*
-Launch the Lesson
-Explore – Intersections of Graphs
-Learn – Graphs of Systems of Equations
-Example 1 – Consistent Systems
-Example 2 – Inconsistent Systems
-Example 3 – Number of Solutions, Equations in Slope-Intercept Form
-Example 4 – Number of Solutions, Equations in Standard Form
-Learn – Solving Systems of Equations by Graphing
-Example 5 – Solve a System by Graphing
-Example 6 – Graph and Solve a System of Equations
-Apply Example 7 – Write a System of Equations
-Learn – Using Systems to Solve Linear Equations
-Example 8 – Use a System to Solve a Linear Equation
-Learn – Solving Systems of Equations by Using Graphing Technology
-Example 9 – Solve a System of Equations
-Example 10 – Write and Solve a System of Equations

**Module 7 Lesson 2: Substitution**
*Students solve systems of equations by using substitution.*
-Explore – Using Substitution
-Learn – Solving Systems of Equations by Substitution
-Example 1 – Solve a System by Substitution
-Example 2 – Solve and Then Substitute
-Example 3 – Use Substitution When There Are No or Many Solutions
-Example 4 – Write and Solve a System of Equations

**Module 7 Lesson 3: Elimination Using Addition and Subtraction**
*Students solve systems of equations by using elimination with addition or subtraction.*
-Learn – Solving Systems of Equations by Elimination with Addition
-Example 1 – Elimination Using Addition
-Example 2 – Write and Solve a System of Equations Using Addition
-Learn – Solving Systems of Equations by Elimination with Subtraction
-Example 3 – Elimination Using Subtraction
-Example 4 – Write and Solve a System of Equations Using Subtraction

**Module 7 Lesson 4: Elimination Using Multiplication**
*Students solve systems of equations by using elimination with multiplication.*

-Explore – Graphing and Elimination Using Multiplication
-Learn – Solving Systems of Equations by Elimination with Multiplication
-Example1 – Elimination Using Multiplication
-Example 2 – Multiply Both Equations to Eliminate a Variable
-Example 3 – Write and Solve a System Using Multiplication

**Module 7 Lesson 5: Systems of Inequalities**
*Students solve systems of inequalities by graphing.*
-Explore – Solutions of Systems of Inequalities
-Learn – Solving Systems of Inequalities by Graphing
-Example 1 – Solve by Graphing
-Example 2 – Solve by Graphing, No Solution
-Example 3 – Apply Systems of Inequalities

**Resources:**

- Textbook: McGraw Hill Reveal Math, Algebra 1
- Student Workbooks: McGraw Hill Reveal Math, Algebra 1
- Technology: McGraw Hill Online Platform, Teacher 2 in 1 Device, Projector, Student Laptops, Calculators
- Graphing Paper

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | - Refer to green BL (Beyond Level) indicators in Teacher Edition and assign corresponding activities: Beyond Level Differentiated Activities, Extension Activities<br>- Use IXL to enhance targeted skills |
| **Struggling Learners** | - Refer to orange AL (Approaching Level) indicators in Teacher Edition and assign corresponding activities: Remediation Activities, Extra Examples, Arrive Math Take Another Look Mini Lessons<br>- Use IXL to enhance targeted skills |
| **English Language Learners** | Refer to purple ELL (English Language Learner) indicators in Teacher Edition and assign corresponding activities |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:<br>• Variation of time: adapting the time allotted for learning, task completion, or testing<br>• Variation of input: adapting the way instruction is delivered<br>• Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete<br>• Modifying the content, process or product |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

## Interdisciplinary Connections

**Indicators:**

**English Language Arts Grade 8**

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text

NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone

NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

L.8.6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression

## Integration of 21st Century Skills

**Indicators:**

*9.1.8.CP.1: Compare prices for the same goods or services.*

*9.1.8.CP.2: Analyze how spending habits affect one's ability to save*

*9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.*

*9.1.8.PB.1: Predict future expenses or opportunities that should be included in the budget planning process.*

*9.1.8.PB.2: Explain how different circumstances can affect one's personal budget.*

*9.1.8.PB.3: Explain how to create a budget that aligns with financial goals.*

*9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life (e.g. teenager, young adult, family).*

*9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business.*

*9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).*

*9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal*

*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.*

**Unit Title:** Exponents, Roots, and Exponential Functions

**Unit Description:** In this unit, students will begin by focusing on exponents and roots. They will apply exponents to simplify expressions, simplify radical expressions, and solve exponential equations. After mastering these concepts, students will delve into exponential functions. They will learn how to write and solve exponential functions, graph and transform exponential functions, and understand geometric sequences. Students will be able to represent and interpret real-world scenarios in which exponential functions could be applicable.

**Unit Duration:** 29 Days

## Desired Results

**Standard(s):**

**A.SSE.A** Interpret the structure of expressions.
**A.SS.E.B** Write expressions in equivalent forms to solve problems.
**N.RN.A** Extend properties of exponents to rational exponents.
**N.RN.B** Use properties of rational and irrational numbers.
**F.IF.A** Understand the concept of a function and use function notation.
**F.IF.C** Analyze functions using different representations.
**F.BF.A** Build a function that models a relationship between two quantities.
**F.BF.B** Build new functions from existing functions.
**F.LE.A** Construct and compare linear and exponential models and solve problems.
**F.LE.B** Interpret expressions for functions in terms of the situation they model.

**Indicators:**

**A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$ , thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.*
**A.SSE.B.3c** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Use the properties of exponents to transform expressions for exponential functions. *For example the expression $1.15^t$ can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
**N.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. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*
**N.RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
**N.RN.A.3** Simplify radicals, including algebraic radicals (e.g. $\sqrt[3]{54} = 3\sqrt[3]{2}$, simplify $\sqrt{32x^2}$)
**N.RN.B.3** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. (Moved to Grade 8)
**F.IF.A.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.
**F.IF.C.7e** Graph exponential and logarithmic functions, showing intercepts and end behavior.
**F.IF.C.8b** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as $y=(1.02)^t$, $y=(0.97)^t$, $y=(1.01)^{12t}$, $y=(1.2)^{t/10}$, and classify them as representing exponential growth or decay.*
**F.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.
**F.BF.B.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*

**F.LE.A.1c** Distinguish between situations that can be modeled with linear functions and with exponential functions. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
**F.LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
**F.LE.B.5** Interpret the parameters in a linear or exponential function in terms of a context.

**Understandings:**
*Students will understand…*

- How to apply the multiplication properties of exponents to simplify expressions.
- How to apply the division properties of exponents to simplify expressions.
- How to apply the properties of zero and negative exponents to simplify expressions.
- How to apply the properties of rational exponents to simplify expressions.
- How to simplify radical expressions.
- How to perform operations with radical expressions.
- How to solve exponential equations.
- How to graph exponential functions.
- How to identify the effects of transformations of the graphs of exponential functions.
- How to create exponential functions and solve problems involving exponential growth and decay.
- How to use the properties of exponents to transform expressions for exponential functions.
- How to write and graph equations of geometric sequences.
- How to write arithmetic and geometric sequences recursively.

**Essential Questions:**
1. How do you perform operations and represent real-world situations with exponents?
2. How do you perform operations with radical expressions?
3. How can you solve an equation where the variable is in the exponent?
4. When and how can exponential functions represent real-world situations?

## Assessment Evidence

**Performance Tasks:**

- Warm-ups
- Exit Tickets
- Reveal Practice Assignments
- GoFormative Assignments
- 8.1-8.3 Quiz
- 8.4-8.6 Quiz
- 9.1-9.2 Quiz

**Other Evidence:**

- Independent Work
- Class Discussions
- Online Activities
- Practice and Homework
- Kahoot
- Quizizz
- Quizlet
- Blooket

**Benchmarks:**
Departmental assessments for Modules 8 and 9 will be developed from the following resources:

On-Level Assessments (Form A)- Three versions of the on-level assessment are available, Form A1, Form A2, and Form A3.

Differentiated Assessments (Form C): Form C represents the beyond-level (BL) assessment.

## Learning Plan

**Learning Activities:**

**Module 8 Lesson 1: Multiplication Properties of Exponents**

*Students will apply the multiplication properties of exponents to simplify expressions.*

-Warm-up – Evaluate powers and expressions with exponents, writing expressions with exponents
-Explore – Product of Powers
-Learn – Product of Powers
-Example 1 – Product of Powers
-Example 2 – Product of Powers and Scientific Notation
-Learn – Power of a Power
-Example 3 – Power of a Power
-Learn – Power of a Product
-Example 4 – Power of a Product
-Example 5 – Power of a Product and Area

**Module 8 Lesson 2: Division Properties of Exponents**

*Students will apply the division properties of exponents to simplify expressions.*

-Launch – Real-world examples of dividing exponents
-Explore – Quotients of Powers
-Learn – Quotients of Powers
-Example 1 – Quotient of Powers
-Example 2 – Apply Division of Monomials
-Learn – Power of a Quotient
-Example 3 – Power of a Quotient
-Example 4 – Power of a Quotient with Variables
-Exit Ticket

**Module 8 Lesson 3: Negative Exponents**

*Students will apply the properties of zero and negative exponents to simplify expressions.*

-Launch – Real-world applications of negative exponents
-Explore – Simplifying Expressions with Negative Exponents
-Learn – Zero Exponent
-Example 1 – Zero Exponent
-Learn – Negative Exponents
-Example 2 – Negative Exponents
-Example 3 – Simplify and Expression with Negative Exponents
-Apply Example 4 – Apply Properties of Exponents

**Module 8 Lesson 4: Rational Exponents**

*Students apply the properties of rational exponents to simplify expressions.*

-Launch – Students see a real-world application of rational exponents.
-Explore – Expressions with Rational Exponents
-Learn – *n*th Roots
-Example 1 – Radical and Exponential Forms
-Example 2 – Evaluate *n*th Roots
-Example 3 – Evaluate Exponential Expressions with Rational Exponents
-Learn – Powers of *n*th Roots
-Example 4 – Evaluate Expressions of Powers of *n*th Roots
-Example 5 – Apply Rational Exponents

**Module 8 Lesson 5: Simplifying Radical Expressions**

*Students will simplify radical expressions.*

-Launch – Real-world application to help students understand the mathematics involved in formulas they may encounter in their careers
-Explore – Square Roots and Negative Numbers

-Learn – Simplifying Square Root Expressions
-Example 1 – Simplify Square Roots
-Example 2 – Multiply Square Roots
-Example 3 – Divide Square Roots
-Example 4 – Simplify Square Roots with Variables
-Example 5 – Write and Solve a Radical Equation
-Learn – Simplifying Cube Root Expressions
-Example 6 – Find Cube Roots
-Example 7 – Simplify Cube Roots
-Example 8 – Multiply Cube Roots
-Example 9 – Divide Cube Roots
-Example 10 – Simplify Cube Roots with Variables

**Module 8 Lesson 6: Operations with Radical Expressions**
*Students will perform operations with radical expressions.*
-Warm-up – Review writing equations that represent real-world situations and solving real-world problems using two-step equations
-Learn – Adding and Subtracting Radical Expressions
-Example 1 – Add and Subtract Expressions with Like Radicands
-Example 2 – Add and Subtract Expressions with Unlike Radicands
-Example 3 – Use Radical Expressions
-Learn – Multiplying Radical Expressions
-Example 4 – Multiplying Radical Expressions
-Example 5 – Multiply Radical Expressions by Using the Distributive Property

**Module 8 Lesson 7: Exponential Equations**
*Students will be able to solve exponential equations.*
-Warm-up – Adding and subtracting radical expressions
-Explore – Solving Exponential Equations
-Example 1 – Solve a One-Step Exponential Equation
-Example 2 – Solve a Multi-step Exponential Equation
-Example 3 – Solve a Real-World Exponential Equation

**Module 9 Lesson 1: Exponential Functions**
*Students will graph exponential functions.*
-Warm-up –Finding function values
-Explore – Exponential Behavior
-Explore – Restrictions on Exponential Functions
-Learn – Identifying Exponential Behavior
-Example 1 – Identify Exponential Behavior
-Learn – Graphing Exponential Functions
-Example 2 – Exponential Growth Function
-Example 3 – Exponential Decay Functions

**Module 9 Lesson 2: Transformations of Exponential Functions**
*Students identify the effects of transformations of the graphs of exponential functions.*
-Warm-up – Transforming linear functions
-Explore – Translating Exponential Functions
-Explore – Dilating Exponential Functions
-Explore – Reflecting Exponential Functions
-Learn – Translations of Exponential Functions
-Example 1 – Vertical Translations of Exponential Functions
-Example 2 – Horizontal Translations of Exponential Functions
-Example 3 – Multiple Translations of Exponential Functions

-Example 4 – Identify Exponential Functions from Graphs (Vertical Translations)
-Example 5 – Identify Exponential Functions from Graphs (Horizontal Translations)
-Learn – Dilations of Exponential Functions
-Example 6 – Vertical Dilations of Exponential Functions
-Example 7 – Horizontal Dilations of Exponential Functions
-Example 8 – Describe Dilations of Exponential Functions
-Example 9 – Identify Exponential Functions from Graphs (Dilations)
-Learn – Reflections of Exponential Functions
-Example 10 – Vertical Reflections of Exponential Functions
-Example 11 – Horizontal Reflections of Exponential Functions
-Learn – Transformations of Exponential Functions
-Example 12 – Multiple Transformations of Exponential Functions

**Module 9 Lesson 3: Writing Exponential Functions**
*Students create exponential functions to solve problems involving exponential growth and decay.*
-Warm-up – Writing linear functions
-Explore – Writing and Exponential Function to Model Population Growth
-Learn – Constructing Exponential Functions
-Example 1 – Write an Exponential Function Given Two Points
-Example 2 – Write and Exponential Function Given a Graph
-Example 3 – Write an Exponential Function Given a Description
-Learn – Solving Problems Involving Exponential Growth
-Example 4 – Exponential Growth
-Example 5 – Apply – Compound Interest
-Learn – Solving Problems Involving Exponential Decay
-Example 6 – Exponential Decay

**Module 9 Lesson 4: Transforming Exponential Expressions**
*Students use the properties of exponents to transform expressions for exponential functions.*
-Warm-up – Evaluating expressions with exponents
-Example 1 – Write Equivalent Exponential Expressions

**Module 9 Lesson 5: Geometric Sequences**
*Students write and graph equations of geometric sequences.*
-Warm-up – writing explicit formulas for arithmetic sequences
-Explore – Modeling Geometric Sequences
-Learn – Geometric Sequences
-Example 1 – Geometric Sequences
-Example 2 – Identify Geometric Sequences
-Example 3 – Find Terms of Geometric Sequences
-Learn – Geometric Sequences as Exponential Functions
-Example 4 – Find the *n*th Term of a Geometric Sequence
-Example 5 – Use a Geometric Sequence

**Module 9 Lesson 6: Recursive Formulas**
*Students will write arithmetic and geometric sequences recursively.*
-Warm-up – writing explicit formulas for arithmetic and geometric sequences
-Explore – Writing Recursive Formulas for Sequences
-Learn – Using Recursive Formulas
-Example 1 – Recursive Formula for an Arithmetic Sequence
-Example 2 – Recursive Formula for a Geometric Sequence
-Learn – Writing Recursive Formulas
-Example 3 – Write a Recursive Formula Using a List
-Example 4 – Write a Recursive Formula Using a Graph

-Example 5 – Write Recursive and Explicit Formulas
-Example 6 – Translate Between Recursive and Explicit Formulas

**Resources:**

- Textbook: McGraw Hill Reveal Math, Algebra 1
- Student Workbooks: McGraw Hill Reveal Math, Algebra 1
- Technology: McGraw Hill Online Platform, Teacher 2 in 1 Device, Projector, Student Laptops, Calculators

| Unit Modifications for Special Population Students | |
|---|---|
| **Advanced Learners** | - Refer to green BL (Beyond Level) indicators in Teacher Edition and assign corresponding activities: Beyond Level Differentiated Activities, Extension Activities<br>- Use IXL to enhance targeted skills |
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| **English Language Learners** | Refer to purple ELL (English Language Learner) indicators in Teacher Edition and assign corresponding activities |
| **Special Needs Learners** | Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:<br>• Variation of time: adapting the time allotted for learning, task completion, or testing<br>• Variation of input: adapting the way instruction is delivered<br>• Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete<br>• Modifying the content, process or product |
| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

| Interdisciplinary Connections |
|---|
| **Indicators:**<br>NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text<br>NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone<br>NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.<br>NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.<br>NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.<br>L.8.6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. |

| Integration of 21st Century Skills |
| --- |
| **Indicators:**<br>*9.1.8.CDM.1: Compare and contrast the use of credit cards and debit cards for specific purchases and the advantages and disadvantages of using each.*<br>*9.1.8.CDM.2: Demonstrate an understanding of the terminology associated with different types of credit (e.g., credit cards, installment loans, mortgages, lines of credit) and compare and calculate the interest rates associated with each.*<br>*9.1.8.CDM.3: Compare and contrast loan management strategies, including interest charges and total principal repayment costs.*<br>*9.1.8.CP.1: Compare prices for the same goods or services.*<br>*9.1.8.CP.2: Analyze how spending habits affect one's ability to save*<br>*9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business.*<br>*9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.*<br>*9.3.12.AC-DES.2 Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.*<br>*9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.*<br>*9.3.12.BM.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision-making in business.*<br>*9.3.12.FN.1 Utilize mathematical concepts, skills and problem solving to obtain necessary information for decision making in the finance industry.*<br>*9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.*<br>*9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.*<br>*9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.*<br>*9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.*<br>*9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).*<br>*9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal*<br>*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.* |

| |
|---|
| **Unit Title:** Polynomials |
| **Unit Description:** In this unit, students will begin by learning how to add, subtract, and multiply polynomial expressions. Students will see multiple representations of how to perform these operations. Once these skills have been mastered, students will learn how to factor polynomials, including in the case of special products. In doing so, students will understand how polynomials are related to special products. Real-world examples will be incorporated throughout this unit. |
| **Unit Duration:** 15 Days |
| **Desired Results** |
| **Standard(s):**<br>**A.SSE.A** Interpret the structure of expressions.<br>**A.APR.A** Perform arithmetic operations on polynomials.<br>**A.REI.C** Solve systems of equations. |
| **Indicators:**<br>**A.SSE.A.1.a** Interpret parts of an expression, such as terms, factors, and coefficients.<br>**A.APR.A.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.<br>**A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 – y^4$ as $(x^2)^2–(y^2)^2$ , thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.*<br>**A.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. |

| **Understandings:**<br>*Students will understand…*<br>● How to add and subtract polynomials by combining like terms.<br>● How to multiply polynomials by monomials.<br>● How to multiply polynomials by polynomials.<br>● How to multiply binomials by applying special patterns.<br>● How to factor polynomials using the Distributive Property.<br>● How to factor trinomials into two binomials.<br>● How to factor polynomials by applying special patterns. | **Essential Questions:**<br>1. How can you perform operations on polynomials and use them to represent real-world situations?<br>2. How is factoring polynomials related to multiplying polynomials? |
|---|---|

## Assessment Evidence

| **Performance Tasks:**<br>● Warm-ups<br>● Exit Tickets<br>● Reveal Practice Assignments<br>● GoFormative Assignments<br>● Quiz – 10.1-10.4 Adding, Subtracting and Multiplying Polynomial Expressions | **Other Evidence:**<br>● Independent Work<br>● Class Discussions<br>● Online Activities<br>● Practice and Homework<br>● Kahoot<br>● Quizizz<br>● Quizlet<br>● Blooket |
|---|---|

**Benchmarks:**
Departmental assessment for Module 10 will be developed from the following resources:

On-Level Assessments (Form A)- Three versions of the on-level assessment are available, Form A1, Form A2, and Form A3.

Differentiated Assessments (Form C): Form C represents the beyond-level (BL) assessment.

## Learning Plan

**Learning Activities:**
**Module 10 Lesson 1: Adding and Subtracting Polynomials**
*Students will add and subtract polynomials by combining like terms.*
-Warm-up – finding degrees of monomials
-Explore – Using Algebra Tiles to Add and Subtract Polynomials
-Learn – Types of Polynomials
-Example 1 – Identify Polynomials
-Example 2 – Standard Form of a Polynomial
-Learn – Adding Polynomials
-Example 3 – Add Polynomials
-Learn – Subtracting Polynomials
-Example 4 – Subtract Polynomials Horizontally
-Example 5 – Subtract Polynomials Vertically
-Example 6 – Add and Subtract Polynomials

**Module 10 Lesson 2: Multiplying Polynomials by Monomials**
*Students will multiply polynomials by monomials.*
-Warm-up – Writing polynomials in order of degree
-Learn – Multiplying a Polynomial by a Monomial

-Example 1 – Multiply a Polynomial by a Monomial
-Example 2 – Simplifying Expressions
-Example 3 – Write and Evaluate a Polynomial Expression
-Example 4 – Solve Equations with Polynomial Expressions

**Module 10 Lesson 3: Multiplying Polynomials**
*Students will multiply polynomials by polynomials.*
-Warm-up – Multiplying Monomials and Binomials
-Learn – Multiplying Binomials
-Example 1 – Multiply Binomials Using the Vertical Method
-Example 2 – Multiply Binomials Using the Horizontal Method
-Example 3 – Multiply Binomials Using the FOIL Method
-Apply – Solve a Problem Using FOIL
-Example 5 – Multiplying Polynomials Using the Distributive Property

**Module 10 Lesson 4: Special Products**
*Students will multiply binomials by applying special patterns.*
-Warm-up – Multiplying Binomials
-Learn – Square of a Sum
-Example 1 – Square of a Sum
-Example 2 – Use Square of Sums
-Learn – Square of a Difference
-Example 3 – Square of a Difference
-Learn – Product of a Sum and a Difference
-Example 4 – Product of a Sum and a Difference

**Module 10 Lesson 5: Using the Distributive Property**
*Students will factor polynomials using the Distributive Property.*
-Warm-up – Finding the GCF of a set of binomials
-Learn – Factoring by Using the Distributive Property
-Example 1 – Use the Distributive Property
-Example 2 – Use Factoring
-Learn – Factor by Grouping
-Example 3 – Factor by Grouping
-Example 4 – Factor by Grouping with Additive Inverses

**Module 10 Lesson 6: Factoring Quadratic Trinomials**
*Students will factor trinomials into two binomials.*
-Warm-up – Properties of multiplying integers
-Learn – Factoring Trinomials with a Leading Coefficient of 1
-Example 1 – $c$ is Positive
-Example 2 – $c$ is Negative, and $b$ is Positive
-Example 3 – $c$ is Negative, and $b$ is Negative
-Example 4 – Factor a Polynomial
-Example 5 – Solve a Problem by Factoring
-Learn – Factoring Trinomials
-Example 6 – $c$ is Negative
-Example 7 – $c$ is Positive

**Module 10 Lesson 7: Factoring Special Products**
*Students will factor polynomials by applying special patterns.*
-Warm-up – Identifying difference of squares
-Learn – Factoring Differences of Squares
-Example 1 – Factor Difference of Squares

-Example 2 – Factor More Than Once
-Example 3 – Use Factors to Find Area
-Learn – Factoring Perfect Squares
-Example 4 – Identify a Perfect Square Trinomial
-Example 5 – Recognize and Factor a Perfect Square Trinomial

**Resources:**

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- Student Workbooks: McGraw Hill Reveal Math, Algebra 1
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| Unit Modifications for Special Population Students | |
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| **Learners with a 504** | Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans. |

| Interdisciplinary Connections |
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| **Indicators:**<br>NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text<br>NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone<br>NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.<br>NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. |

L.8.6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

## Integration of 21st Century Skills

**Indicators:**

*9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.*
*9.3.12.AC-DES.2 Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.*
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*9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).*
*9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal*
*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.*

**Unit Title:** Quadratic Functions

**Unit Description:** In this unit, students will first learn how to graph quadratic equations. They will discover the most efficient ways to graph quadratics and observe patterns in function rules that relate to transformations of these quadratic functions. Students will graph quadratics functions written in both vertex form and standard form. Once this concept has been mastered, students will use their knowledge of graphing quadratic functions to solve quadratic equations graphically. Students will also use their knowledge of factoring quadratic expressions to solve quadratic equations algebraically. Additionally, students will learn how to use the discriminant of a quadratic equation to find the number of solutions to the equation and use the Quadratic Formula to calculate solutions to quadratic equations. Once students have mastered the skills of solving quadratic equations graphically and algebraically, they will learn how to solve nonlinear systems, model, and fit curves, analyze exponential growth patterns, and combine functions.

**Unit Duration:** 17 Days

## Desired Results

**Standard(s):**

**F.IF.B** Interpret functions that arise in applications in terms of the context.
**F.IF.C** Analyze functions using different representations.
**F.BF.B** Build new functions from existing functions.
**A.SSE.B** Write expressions in equivalent forms to solve problems.
**A.REI.B** Solve equations and inequalities in one variable.
**A.REI.C** Solve systems of equations.
**A.CED.A** Create equations that describe numbers or relationships.
**F.LE.A** Construct and compare linear and exponential models and solve problems.
**F.BF.A** Build a function that models a relationship between two quantities.

**Indicators:**

**F.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. *Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
**F.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.
**F.IF.C.7a** Graph linear and quadratic functions and show intercepts, maxima, and minima.
**F.IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
**F.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.
**F.BF.B.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
**A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
**A.SSE.B.3a** Factor a quadratic expression to reveal the zeros of the function it defines.
**A.SSE.B.3b** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
**A.REI.B.4** Solve quadratic equations in one variable.
**A.REI.B.4b** Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
**A.REI.C.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = –3x$ and the circle $x^2 + y^2 = 3$.*

**A.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.*
Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.
**A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
**F.LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.
**F.LE.A.1a** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
**F.LE.A.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
**F.BF.A.1** Write a function that describes a relationship between two quantities.
**F.BF.A.1b** Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

**Understandings:**
*Students will understand…*
- How to analyze and graph quadratic functions.
- How to identify effects of transformations of the graphs of quadratic functions.
- How to write quadratic equations and solve them by graphing.
- How to solve quadratic equations by factoring and using the square root property.
- How to solve quadratic equations by completing the square.
- How to solve quadratic equations by using the Quadratic Formula.
- How to solve systems of linear and quadratic equations.
- How to model data with linear, exponential, and quadratic functions.
- How to combine standard function types.

**Essential Questions:**
1. Why is it helpful to have different methods to analyze quadratic functions and solve quadratic equations?
2. How can you use the values of *a*, *b,* and *c* in the equation of a quadratic function to visualize its graph?
3. How does performing an operation on a quadratic function change its graph?
4. How does having a formula make it possible to solve quadratic equations where other methods are not easy to apply?
5. How can differences of ratios of successive *y*-values be used to write a model?

## Assessment Evidence

**Performance Tasks:**
- Warm-ups
- Exit Tickets
- Reveal Practice Assignments
- GoFormative Assignments
- Module 11.1-11.2 Quiz
- Module 11.3-11.6 Quiz

**Other Evidence:**
- Independent Work
- Class Discussions
- Online Activities
- Practice and Homework
- Kahoot
- Quizizz
- Quizlet
- Blooket

**Benchmarks:**
Departmental assessment for Module 11 will be developed from the following resources:

On-Level Assessments (Form A)- Three versions of the on-level assessment are available, Form A1, Form A2, and Form A3.

Differentiated Assessments (Form C): Form C represents the beyond-level (BL) assessment.

## Learning Plan

**Learning Activities:**

**Module 11 Lesson 1: Graphing Quadratic Functions**

*Students will analyze and graph quadratic functions.*

-Warm-up – 1) Identifying A, B, and C in the standard form of a linear equation and 2) Writing a linear equation that models a real-world situation
-Explore – Graphing Parabolas
-Example 1 – Identify Characteristics: Graph with *x*-intercept
-Example 2 – Identify Characteristics: Graph with No *x*-intercept
-Learn – Graphing Quadratic Functions
-Example 3 – Graph a Quadratic Function by Using Key Features
-Example 4 – Graph a Quadratic Function by Using a Table
-Example 5 – Use a Graph of a Quadratic Function
-Learn – Analyzing Key Features of a Quadratic Function
-Example 6 – Interpret the Graph of a Quadratic Function

**Module 11 Lesson 2: Transformations of Quadratic Functions**

*Students will identify effects of transformations of the graphs of quadratic functions.*

-Warm-up – Transforming Exponential Functions
-Explore – Transforming Quadratic Functions
-Learn- Translations of Quadratic Functions
-Example 1 – Vertical Translations of Quadratic Functions
-Example 2 – Horizontal Transformations of Quadratic Functions
-Example 3 – Multiple Translations of Quadratic Functions
-Learn- Dilations of Quadratic Functions
-Example 4 – Vertical Dilations of Quadratic Functions
-Example 5 – Horizontal Dilations of Quadratic Functions
-Learn – Reflections of Quadratic Functions
-Example 6 – Vertical Reflections of Quadratic Functions
-Example 7 – Horizontal Reflections of Quadratic Functions
-Learn – Transformations of Functions
-Example 8 – Multiple Transformations of Quadratic Functions
-Example 9 – Apply Transformations of Quadratic Functions
-Example 10 – Identify a Quadratic Equation from a Graph

**Module 11 Lesson 3: Solving Quadratic Equations by Graphing**

*Students will write quadratic equations and solve them by graphing.*

-Warm-up – Naming x-intercepts from a graph
-Explore – Roots and Zeros of a Quadratic
-Learn – Solving Quadratic Equations by Graphing
-Example 1 – Solve a Quadratic Equation with Two Roots
-Example 2 – Solve a Quadratic Equation with a Double Root
-Example 3 – Solve a Quadratic Equation with No Real Roots
-Example 4 – Approximate Roots of Quadratic Functions

**Module 11 Lesson 4: Solving Quadratic Equations by Factoring**

*Students will solve quadratic equations by factoring and using the square root property.*

-Warm-up – Determining whether a polynomial is factorable and writing a polynomial that represents the area of a shaded region
-Explore – Using Factors to Solve Quadratic Equations
-Learn – Solving Quadratic Equations by Using the Square Root Property
-Example 1 – Using the Square Root Property
-Example 2 – Solve an Equation by Using the Square Root Property

-Learn – Solving Quadratic Equations by Factoring
-Example 3 – Solve a Quadratic Equation by Using the Distributive Property
-Example 4 – Solve a Quadratic Equation by Factoring a Trinomial
-Example 5 – Solve a Quadratic Equation by Factoring a Difference of Squares
-Example 6 – Solve a Quadratic Equation by Factoring a Perfect Square Trinomial
-Apply – Factor a Trinomial to Solve a Problem
-Learn – Writing Functions Given the Zeros
-Example 8 – Write a Quadratic Function Given a Graph
-Example 9 – Write a Quadratic Function Given Points

**Module 11 Lesson 5: Solving Quadratic Equations by Completing the Square**
*Students will solve quadratic equations by completing the square.*
-Warm-up – Determining whether a trinomial is a perfect square
-Learn – Solve Quadratic Equations by Completing the Square
-Example 1 – Complete the Square
-Example 2 – Solve an Equation by Completing the Square
-Example 3 – Solve an Equation with *a* Not Equal to 1
-Learn – Finding the Maximum or Minimum Value
-Example 4 – Find a Minimum
-Example 5 – Find a Maximum
-Example 6 – Use Extrema and Key Features

**Module 11 Lesson 6: Solving Quadratic Equations by Using the Quadratic Formula**
*Students will solve quadratic equations by using the Quadratic Formula.*
-Warm-up – Evaluating algebraic expressions and solving a number problem by writing and solving a quadratic equation
-Explore – Deriving the Quadratic Formula Algebraically
-Learn – Solving Quadratic Equations by Using the Quadratic Formula
-Example 1 – Use the Quadratic Formula
-Example 2 – Use the Quadratic Formula When *a* is Not Equal to 1
-Example 3 – Solve a Quadratic Equation with Irrational Roots
-Learn – The Discriminant
-Example 4 – Use the Discriminant

**Module 11 Lesson 7: Solving Systems of Linear and Quadratic Equations**
*Students will solve systems of linear and quadratic equations.*
-Warm-up – Solving linear systems and solving real-world problems by writing and solving linear systems
-Learn – Solve Systems of Linear and Quadratic Equations by Graphing
-Example 1 – Solve a System of Linear and Quadratic Equations by Graphing
-Learn – Solving Systems of Linear and Quadratic Equations Algebraically
-Example 2 – Solve a System of Linear and Quadratic Equations Algebraically
-Example 3 – Use a System of Linear and Quadratic Equations

**Module 11 Lesson 8: Modeling and Curve-Fitting**
*Students will model data with linear, exponential, and quadratic functions.*
-Warm-up – Fitting a line to a set of data
-Explore – Using Differences and Ratios to Model Data
-Learn – Modeling Real-World Situations
-Example 1 – Determine a Model by Using First Differences
-Example 2 – Determine a Model by Using Second Differences
-Example 3 – Determine a Model by Using Ratios
-Learn – Curve Fitting
-Example 4 – Find the Best Model

**Module 11 Lesson 9: Combining Functions**
*Students will combine standard function types.*
-Warm-up – Simplifying a polynomial by combining like terms
-Explore – Using Graphs to Combine Functions
-Learn – Adding and Subtracting Functions
-Example 1 – Add Functions
-Example 2 – Subtract Functions
-Learn – Multiplying Functions
-Example 3 – Multiply Linear and Quadratic Functions
-Example 4 – Multiply Linear and Exponential Functions
-Example 5 – Combine Functions
-Example 6 – Combine Two Functions

**Resources:**

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| Unit Modifications for Special Population Students | |
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*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.*

**Unit Title:** Statistics

**Unit Description:**
In this unit, students will work towards three main ideas: representing data using numerical statistics and graphical methods, analyzing shapes of distributions, and summarizing and interpreting categorical data using frequency tables. Students will begin this unit by learning how to represent sets of data using measures of center and percentiles, how to represent data using dot plots, histograms, and bar graphs, and how to analyze data collection and representation methods to determine bias or misleading information. Once these skills have been mastered, students will continue to learn how to represent sets of data using measures of spread. Then, they will be able to analyze the shapes of distributions to determine appropriate statistics and identify extreme data points. Students will then use statistics appropriate to the shapes of the distributions to compare the measures of center and spread of two data sets. After mastering these skills, students will be able to achieve their final module goal of summarizing and interpreting categorical data using frequency tables. Throughout this unit, students will be able to implement the skills they've mastered throughout the Algebra 1 course in real-world scenarios.

**Unit Duration:** 11 Days

## Desired Results

**Standard(s):**
**S.ID.A** Summarize, represent, and interpret data on a single count or measurement variable.
**S.ID.B** Summarize, represent, and interpret data on two categorical and quantitative variables.
**N.Q.A** Reason quantitatively and use units to solve problems.
**S.IC.A** Understand and evaluate random processes underlying statistical experiments.
**S.IC.B** Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

**Indicators:**
**S.ID.A.1** Represent data with plots on the real number line (dot plots, histograms, and box plots).
Climate Change Example: Students may represent geoscience data, with plots on the real number line, as they analyze results from global climate models.
**S.ID.A.2** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

**S.ID.A.3** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
**S.ID.B.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
**N.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.
Climate Change Example: Students may use units to guide the solution of multi-step problems about how variations in the flow of energy into and out of the Earth's systems result in climate change. Note: Changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
**S.IC.A.1** (+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
**S.IC.B.6** (+) Evaluate reports based on data.

**Understandings:**
*Students will understand…*
- How to represent sets of data using measures of center and percentiles.
- How to represent data using dot plots, histograms, and bar graphs.
- How to analyze data collection and representation methods to determine bias or misleading information.
- How to represent sets of data using measures of spread.
- How to analyze the shapes of distributions to determine appropriate statistics and identify extreme data points.
- How to use statistics appropriate to the shapes of the distributions to compare the measures of center and spread of two data sets.
- How to summarize and interpret categorical data using frequency tables.

**Essential Questions:**
1. How do you summarize and interpret data?
2. Why is it useful to know how to create and interpret different types of data displays?
3. How are statistics used in the real world to sway opinions?
4. How are histograms and box plots useful for comparing real-world data?

## Assessment Evidence

**Performance Tasks:**
- Warm-ups
- Exit Tickets
- Reveal Practice Assignments
- GoFormative Assignments
- 12.1-12.3 Quiz

**Other Evidence:**
- Independent Work
- Class Discussions
- Online Activities
- Practice and Homework
- Kahoot
- Quizizz
- Quizlet
- Blooket

**Benchmarks:**
Departmental assessment for Module 12 will consist of a project.

## Learning Plan

**Learning Activities:**

**Module 12 Lesson 1: Measures of Center**

*Students will represent sets of data using measures of center and percentiles.*

-Warm-up – ordering real numbers from least to greatest
-Explore – Finding Percentiles
-Learn – Mean, Median and Mode
-Example 1 – Measures of Center
-Learn – Percentiles
-Example 2 – Find Percentiles

**Module 12 Lesson 2: Representing Data**

*Students will represent data using dot plots, histograms, and bar graphs.*

-Warm-up – Finding mean, median, and mode, and determining which measure of central tendency is the best indicator to use in a given situation
-Learn – Dot Plots
-Example 1 – Make a Dot Plot
-Example 2 – Make a Dot Plot by Using a Scaled Number Line
-Learn – Bar Graphs and Histograms
-Apply Example 3 – Determine an Appropriate Graph for Discrete Data
-Example 4 – Determine an Appropriate Graph for Continuous Data

**Module 12 Lesson 3: Using Data**

*Students will analyze data collection and representation methods to determine bias or misleading information.*

-Warm-up – Surveying
-Explore – Phrasing Questions
-Learn – Collecting Data
-Example 1 – Sample Bias
-Example 2 – Question Bias
-Learn – Using Statistics and Representations
-Example 3 – Data Summaries
-Example 4 – Data Representations

**Module 12 Lesson 4: Measures of Spread**

*Students will represent sets of data using measures of spread.*

-Warm-up – Finding minimum, median, and maximum data values in a set of data
-Explore – Using Measures of Spread to Describe Data
-Learn – Range and Interquartile Range
-Example 1 – Range
-Example 2 – Make a Box Plot
-Example 3 – Interquartile Range
-Learn – Standard Deviation
-Example 4 – Calculate Standard Deviation

**Module 12 Lesson 5: Distributions of Data**

*Students will analyze the shapes of distributions to determine appropriate statistics and identify extreme data points.*

-Warm-up – comparing the mean and median of a set of data
-Learn – Shapes of Distributions
-Example 1 – Analyze Distribution by Using Technology
-Example 2 – Choose Appropriate Statistics by Using a Histogram
-Example 3 – Choose Appropriate Statistics by Using a Box Plot
-Learn – Extreme Data Points

-Example 4 – Choose Appropriate Statistics with Extreme Data Points

**Module 12 Lesson 6: Comparing Sets of Data**
*Students will use statistics appropriate to the shapes of the distributions to compare the measures of center and spread of two data sets.*
-Warm-up – analyzing the distribution of a set of data and determining appropriate measures of center and spread
-Explore – Transforming Sets of Data by Using Addition
-Explore – Transforming Sets of Data by Using Multiplication
-Learn – Linear Transformations of Data
-Example 1 – Transformations Using Addition
-Example 2 – Transformations Using Multiplication
-Example 3 – Compare Symmetric Distributions of Data
-Example 4 – Compare Skewed Distributions of Data

**Module 12 Lesson 7: Summarizing Categorical Data**
*Students will summarize and interpret categorical data using frequency tables.*
-Warm-up – completing frequency tables
-Explore – Categorical Data
-Learn – Two-Way Frequency Tables
-Example 1 – Use a Two-Way Frequency Table
-Learn – Two-Way Relative Frequency Tables
-Example 2 – Use a Two-Way Relative Frequency Table
-Example 3 – Use a Two-Way Conditional Relative Frequency Table

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*9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.*
*9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.*
*9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).*
*9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).*
*9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).*
*9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal*
*9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.*
*9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.*

*9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data.*