Greenwich-Stow Creek Partnership Schools

Algebra Curriculum

Approved by the Board of Education

Stow Creek Board of Education: 8-22-2024

Greenwich Board of Education: 8-21-2024

8th Grade—Algebra

Domain: The Real Number System; Quantities; The Complex Number System	**Marking:** Period: 1

Cluster Headings: Reason quantitatively and use units to solve problems; Create equations that describe numbers or relationships; Understand solving equations as a process of reasoning and explain the reasoning; Solve equations and inequalities in one variable; Interpret the structure of expressions; Write expressions in equivalent forms to solve problems; Understand the concept of a function and use function notation; Construct and compare linear and solve problems; Interpret expressions for functions in terms of the situation they model.

Overview of Unit:

- Utilize the extension of a new number system—integers, rational numbers, real numbers, and complex numbers
- Find the values of a variable of an expression on either side that are equal
- Find values of a solution of are true of an equation
- Define the set of inputs to a function is called its domain
- A function can be described in various ways, such as by a graph or algebraic expression
- Understand that the graph of a function is often a useful way of visualizing the relationship of the function models and manipulating a mathematical expression for a function can throw light on the function's properties
- Describe how a function can grow at a constant rate and can have a constant term of zero to describe proportional relationships
- Determining an output value for a particular input involves evaluating an expression
- Find inputs that yield a given output involves solving an equation

Learning Targets—Big Idea and Standards

Big Ideas:

- Write and solve one-step and multi-step equations
- Use proportional reasoning and understand measurements when solving problems
- Write and solve equations with variables on both sides of the equation
- Write and solve equations involving absolute value
- Solve literal equations for given variables
- Write inequalities and represent solutions of inequalities on number lines
- Wrie and solve inequalities using addition, subtraction, multiplication, or division
- Write and solve multi-step and compound inequalities
- Write and solve inequalities involving absolute value
- Understand and describe the concept of a function
- Identify and graph linear functions

- Understand the use of function notation
- Graph and interpret linear equations written in standard form
- Find the slope of a line and use slope-intercept form to graph the function
- Graph transformation of a linear function
- Graph absolute value functions
- Explore money management

Mathematics Standards: N.Q.A.1, A.CED.A.1-2, A.CED.A.4, A.REI.A.1, A.REI.B.3, A.SSE.A.1a, F.IF.A.1-2, F.IF.B.4-5, F.IF.C.7a, F.LE.A.1a-b, F.LE.B.2-3, F.LE.B.5

N.Q.A: Reason quantitatively and use units to solve problems

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

A.CED.A: Create equations that describe numbers or relationships

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.

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

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.

A.REI.A: Understand solving equations as a process of reasoning and explain the reasoning

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: Solve equations and inequalities in one variable

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

A.SSE.A: Seeing Structure in Expressions

1) Interpret expressions that represent a quantity in terms of its context.
   a) Interpret parts of an expression, such as terms, factors, and coefficients.

F.IF.A: Understand the concept of a function and use function notation

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 $y = f(x)$.

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: Interpret functions that arise in applications in terms of the context

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.

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.

F.IF.C: Analyze functions using different representations

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.

F.LE.A: Construct and compare linear and exponential models and solve problems

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

F.LE.B: Interpret expressions for functions in terms of the situation they model

5. Interpret the parameters in a linear or exponential function in terms of a context.

Success Criteria

- Apply properties of equality to create equivalent equations
- Solve linear equations using addition, subtraction, multiplication, or division
- Write linear equations that model real-life situations
- Apply more than one property of equality to create equivalent equations
- Solve multi-step linear equations using inverse operations

- Write multi-step linear equations that model real-life situations
- Use ratios and rates to solve real-life problems
- Convert units
- Choose an appropriate level of accuracy when measuring to solve real-life problems
- Determine where to round numbers when finding estimates
- Apply properties of equality using variable terms
- Solve equations with variables on both sides
- Recognize when an equation has zero, one, or infinitely many solutions
- Write the two linear equations related to a given absolute value equation
- Solve equations involving one or two absolute values
- Identify special solutions of absolute value equations
- Use rewritten formulas to solve problems
- Write word sentences as inequalities
- Determine whether a value is a solution of an inequality
- Graph and interpret inequalities
- Apply the Addition, Subtraction, Multiplication, or Division Properties of Inequality to produce and solve equivalent inequalities
- Use more than one property of inequality to produce equivalent inequalities
- Solve multi-step inequalities using inverse operations
- Use multi-step inequalities to solve real-life problem
- Write word sentences as compound inequalities
- Solve and graph solutions of compound inequalities
- Write a compound inequality related to a given absolute value inequality
- Identify linear pairs and vertical angles
- Solve absolute value inequalities and use them to model real-life problems
- Determine whether a relation is a function and find the domain and range of a function
- Distinguish between independent and dependent variables
- Estimate intercepts of a graph of a function.
- Approximate when a function is positive, negative, increasing, or decreasing
- Sketch a graph of a function from a verbal description and identify linear functions using graphs, tables, and equations
- Graph linear functions with discrete and continuous domains
- Write real-life problems that correspond to discrete or continuous data
- Evaluate and interpret functions using function notation
- Graph equations of horizontal and vertical lines
- Graph linear equations written in standard form using intercepts
- Solve real-life problems using linear equations in standard form
- Find the slope of a line
- Use the slope-intercept form of a linear equation to solve real-life problems using slopes and *y*-intercepts
- Identify and graph a transformation of a linear graph
- Explain how translations, reflections, stretches, and shrinks affect graphs of functions
- Graph absolute value functions
- Find the domain and range of absolute value functions
- Describe transformations of graphs of absolute value functions

Evidence of Learning—District Assessment Tools

- Model Curriculum Unit Assessment
- Teacher-made tests and quizzes
- Publisher's tests and quizzes
- Teacher/student conferencing
- Homework Review
- Class discussion of essential questions
- Teacher observation
- Daily assignments

District Learning Plan and Materials

Materials:

- Text: *Math and You 2025*
- *Math and You* Record and Practice Journal
- *Math and You* Assessment Book
- See *Math and You* Materials List

Learning Plan:

Math and You 2025

- Chapter 1, Sections 1.1-1.6
- Chapter 2, Sections 2.1-2.6
- Chapter 3, Sections 3.1-3.8

Web-based activities

- ALEKS, Khan Academy, *Math and You*…)
- Concept and Tools Videos
- Standards Based Practice
- Interactive Whiteboard Lessons
- Online Lesson Video

Differentiation:

Math and You 2025 Website- "Differentiating the Lesson"

- STEAM Performance Task
- Intensive Intervention Activities
- Lesson Tutorials (videos)

- Skills Review Handbook
- Basic Skills Handbook

Accommodations for ELL:

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, measuring cups, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Small group instruction and assistance
- Reduced assignments

Accommodations for Special Education:

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Assistance from the Special Education teacher in a small group setting
- Refer to student IEP

Accommodations for at Risk Students (504):

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, measuring cups, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Reduced assignments

Web-based Activities

- ALEKS, Khan Academy, *Math and You*…)
- Concept and Tools Videos
- Standards Based Practice
- *Math and You 2025* ELL Support
- Vocabulary Cards

Accommodations for Enrichment (G&T):

- Extension activities
- Independent practices in small groups
- Internet activities

Interdisciplinary Connections

X__Interdisciplinary Standards: NJSLS

X 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.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content

X NJSLSA.L1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking

Integration of 21st Century Skills: Career Readiness, Life Literacy, and Key Skills

☐ **9.1 Personal Financial Literacy**

Financial Health: *Financial Psychology, Civic Financial Responsibility*

Financial Landscape: *Financial Institutions, Economic & Government Influences*

Money Management: *Planning & Budgeting, Risk Management & Insurance, Credit and Debit Management, Credit Profile*

☐ **9.2 Career Awareness and Planning**

☐ **9.4 Life Literacies and Key Skills**

Creativity and Innovation

Critical Thinking and Problem Solving

Global and Cultural Awareness

Effective Integration of Technology: Computer Science and Design Thinking & Life Literacies and Key Skills

☐ **8.1 Computer Science**

☐ **8.2 Design Thinking**

☐ **9.4 Life Literacies and Key Skills**

Digital Citizenship

Information and Media Literacy

Technology Literacy

Effective Integration of Media Arts: Visual and Performing Arts Performance Standards

☐ **1.2 Media Arts**

Creating - Conceive, Develop, and/or Construct

Performing - Integrate, Practice, and/or Present

Responding - Perceive, Evaluate, and/or Interpret

Connecting - Synthesize and/or Relate

8th Grade—Algebra

Domains: The Real Number System; Quantities; The Complex Number System; Creating Equations; Reasoning with Equations and Inequalities Seeing Structure in Expressions	**Marking Period**: 2

Cluster Headings: Extend the properties of exponents to rational exponents; Reason quantitatively and use units to solve problems; Perform arithmetic operations with complex numbers; Represent complex numbers and their operations on the complex plane; Create equations that describe numbers or relationships; Understand solving equations as a process of reasoning and explain the reasoning; Solve equations and inequalities in one variable; Solve systems of equations; Represent and solve equations and inequalities graphically; Write expressions in equivalent forms to solve problems.

Overview of Unit:

- Utilize the extension of a new number system—integers, rational numbers, real numbers, and complex numbers
- Use appropriate units when preforming multi-step tasks
- Utilize a wider variety of units in modeling, e.g., acceleration, currency conversions, derived quantities such as person-hours and heating degree days, social science rates such as per-capita income, and rates in everyday life such as points scored per game or batting averages
- Identify that two or more equations and/or inequalities form a system
- Solve systems of linear equations by graphing, substitution, and elimination
- Understand that a solution for such a system must satisfy every equation and inequality in the system
- Prove that systems can have one, infinitely many, or no solutions
- Solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line
- Use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems
- 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)
- Write equations in slope-intercept and point-slope form and be able to write parallel and perpendicular lines
- Interpret scatter plots
- Write and find lines that best fit
- Examine characteristics of arithmetic sequence and make connections to linear functions
- Evaluate, graph, and write piecewise functions
- Make comparison between linear and exponential models and distinguish between situations that can be modeled with linear functions with exponential functions
- Make comparison between linear and exponential models
- Extend understanding of integer exponents to rational exponents
- Solve exponential equations algebraically and graphically
- Identify, extend, and graph geometric sequences and make connections to exponential functions
- Write terms of recursive sequences and write recursive rules for arithmetic and geometric sequences

Learning Targets—Big Idea and Standards

Big Ideas:

- Write equations of lines in slope-intercept or point-slope form
- Recognize and write equations of parallel and perpendicular lines
- Use scatter plots and lines of fit to describe relationships between data
- Analyze lines of fit and find lines of best fit
- Understand the concept of arithmetic sequence
- Graph and write piecewise functions
- Solve linear systems by graphing, substitution, or elimination
- Solve linear systems with different numbers of solutions
- Solve equations by graphing

- Graph linear inequalities in two variables
- Graph and write systems of linear inequalities
- Write equivalent expressions involving powers
- Write and evaluate with nth root of a number
- Graph and write exponential functions
- Graph and write exponential growth and decay functions
- Solve exponential equations
- Identify, extend, and graph geometric sequences
- Write terms of recursively defined sequences and rite recursive rules for sequences

Mathematics Standards: N.Q.A.1-3, N.RN.A.1-3, A.APR.A.1, A.CED.A.3, A.REI.A.2, A.REI.C.5-6, A.REI.D.12, F.FBF.A.1a-b, F.BF.A.2, F.IF.A.3, F.IF.C.8-9, F.LE.A.1-3

N.Q.A: Reason quantitatively and use units to solve problems

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.

2. Define appropriate quantities for the purpose of descriptive modeling.

3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

N.RN.A: Extend the properties of exponents to rational exponents

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 $\left(5^{1/3}\right)^3 = 5^{(1/3)^3}$ to hold, so $\left(5^{1/3}\right)^3$ must equal 5.

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

3. Simplify radicals, including algebraic radicals (e.g. $\sqrt[3]{54} = 3\sqrt[3]{2}$, simplify $\sqrt{32x^2}$).

A.APR.A: Perform arithmetic operations on polynomials

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.CED.A: Create equations that describe numbers or relationships

3. 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.

A.REI.A: Understand solving equations as a process of reasoning and explain the reasoning

2. 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.C: Solve systems of equations

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.

6. Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.

A.REI.D: Represent and solve equations and inequalities graphically

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.

F.FBF.A: Build a function that models a relationship between two quantities

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.

   b) 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.

F.IF.A: Understand the concept of a function and use function notation

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

F.IF.C: Analyze functions using different representations

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

   a. 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.

   b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (.97)^t$, $y = (1.01)^{12t}$, $y = (1.01)^{\frac{t}{10}}$, and classify them as representing exponential growth or decay

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

F.LE.A: Construct and compare linear and exponential models and solve problems

1) Distinguish between situations that can be modeled with linear functions and with exponential functions.

   a) Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

   b) Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

   c) Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

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).

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.

Success Criteria

- Find and use the slope and the y-intercept of a line to write an equation
- Write equations in slope-intercept and point slope form to solve real-life problems
- Use any two points to write an equation of a line
- Identify parallel and perpendicular lines from their equations
- Write equations of parallel lines and perpendicular lines
- Read and interpret scatter plots
- Identify and distinguish between correlation and causation
- Write and interpret an equation of a line of fit
- Use lines of fit to solve real-life problems
- Write the terms of arithmetic sequences
- Identify, write, and graph arithmetic sequences as a function
- Evaluate, write, and graph piecewise functions
- Determine whether an ordered pair is a solution of a system
- Graph a linear system
- Approximate the solution of a linear system using a graph
- Solve a system of linear equations by graphing, substitution or elimination
- Solve real-life problems using graphing, substitution or elimination
- Determine the number of solutions of a system
- Solve a linear system with any number of solutions
- Solve an absolute value equation by graphing
- Explain why the x-coordinate of a point where $y=f(x)$ and $y=g(x)$ intersect is a solution of $f(x)=g(x)$
- Determine whether an ordered pair is a solution of a linear inequality in two variables
- Graph linear inequalities in two variables
- Interpret solutions of a linear inequality in a real-life situation

- Determine whether an ordered pair is a solution of a system of linear inequalities
- Graph systems of linear inequalities
- Write systems of linear inequalities from a graph
- Solve real-life problems using systems of linear inequalities
- Explain the meanings of zero and negative exponents
- Evaluate and simplify expressions involving zero and negative exponents
- Find *n*th roots
- Evaluate expressions with rational exponents
- Solve real-life problems involving rational exponents
- Identify, write, evaluate, and graph an exponential function
- Model real-life problems using exponential functions
- Determine whether data represent exponential growth or exponential decay
- Write exponential growth functions and exponential decay functions
- Solve real-life problems using exponential growth and decay functions
- Solve exponential equations with the same base or unlike bases
- Solve exponential equations by graphing
- Determine whether a sequence is arithmetic, geometric, or neither
- Write and graph the terms of geometric sequences
- Write geometric sequences as functions
- Write terms of recursively defined sequences
- Write recursive rules for sequences
- Translate between recursive rules and explicit rules

Evidence of Learning—District Assessment Tools

- Model Curriculum Unit Assessment
- Teacher-made tests and quizzes
- Publisher's tests and quizzes
- Teacher/student conferencing
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District Learning Plan and Materials

Materials:

- Text: *Math and You 2025*
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- *Math and You* Assessment Book
- See *Math and You* Materials List

Learning Plan:

Math and You 2025

- Chapter 4, Sections 4.1-4.7
- Chapter 5, Sections 5.1-5.7
- Chapter 6, Sections 6.1-6.7

Web-based activities

- ALEKS, Khan Academy, *Math and You*…)
- Concept and Tools Videos
- Standards Based Practice
- Game Closet
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Differentiation:

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- STEAM Performance Task
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- Skills Review Handbook
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Accommodations for ELL:

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Small group instruction and assistance
- Reduced assignments

Accommodations for Special Education:

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Assistance from the Special Education teacher in a small group setting
- Refer to student IEP

Accommodations for at Risk Students (504):

- Visual models/drawings

- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Reduced assignments

Web-based Activities

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Accommodations for Enrichment (G&T):

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Integration of 21st Century Skills: Career Readiness, Life Literacy, and Key Skills

☐ **9.1 Personal Financial Literacy**

Financial Health: *Financial Psychology, Civic Financial Responsibility*

Financial Landscape: *Financial Institutions, Economic & Government Influences*

Money Management: *Planning & Budgeting, Risk Management & Insurance, Credit and Debit Management, Credit Profile*

☐ **9.2 Career Awareness and Planning**

☐ **9.4 Life Literacies and Key Skills**

Creativity and Innovation

Critical Thinking and Problem Solving

Global and Cultural Awareness

Effective Integration of Technology: Computer Science and Design Thinking & Life Literacies and Key Skills

☐ **8.1 Computer Science**

☐ **8.2 Design Thinking**

☐ **9.4 Life Literacies and Key Skills**

Digital Citizenship

Information and Media Literacy

Technology Literacy

Effective Integration of Media Arts: Visual and Performing Arts Performance Standards

☐ **1.2 Media Arts**

Creating - Conceive, Develop, and/or Construct

Performing - Integrate, Practice, and/or Present

Responding - Perceive, Evaluate, and/or Interpret

Connecting - Synthesize and/or Relate

8th Grade—Algebra

Domain: Reasoning with Equations and Inequalities; Seeing Structure in Expressions; Building Functions; Interpreting Functions; Linear, Quadratic, and Exponential Models	**Marking Period**: 3

Cluster Headings: Understand solving equations as a process of reasoning and explain the reasoning; Interpret the structure of expressions; Write expressions in equivalent forms to solve problems; Build a function that models a relationship between two quantities; Build new functions from existing functions; Understand the concept of a function and use function notation; Interpret functions that arise in applications in terms of the context; Analyze functions using different representations; Construct and compare linear and exponential models and solve problems; Interpret expressions for functions in terms of the situation they model.

Overview of Unit:

- Add, subtract, multiply, and divide operations with polynomials
- Explore patterns in the factors of polynomials and the products of binomials
- Find special products of binomial using the square of a binomial pattern and the sum of the different parts
- Solve polynomials in factored form by factoring using the Greatest Common Factor
- Use equations in factored form to reveal the roots
- Graph and analyze in vertex and intercept form of functions
- Identify characteristics of graphs
- Describe transformations of quadratic function
- Compare linear, exponential, and quadratic functions
- Use the concept of a zero of a function to write and graph a quadratic function
- Use properties of radicals to write equivalent expressions
- Solve quadratic equations by graphing
- Distinguish between finding the zero of a function and finding the x-intercept of a graph
- Understand that real-life problems do not always have whole-number or rational solutions
- Solve quadratic equations by finding square roots, completing the square, and using the Quadratic Formula
- Solve nonlinear systems graphically and algebraically

Learning Targets—Big Idea and Standards

Big Ideas:

- Add, subtract, multiply, and divide polynomials
- Use patterns to find products of polynomials
- Solve polynomial equations in factored form
- Factor polynomials of the form x^2+bx+c
- Factor polynomials of the form ax^2+bx+c
- Recognize and factor special products
- Factor polynomials completely
- Graph and describe functions of the form $f(x)=ax^2$
- Graph and describe functions of the form $f(x)=ax^2 + c$
- Graph and describe functions of the form $f(x)=ax^2 + bx + c$
- Graph and describe functions of the form $f(x)=a(x-h)^2 + k$
- Graph and use functions in intercept form
- Compare linear, exponential, and quadratic functions
- Use properties of radicals to write equivalent expression
- Use graphs to solve quadratic equations and find zeros of functions
- Solve quadratic equations using square roots
- Solve quadratic equations by completing the square
- Use the Quadratic Formula to solve and analyze quadratic equations
- Solve nonlinear systems graphically and algebraically

Mathematics Standards: A.REI.B.4, A.REI.C.7, A.REI.D.10-11, A.SSE.B.4, F.BF.B.3, F.IF.B.4-6, F.IF.C.7a, F.IF.C.7c-d, F.IF.C.8a, F.IF.C.9, F.LE.A.1a, F.LE.A.3, F.LE.B.5

A.REI.B: Solve equations and inequalities in one variable

4. Solve quadratic equations in one variable.
   a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
   b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.

A.REI.C: Solve systems of equations

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.REI.D: Represent and solve equations and inequalities graphically

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).

11. Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = f(x)$ 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.SSE.B: Write expressions in equivalent forms to solve problems

4. Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1) and use the formula to solve problems. For example, calculate mortgage payments

F.BF.B: Build new functions from existing functions

3. Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, 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.IF.B: Interpret functions that arise in applications in terms of the context

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.

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.

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F.IF.C: Analyze functions using different representations

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.

c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior

d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. 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.

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

F.LE.A: Construct and compare linear and exponential models and solve problems

3. Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

b. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

F.LE.B: Interpret expressions for functions in terms of the situation they model

5. Interpret the parameters in a linear or exponential function in terms of a context

Success Criteria

- Classify polynomials
- Add and subtract polynomials
- Model real-life situations using sums and differences of polynomials
- Multiply and divide polynomials by monomials
- Multiply binomials using the Distributive Property or FOIL Method
- Multiply binomials using the FOIL Method
- Multiply binomials and trinomials
- Use the square of a binomial pattern
- Multiply binomials using the sum and difference pattern
- Solve problems using special product patterns
- Use the Zero-Product Property to solve polynomial equations in factored form
- Factor polynomials using the greatest common factor
- Solve polynomial equations by rewriting them in factored form
- Factor polynomials of the form x^2+bx+c *or* ax^2+bx+c
- Explain how to use b and c to find binomial factors of a polynomial x^2+bx+c *or* ax^2+bx+c
- Factor perfect square trinomials and the difference of two squares
- Solve real-life problems by factoring using special product patterns
- Factor polynomials by grouping

- Solve real-life problems by factoring
- Identify characteristics of quadratic functions and their graphs
- Graph and compare quadratic functions of the form $f(x)=ax^2$ to the graph of the parent quadratic function $f(x)=x^2$
- Graph quadratic functions of the form $f(x)=ax^2+c$ and compare the graph of $f(x)=ax^2+c$ to the parent quadratic function
- Describe translations of the graph of $f(x)=ax^2c$
- Use quadratic functions to solve real-life problems
- Find the axis of symmetry and vertex of a quadratic function
- Graph quadratic functions of the form $f(x)=ax^2+bx+c$
- Determine a maximum or minimum value of a quadratic function
- Graph quadratic functions of the form $f(x)=a(x-h)^2+k$ and compare the graph of $f(x)=a(x-h)^2+k$ to the parent function
- Graph quadratic functions of the form $f(x)=a(x-p)(x-q)$
- Find zeros of functions using intercept form
- Use characteristics to graph and write quadratic functions and cubic functions
- Determine whether data can be represented by a linear, exponential, or quadratic function
- Write functions to model data and compare using average rates of change
- Use properties of square or cubed roots to write equivalent expressions
- Rationalize the denominator of a fraction
- Perform operations with radicals
- Solve quadratic equations by graphing
- Use graphs to find and approximate zeros of functions
- Use technology (graphing calculator) to find a quadratic model for a set of data
- Find the square roots of a number
- Solve quadratic equations using square roots
- Approximate solutions of quadratic equations
- Complete the square for an expression of the form x^2+bx and solve quadratic equations by completing the square
- Find maximum and minimum values of quadratic functions by completing the square
- Solve quadratic equations using the Quadratic Formula
- Find and interpret the discriminant of a quadratic equation
- Solve nonlinear systems graphically and algebraically
- Approximate the solutions of nonlinear systems

Evidence of Learning—District Assessment Tools

- Model Curriculum Unit Assessment
- Teacher-made tests and quizzes
- Publisher's tests and quizzes
- Teacher/student conferencing
- Homework Review
- Class discussion of essential questions
- Teacher observation
- Daily assignments

District Learning Plan and Materials

Materials:

- Text: *Math and You 2025*
- *Math and You* Record and Practice Journal
- *Math and You* Assessment Book
- See *Math and You* Materials List

Learning Plan:

Math and You 2025

- Chapter 7, Sections 7.1-7.8
- Chapter 8, Sections 8.1-8.6
- Chapter 9, Sections 9.1-9.6

Web-based activities

- ALEKS, Khan Academy, *Math and You*…)
- Concept and Tools Videos
- Standards Based Practice
- Game Closet
- Interactive Whiteboard Lessons
- Online Lesson Video
- ALEKS, Khan Academy, *Math and You*…)

Differentiation:

Math and You 2025 Website- "Differentiating the Lesson"

- STEAM Performance Task
- Intensive Intervention Activities
- Lesson Tutorials (videos)
- Skills Review Handbook
- Basic Skills Handbook

Accommodations for ELL:

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Small group instruction and assistance
- Reduced assignments

Accommodations for Special Education:

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Assistance from the Special Education teacher in a small group setting
- Refer to student IEP

Accommodations for at Risk Students (504):

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Reduced assignments

Web-based Activities

- ALEKS, Khan Academy, *Math and You*…)
- Concept and Tools Videos
- Standards Based Practice
- Game Closet
- *Math and You 2025* ELL Support
- Vocabulary Cards

Accommodations for Enrichment (G&T):

- Extension activities
- Independent practices in small groups
- Internet activities

Interdisciplinary Connections

X__Interdisciplinary Standards: NJSLS

X 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.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content

X NJSLSA.L1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking

Integration of 21st Century Skills: Career Readiness, Life Literacy, and Key Skills

☐ **9.1 Personal Financial Literacy**

Financial Health: *Financial Psychology, Civic Financial Responsibility*

Financial Landscape: *Financial Institutions, Economic & Government Influences*

Money Management: *Planning & Budgeting, Risk Management & Insurance, Credit and Debit Management, Credit Profile*

☐ **9.2 Career Awareness and Planning**

☐ **9.4 Life Literacies and Key Skills**

Creativity and Innovation

Critical Thinking and Problem Solving

Global and Cultural Awareness

Effective Integration of Technology: Computer Science and Design Thinking & Life Literacies and Key Skills

☐ **8.1 Computer Science**

☐ **8.2 Design Thinking**

☐ **9.4 Life Literacies and Key Skills**

Digital Citizenship

Information and Media Literacy

Technology Literacy

Effective Integration of Media Arts: Visual and Performing Arts Performance Standards

☐ **1.2 Media Arts**

Creating - Conceive, Develop, and/or Construct

Performing - Integrate, Practice, and/or Present

Responding - Perceive, Evaluate, and/or Interpret

Connecting - Synthesize and/or Relate

8th Grade—Algebra

Domain: Arithmetic with Polynomials and Rational Expressions; Reasoning with Equations and Inequalities; Building Functions; Interpreting Functions; Personal Finance	**Marking Period:** 4

Cluster Headings: Perform arithmetic operations on polynomials; Understand the relationship between zeros and factors of polynomials; Use polynomial identities to solve problems; Rewrite rational expressions; Understand solving equations as a process of reasoning and explain the reasoning; Represent and solve equations and inequalities graphically; Build a function that models a relationship between two quantities; Build new functions from existing functions; Interpret functions that arise in applications in terms of the context; Analyze functions using different representations; Financial Health.

Overview of Unit:

- Use properties of radicals to write equivalent expressions.
- Solve quadratic equations by graphing
- Distinguish between finding the zero of a function and finding the x-intercept of a graph
- Understand that real life problems do not always have whole-number or rational solutions
- Show algebraic ways to solve quadratic equations: using square roots, completing the square, and using the Quadratic Form
- Solve nonlinear systems graphically
- Graph and describe square roots and cube roots
- Apply transformations to square and cube roots and compare to parent function
- Interpret key features of a graph such as domain and range
- Connect using properties of equality to solve equations
- Understand the relationship between a function and its inverse.

- Find inverses of relations and functions, and determine if the inverse of a function is a function
- Analyze data and displays
- Analyze quantitative and qualitative data
- Make and interpret various data displays
- Develop the necessary knowledge, skills and dispositions to thrive in an interconnected global economy

Learning Targets—Big Idea and Standards

Big Ideas:

- Use properties of radicals to write equivalent expressions
- Use graphs to solve quadratic equations and find zeros of functions
- Solve quadratic equations using square roots and completing the square
- Use the Quadratic Formula to solve and analyze quadratic equations
- Solve nonlinear systems graphically and algebraically
- Graph and describe square root and cube root functions
- Solve radical equations and identify any extraneous solutions
- Understand the relationship between a function and its inverse
- Find measures of center and variation of a data set
- Make and interpret box-and-whisker plots for data set
- Describe and compare shapes of distribution
- Use two-way tables to represent data
- Use appropriate data displays to represent situations
- Explore money management
- Explore the psychology of spending and saving that influences decisions related to finances

Mathematics Standards: A.APR.A.1, A.REI.B.4a-b, F.BF.A.1c, F.BF.B.4, F.IF.B.4-5, F.IF.C.7b, F.IF.C.8

A.APR.A: Perform arithmetic operations on polynomials

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.REI.B: Solve equations and inequalities in one variable

4. Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2=q$ that has the same solutions. Derive the quadratic formula from this form.

b. Solve quadratic equations by inspection (e.g., for $x^2=49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.

Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

F.BF.A: Build a function that models a relationship between two quantities

1. Write a function that describes a relationship between two quantities.

   c. Compose functions. For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.

F.BF.B: Build new functions from existing functions

4. Find inverse functions.

   a. 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. For example, $f(x) = 2x^3$ or $f(x) = \frac{(x+1)}{(x-1)}$ for $x \neq 1$.

   b. Verify by composition that one function is the inverse of another.

   c. Read values of an inverse function from a graph or a table, given that the function has an inverse.

   d. Produce an invertible function from a non-invertible function by restricting the domain.

F.IF.B: Interpret functions that arise in applications in terms of the context

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.

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

F.IF.C: Analyze functions using different representations

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. 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.

b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y=(1.02)^t$, $y=(.97)^t$, $y=(1.01)^{12t}$, $y=(1.01)^{\frac{t}{10}}$, and classify them as representing exponential growth or decay.

Financial Literacy Standards:

- 9.1.2.FP.1: Explain how emotions influence whether a person spends or saves
- 9.1.2.FP.2: Differentiate between financial wants and needs
- 9.1.2.FP.3: Identify the factors that influence people to spend or save (e.g., commercials, family, culture, society)
- 9.1.2.PB.2: Explain why an individual would choose to save money
- 9.1.5.CP.1: Identify the advantages of maintaining a positive credit history
- 9.1.5.EG.3: Explain the impact of the economic system on one's personal financial goals
- 9.1.5.FI.1: Identify various types of financial institutions and the services they offer including banks, credit unions, and credit card companies
- 9.1.5.FP.1: Illustrate the impact of financial traits on financial decisions
- 9.1.5.FP.3: Analyze how spending choices and decision-making can result in positive or negative consequences

Success Criteria

- Use properties of square roots and cube roots to write equivalent expressions
- Rationalize the denominator of a fraction
- Perform operations with radicals
- Solve quadratic equations by graphing
- Use graphs to find and approximate zeros of functions
- Use technology (graphing calculator) to find a quadratic model for a set of data
- Find the square roots of a number
- Solve quadratic equations using square roots
- Approximate solutions of quadratic equations
- Complete the square for an expression of the form x^2+bx
- Solve quadratic equations by completing the square
- Find maximum and minimum values of quadratic functions by completing the square
- Solve quadratic equations using the Quadratic Formula
- Find and interpret the discriminant of a quadratic equation
- Choose an efficient method for solving a quadratic equation and explain my choice of method

- Solve nonlinear systems graphically and algebraically
- Approximate the solutions of nonlinear systems
- Find the domain and range of a square root function
- Graph square root functions
- Graph and describe transformations of square root or a cub root functions
- Use square root or cube root functions to solve real-life problems
- Identify and solve radical equations
- Identify extraneous solutions of radical equations
- Solve real-life problems involving radical equations
- Explain what inverse functions are and find inverses of functions algebraically
- Determine if the inverse of a function is also a function
- Find and compare the measures of center and measures of variation of a data set
- Describe effects of data transformations
- Use box-and-whisker plots to represent, compare and interpret data sets
- Explain how to identify outliers in a data set
- Describe the shape of a distribution
- Compare data sets and determine which measures of center and variation best represent a data set
- Find and interpret marginal frequencies
- Make two-way tables
- Interpret segmented bar graphs
- Find and interpret relative frequencies and conditional relative frequencies
- Recognize associations and trends in data using two-way tables
- Classify data as qualitative or quantitative
- Create an appropriate data display and explain the choice of display
- Identify misleading data displays
- Understand how taxes affect one's personal finances
- Explain how a budget aligned with an individual's financial goals can help prepare for life events
- Credit management includes making informed choices about sources of credit and requires an understanding of the cost of credit

Evidence of Learning

- Model Curriculum Unit Assessment
- Teacher-made tests and quizzes
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Learning Plan:

Math and You 2025

- Chapter 10, Sections 10.1-10.4
- Chapter 11, Sections 11.1-11.6
- Budget Project Extension

Web-based activities

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- Standards Based Practice
- Game Closet
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- Use of manipulatives
- Tools (rulers, calculators, etc.)
- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Small group instruction and assistance
- Reduced assignments

Accommodations for Special Education:

- Visual models/drawings
- Use of manipulatives
- Tools (rulers, calculators, etc.)

- Guided and strategy groups
- Multi-leveled cooperative learning groups
- Assistance from the Special Education teacher in a small group setting
- Refer to student IEP

Accommodations for at Risk Students (504):

- Visual models/drawings
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- Tools (rulers, calculators, etc.)
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- Reduced assignments

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Integration of 21st Century Skills: Career Readiness, Life Literacy, and Key Skills

☒ **9.1 Personal Financial Literacy**

Financial Health: *Financial Psychology, Civic Financial Responsibility*

Financial Landscape: *Financial Institutions, Economic & Government Influences*

Money Management: *Planning & Budgeting, Risk Management & Insurance, Credit and Debit Management, Credit Profile*

☒ **9.2 Career Awareness and Planning**

☒ **9.4 Life Literacies and Key Skills**

Creativity and Innovation

Critical Thinking and Problem Solving

Global and Cultural Awareness

Effective Integration of Technology: Computer Science and Design Thinking **&** Life Literacies and Key Skills

☐ **8.1 Computer Science**

☐ **8.2 Design Thinking**

☐ **9.4 Life Literacies and Key Skills**

Digital Citizenship

Information and Media Literacy

Technology Literacy

Effective Integration of Media Arts: Visual and Performing Arts Performance Standards

☐ **1.2 Media Arts**

Creating - Conceive, Develop, and/or Construct Performing - Integrate, Practice, and/or Present Responding - Perceive, Evaluate, and/or Interpret Connecting - Synthesize and/or Relate	