

Foundations of College Math

Unit Title: Unit 1: The Set of Real Numbers, Linear Equations and Inequalities (18 days)

Stage 1: Desired Results

Standards & Indicators:

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.

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

N-RN.A. 2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

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.

N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling

A-SSE A.1. Interpret expressions that represent a quantity in terms of its context.

A-SSE A 2. Use the structure of an expression to identify ways to rewrite it.

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 -APR A.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

A -APR B.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial

A -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

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

A -REI A.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

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

A-REI B.4. Solve quadratic equations in one variable.

A-REI B.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.

Integration of Climate Change

- 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

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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.
- 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.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g. 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoG1.1, 7.1.IH.IPERS.6, .1.IL.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.

Central Idea/Enduring Understanding:

Chapter 1

Real numbers allow us to talk about parts of things, to expand our thinking, to explain phenomena in precise ways, and to operate with numbers consistently and predictably. In this chapter, we will explore how real numbers are used, and the way they open the door to algebra.

Chapter 2

Equations are mathematical sentences that state a relationship between two or more mathematical expressions. Solutions for equations can be found by isolating the variable on one side of the equal sign using the Properties of Equality.

Essential/Guiding Question:

At the end of the Unit, students should be able to answer the Essential Questions:

Chapter 1- How are symbols useful in mathematics? How can you find the solution to a math problem? Chapter 2- How can mathematical ideas be represented?

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<p>Content:</p> <p>1.3 Exponents, Square Roots, and the Order of Operations</p> <p>1.4 Addition of Real Numbers</p> <p>1.6 Multiplication and Division of Real Numbers</p> <p>1.7 Properties of Real Numbers and Simplifying Expressions</p> <p>2.1 Addition, Subtraction, Multiplication, and Division Properties of Equality</p> <p>2.2 Solving Linear Equations</p> <p>2.4 Introduction to Word Problems</p> <p>2.6 Formulas and Applications of Geometry</p> <p>7.7 Applications of Rational Equations and Proportions</p> <p>2.8 Solving Linear Inequalities</p>	<p>Skills(Objectives):</p> <p>Simplify expressions by using the order of operations</p> <p>Simplify expressions with square roots</p> <p>Add, subtract, multiply and divide real numbers</p> <p>Translate verbal expressions into algebraic expressions and equations and vice versa</p> <p>Solve linear equations using the properties of equality</p> <p>Translate, set up and solve word problems some involving geometry</p> <p>Set up and solve proportions</p> <p>Solve linear inequalities</p>
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<p>Interdisciplinary Connections:</p> <p>Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.</p> <ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others 4. Model with mathematics 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning
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Stage 2: Assessment Evidence

<p>Performance Task(s):</p> <p>A -CED - Planning a Pizza Party</p> <p>https://curriculum.illustrativemathematics.org/HS/students/1/2/1/index.html</p>	<p>Other Evidence:</p> <p>Written and Online Assignments</p> <p>Exit Cards</p> <p>Mid Chapter Quizzes</p> <p>End of Chapter Assessments</p>
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Stage 3: Learning Plan

<p>Learning Opportunities/Strategies:</p> <p>Think, Pair, Share</p> <p>Turn and talk</p> <p>Student driven activities</p> <p>Help students to translate verbal sentences into equations and then solve the equations. For example, ask:</p> <p>Sum, difference, product, and quotient</p> <ul style="list-style-type: none"> • What are some words or phrases that describe addition? more than, increased by • What are some words or phrases 	<p>Resources:</p> <p>Beginning Algebra by Miller, O'Neill, Hyde,</p> <p>Delta math</p> <p>ALEKS</p> <p>Pear Assessment</p> <p>Classkick</p> <p>Khan Academy</p> <p>Lesson Presentations and Videos</p> <p>Graphing Calculator</p> <p>Desmos</p> <p>Google Apps for Education</p> <p>LGBT and Disabilities Resources:</p> <ul style="list-style-type: none"> • LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth • LGBTQ+ Books
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<p>that describe subtraction? less than, decreased by</p> <ul style="list-style-type: none"> ● How do you know when you need a variable? Phrases like “a number” or “a quantity” are used. ● The primary goal of solving an equation is to find the answer. What is a step that helps find the answer? Isolate the variable. ● What does it mean to “maintain equality” when solving an equation? <p>Whatever operation you apply to one side of an equation, you must apply to the other side of the equation.</p> <p>Help students to solve linear inequalities using many of the same rules used for solving linear equations. For example, ask:</p> <ul style="list-style-type: none"> ● How can you isolate the variable x on one side of the inequality? Using inverse operations ● What step should you complete if you isolate the variable x by multiplication or division by a negative number? Reverse the inequality symbol. ● What words or phrases in a word problem indicate an inequality? <p>At least: \geq, at most: \leq, less than: $<$, and greater than: $>$</p>	<p>DEI Resources:</p> <ul style="list-style-type: none"> ● Learning for Justice ● GLSEN Educator Resources ● Supporting LGBTQIA Youth Resource List ● Respect Ability: Fighting Stigmas, Advancing Opportunities ● NJDOE Diversity, Equity & Inclusion Educational Resources ● Diversity Calendar
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Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Khan Academy Project based learning Tablets Challenging problems with higher degree of difficulty Higher order thinking questions Differentiation of pacing and activities Differentiation of learning strategies: visual, auditory, kinetic and cooperative Enrichment and extension Technology connection Practice assignments	Tutoring Tables Graphic organizers Differentiation of learning strategies: visual, auditory, kinetic and cooperative Technology connection Practice Assignments Puzzle time activities Record and practice journal Differentiating the lesson activities Lesson tutorials	Provide a highly structured, predictable learning environment Provide organizers/study guides Lessons designed to the style of learning that matches the student Cooperative Learning Positive reinforcement Announce test with adequate prep time Lessons presentation available on google classroom	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency

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Puzzle time activities Record and practice journal	Skills review handbook	Frequent check for understanding Break down task into manageable units One-on-one instruction Tutoring Pair student with a high achieving student	Provide word banks Allow for translators, dictionaries
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Unit Title: Unit 2: Graphing Linear Equations in Two Variables; Systems of Linear Equations in Two Variables (20 days)

Stage 1: Desired Results

Standards & Indicators:

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-IFA.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

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.

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. Analyze functions using different representations

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-BF A.1. Write a function that describes a relationship between two quantities.

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- 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.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 $c(m)$.

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<ul style="list-style-type: none"> 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. ★ 🌱 <i>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).</i> 		
Career Readiness, Life Literacies and Key Skills		
Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoG1.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
<p>Central Idea/Enduring Understanding: Chapter 3 In this chapter, we will study equations in x and y and their related graphs. This is important content for a variety of applications, including computer games</p> <p>Chapter 4 In this chapter, you will learn that the solution to systems are points of intersections. Also that some systems of linear equations have no solution, indicating that the lines never intersect. Other systems may have infinitely many solutions. This occurs if the equations represent the same line.</p>		<p>Essential/Guiding Question: At the end of the Unit, students should be able to answer the Essential Questions:</p> <p>Chapter 3 - What are the 3 ways you can graph a linear equation?</p> <p>Chapter 4 - Why do we use different methods to solve math problems?</p>
<p>Content: 3.1 Rectangular Coordinate System 3.2 Linear Equations in Two Variables 3.3 Slope of a Line and Rate of Change 3.4 Slope Intercept Form of a Linear Equation 4.1 Solving Systems of Equations by Graphing Method 4.2 Solving Systems of Equations by Substitution Method 4.3 Solving Systems of Equations by Addition Method 4.5 Graphing Linear Inequalities</p>		<p>Skills(Objectives): Plot points in a coordinate plane</p> <p>Determine if a point is a solution to a linear equation and to a system of linear systems</p> <p>Graph linear equations and inequalities</p> <p>Find the slope given two points or an equation in standard form</p> <p>Determine if two lines are parallel, perpendicular or neither</p> <p>Write an equation of a line given two points or a point and</p>

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	<p>the slope</p> <p>Solve a system of equations by using three different methods to find both x and y</p>
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Interdisciplinary Connections:

Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.

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

Stage 2: Assessment Evidence

Performance Task(s):

F.BF.A.1- Sum of Functions

<https://tasks.illustrativemathematics.org/content-standards/HSF/BF/A/1/tasks/230>

F.IF.A.2- Cell Phones

<https://tasks.illustrativemathematics.org/content-standards/HSF/IF/A/2/tasks/634>

Other Evidence:

Written and Online Assignments
Exit Cards
Mid Chapter Quizzes
End of Chapter Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:

Think , Pair, Share

Turn and talk

Student-driven activities

Help students reason abstractly and quantitatively regarding the average rate of change and slope. Ask:

- The rate of change is a ratio that compares what two quantities?

Any two quantities; the rate of change is how much one quantity changes, on average, relative to the change in another quantity.

For linear functions, how do you find the rate of change?

Divide the change in the y-coordinates by the change in the x-coordinates.

- What is another name for the average rate of change of a line? the slope

There is a solution if the graphs of the lines

Resources:

Beginning Algebra by Miller, O'Neill, Hyde,
Delta math
ALEKS
Pear Assessment
Classkick
Khan Academy
Lesson Presentations and Videos
Graphing Calculator
Desmos
Google Apps for Education

LGBT and Disabilities Resources:

- [LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth](#)
- [LGBTQ+ Books](#)

DEI Resources:

- [Learning for Justice](#)
- [GLSEN Educator Resources](#)
- [Supporting LGBTQIA Youth Resource List](#)
- [Respect Ability: Fighting Stigmas, Advancing Opportunities](#)
- [NJDOE Diversity, Equity & Inclusion Educational Resources](#)
- [Diversity Calendar](#)

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intersect. There is a solution if the equations have different slopes or have the same slope and same y-intercept.

- In a real-world problem involving a system of linear equations, what questions can you ask yourself to help you make sense of the problem?
- After you find the x- and y-values for the intersection of two linear equations, how can you double-check your answer?

Substitute your values for x and y into both equations and make sure that they are a solution of both equations.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life. Help students recognize situations in the real world that can be modeled with systems of inequalities. Ask:

- Why are inequalities useful for many real-world situations?

Because in the real world, solutions may not be exact but can consist of a range of values.

- Why is graphing a good way to show the solutions to a system of inequalities?

Because a graph shows the set of points that satisfy all of the inequalities. You can choose any point in that region and know that it will make each of the inequalities true. You don't have to guess which points might work..

- What symbol should be used to show that x can be no more than a number n? to show that x must be at least n?

$x \leq n$; $x \geq n$

- If the solution to a system of inequalities in a real-world problem is an enclosed region of a graph, does it mean that there must be an infinite number of solutions?

Not necessarily; in a real-world problem, the solutions might have to be whole numbers, for example, number of people. In that case, the solutions will include only the whole number coordinate pairs in the region, which will be a finite number.

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Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation			
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Khan Academy Project based learning Tablets Challenging problems with higher degree of difficulty Higher order thinking questions Differentiation of pacing and activities Differentiation of learning strategies: visual, auditory, kinetic and cooperative Enrichment and extension Technology connection Practice assignments Puzzle time activities Record and practice journal	Tutoring Tables Graphic organizers Differentiation of learning strategies: visual, auditory, kinetic and cooperative Technology connection Practice Assignments Puzzle time activities Record and practice journal Differentiating the lesson activities Lesson tutorials Skills review handbook	Provide a highly structured, predictable learning environment Provide organizers/study guides Lessons designed to the style of learning that matches the student Cooperative Learning Positive reinforcement Announce test with adequate prep time Lessons presentation available on google classroom Frequent check for understanding Break down task into manageable units One-on-one instruction Tutoring Pair student with a high achieving student	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: Unit 3: Polynomials and Properties of Exponents and Factoring Polynomials
Stage 1: Desired Results
<p>Standards & Indicators:</p> <p>A-SSE A.1. Interpret expressions that represent a quantity in terms of its context.</p> <p>A-SSE A 2. Use the structure of an expression to identify ways to rewrite it.</p> <p>A-SSE B3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <p>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.</p> <p>A -APR B.3. Identify zeros of polynomials when suitable factorizations are available. C. Use polynomial identities to solve problems.</p>

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Career Readiness, Life Literacies and Key Skills		
Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.II.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
<p>Central Idea/Enduring Understanding: Chapters 5 and 6 An expression made up of a sum of monomials that contain one variable is called a polynomial in one variable. Pascal's Triangle is an easy way to find the coefficients of the expansion of the powers of binomials. Tables of values can be used to explore graphs of polynomial functions. Factoring, synthetic substitution, and Descartes' Rule of Signs can be used to solve equations or find the zeros of polynomial functions.</p>		<p>Essential/Guiding Question: At the end of the Unit, students should be able to answer the Essential Questions: Chapter 5 - Why is math used to model real-world situations? Chapter 6 - How do we know which factoring method(s) to use to solve a problem? •</p>
<p>Content: 5.1 Multiplying and Dividing Expressions with Common Bases 5.2 More Properties of Exponents 5.3 Definition of b^0 and b^{-n} 5.4 Scientific Notations 5.5 Addition and Subtraction of Polynomials 5.6 Multiplication of Polynomials and Special Products 5.7 Division of Polynomials 6.1 Greatest Common Factor and Factoring by Grouping 6.2 Factoring Trinomials of the Form $x^2 + bx + c$ 6.4 Factoring Trinomials - AC Methods 6.5 Difference of Squares and Perfect Square Trinomials 6.7 Solving Equations Using the Zero Product Rule</p>		<p>Skills(Objectives): Multiply, divide, add and subtract polynomials Apply the properties of exponents to simplify expressions with exponents Change numbers from standard form to scientific and vice versa Multiply polynomials and apply special products Dividing polynomials using synthetic division Factor out the GCF Factor by grouping Factor trinomials Solve equations by factoring and using the zero product rule</p>

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Interdisciplinary Connections:

Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.

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

Stage 2: Assessment Evidence

Performance Task(s):

A.APR.A.1-Powers of 11

<https://tasks.illustrativemathematics.org/content-standards/HSA/APR/A/1/tasks/1654>

A.SSE.A.2-ACubic Identity

<https://tasks.illustrativemathematics.org/content-standards/HSA/SSE/A/2/tasks/919>

Other Evidence:

Written and Online Assignments
Exit Cards
Mid Chapter Quizzes
End of Chapter Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:

Think, Pair, Share

Turn and talk

Student driven activities

Help students to understand how to use the exponent laws as tools. Some students may need to separate and break the large table summarizing all of the laws into smaller, more manageable parts to avoid feeling overwhelmed. Help them to see that this is a manageable amount of information, particularly when they break it into parts.

- Look at the exponent laws in the Concept Summary. Which ones are similar?

Sample answer: Product of Powers and Quotient of Powers.

- Redraw the Concept Summary as a spider chart or concept chart in any shape that makes sense to you. Write each exponent law and at least one example of each type. Use color. Judge student work on its completeness, not its form. Encourage students to personally process the information and create a form that

Resources:

Beginning Algebra by Miller, O'Neill, Hyde,
Delta math
ALEKS
Pear Assessment
Classkick
Khan Academy
Lesson Presentations and Videos
Graphing Calculator
Desmos
Google Apps for Education

LGBT and Disabilities Resources:

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- [LGBTQ+ Books](#)

DEI Resources:

- [Learning for Justice](#)
- [GLSEN Educator Resources](#)
- [Supporting LGBTQIA Youth Resource List](#)
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- [Diversity Calendar](#)

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makes sense to themselves instead of trying to find the “right” answer or copy a model that makes sense to another student.

- Expand your concept summary by including an example of each exponent law using small real numbers for the base and exponent. How does using real numbers help you to make sense of the exponent laws?
- Which exponent law do you find the easiest? Which one do you find the hardest to understand? Why?

Help students compare and contrast the two methods offered in this lesson. Encourage them to think about their own learning style and which method is likely to work best for them. Consider asking questions like these:

- What do you notice about Pascal’s triangle? Discuss the structure of it. x on one side of the inequality?

Sample answer: It has ones all along the left and right side.

- After studying the structure of Pascal’s triangle, try writing it out without looking in your textbook. What strategies help you?.
- Write out the Binomial Theorem. What strategies can you use to help you remember and make sense of this theorem?
- When can you use the Binomial Theorem and not Pascal’s triangle?

You can use the Binomial Theorem to expand polynomials with coefficients other than 1.

Many errors in long division are the result of messy, cramped work. Encourage students to pay particular attention to the alignment of terms when doing long division. For example, ask:

- What do you do before performing long division on a polynomial if the terms are not organized in descending order? For example, what would you do with $8x + 9x^2 + 7 + 14x^3$ before dividing it by $x + 2$?

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High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
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Unit Title: Unit 4: Rational Expressions and Equations and Radicals
Stage 1: Desired Results
<p>Standards & Indicators:</p> <p>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</p> <p>N-RN.A. 2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.</p> <p>A-SSE A.1. Interpret expressions that represent a quantity in terms of its context.</p> <p>A-SSE A 2. Use the structure of an expression to identify ways to rewrite it.</p> <p>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.</p> <p>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.</p>

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A -APR B.3. Identify zeros of polynomials when suitable factorizations are available. C. Use polynomial identities to solve problems.		
Career Readiness, Life Literacies and Key Skills		
Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.II.IPERS.7, 8.2.12.ETW.3).	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
Central Idea/Enduring Understanding: Chapter 7 Rational expressions are roots of two polynomial expressions. Operations with rational expressions are similar to operations with fractions. Rational equations can be solved as polynomial equations once the fractions are eliminated by multiplying by the LCD Chapter 8 In this chapter, we will perform operations on radical expressions and use radicals in applications.		Essential/Guiding Question: At the end of the Unit, students should be able to answer the Essential Questions: Chapter 7- How do you add, subtract, factor, and multiply algebraic expressions? How can you rewrite expressions to help you solve problems? Chapter 8- How do I use perfect squares to simplify squares?
Content: 7.1 Introduction to Rational Expressions 7.2 Multiplication and Division of Rational Expressions 7.3 Least Common Denominator 7.4 Addition and Subtraction of Rational Expressions 7.6 Rational Equations 8.1 Introduction to Roots and Radicals 8.2 Simplifying Radicals 8.3 Addition and Subtraction of Radicals 8.4 Multiplication of Radicals		Skills(Objectives): Simplify, multiply and divide rational expressions using common factors Factor out the GCF from a polynomial Add and subtract rational expressions but first find a common denominator Solve rational equations by factoring Simplify radicals Add, subtract and multiply radicals (find a perfect square factor and simplify)

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Interdisciplinary Connections:

Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.

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

Stage 2: Assessment Evidence

Performance Task(s):

N-RN.A.1-Evaluating Exponential Expressions
<https://tasks.illustrativemathematics.org/content-standards/HSN/RN/A/1/tasks/1866>

A.APR.B.3-Graphing from Factors
<https://tasks.illustrativemathematics.org/content-standards/HSA/APR/B/3/tasks/2139>

Other Evidence:

Written and Online Assignments
 Exit Cards
 Mid Chapter Quizzes
 End of Chapter Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:

Think, Pair, Share

Turn and talk

Student driven activities

Help students understand polynomials. For example, ask:

- Think about factoring quadratics. What information can be easily determined when a quadratic is factored?

The zeros; the solutions; the x-intercepts

- What do you think you will know about a polynomial when it is completely factored?

The zeros; the solutions; the x-intercepts

- Expand $(a + b)^3$. What is the resulting polynomial?
- How can you simplify $a^3 + 3a^2b + 3ab^2 + b^3$?

Help students remember how to find lowest common multiples, and how to add and subtract fractions by showing some examples

Resources:

Beginning Algebra by Miller, O'Neill, Hyde,
 Delta math
 ALEKS
 Pear Assessment
 Classkick
 Khan Academy
 Lesson Presentations and Videos
 Graphing Calculator
 Desmos
 Google Apps for Education

LGBT and Disabilities Resources:

- [LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth](#)
- [LGBTQ+ Books](#)

DEI Resources:

- [Learning for Justice](#)
- [GLSEN Educator Resources](#)
- [Supporting LGBTQIA Youth Resource List](#)
- [Respect Ability: Fighting Stigmas, Advancing Opportunities](#)
- [NJDOE Diversity, Equity & Inclusion Educational Resources](#)
- [Diversity Calendar](#)

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<p>with real numbers. Choose one or two examples and work through them.</p> <p>Help students maintain oversight of the process of solving rational equations and rational inequalities. For example, ask:</p> <ul style="list-style-type: none"> • How do you solve a rational equation or rational inequality? <p>Find the lowest common denominator and then eliminate the denominator and solve the equation.</p> <ul style="list-style-type: none"> • What is an extraneous solution? <p>Any answer that results in a denominator of 0</p> <ul style="list-style-type: none"> • What is an important step in solving rational equations or rational inequalities that model real world situations? 	
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Pacing Guide

Foundations of College Math	Beginning Algebra	Standards
UNIT 1 The Set of Real Numbers, Linear Equations and Inequalities (18 Days)	CHAPTERS 1: (11 Days) 2: (7 Days)	N.RN.A.1-2 N.RN.B.3 N.Q.A.1-2 A.SSE.A1-2 A.SSE.B.3 A.APR.A.1 A.APR.B.3 A.CED.A.1-3 A.REI.A.1-2 A.REI.B.3-5
UNIT 2 Graphing Linear Equations in Two Variables; Systems of Linear Equations in Two Variables (22 Days)	CHAPTERS 3: (10 Days) 4: (12 Days)	F.IF.A.1-2 F.IF.B.4-6 F.IF.C.7 F.BF.A.1
END OF MP		
UNIT 3 Polynomials and Properties of Exponents and Factoring Polynomials (30 Days)	CHAPTERS 5: (16 Days) 6: (14 Days)	A.SSE.A.1-2 A.SSE.B.3 A.APR.A.1 A.APR.B.3
UNIT 4 Rational Expressions and Equations and Radicals (19 Days)	CHAPTERS 7: (10 Days) 8: (9 Days)	N.RN.A.1-2 N.RN.B.3 A.SSE.A1-2 A.SSE.B.3 A.APR.A.1 A.APR.B.3
END OF MP		