Shepard Preparatory High School

Algebra 1

Curriculum

Algebra 1 is a foundational high school mathematics course designed to introduce variables, algebraic expressions, and functions to model real-world scenarios. It focuses on mastering linear equations, inequalities, systems of equations, polynomials, and quadratic functions. The curriculum prepares students for higher-level mathematics like geometry and algebra 2.

Algebra 1

Algebra 1

Unit 1	
Linear Equations	
Timeframe	Week 1-3
Unit Overview	Enduring Understandings 1. Linear equations are used to model a variety of real-world situations. 2. The concept of slope allows us to analyze how a quantity changes over time. 3. Linear functions can be written in different forms and each form reveals different characteristics of the graph. 4. The graph of a linear equation is a line.
Essential Questions	1. How can change be best represented mathematically? 2. How can we use mathematical models to describe change or change over time? 3. Why are linear equations expressed in different forms and what are the benefits of each form? 4. What makes a linear function be a good fit for a scatter plot?
Unit Focus	• Function notation can be used to represent coordinate of a point • Linear functions can be written in different forms • Each form of linear functions reveals a characteristic of a graph • Two lines with the same slope and different y-intercepts are parallel • Two lines with negative reciprocal slopes are perpendicular • A scatter plot is a graph used to determine whether there is a relationship between paired data • Depending of the data presented, a linear model can be used to model the data
Interdisciplinary Connections	• NJSLS-9.4 Life Literacies and Key Skills
Common Assessments	• Assessment Suite chapter quizzes and tests

Materials

Common Materials	Supplemental Materials
Prentice Hall Algebra 1 Textbook Kuta Software Worksheets Khan academy	Discovering Algebra "An Investigative Approach" by Key Curriculum Press Teacher created materials

New Jersey Student Learning Standards (NJSLS)			
Subject Area **Mathematics**	**Technology** *8.1: Educational Technology* *8.2: Technology Education, Engineering, Design and Computational Thinking - Programming*	**21st Century Life and Careers** *Career Ready Practices* *9.1: Personal Financial Literacy* *9.2: Career Awareness, Exploration, and Preparation*	**ELA Companion** *Secondary Science and Social Studies Only* N/A
NJ: Grades 9-12 Number and Quantity N.Q.A. Quantities Reason quantitatively and use units to solve problems 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.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Statistics and Probability S.ID.B. Interpreting Categorical and Quantitative Data Summarize, represent, and interpret data on two categorical and quantitative variables S.ID.B.6.a Represent data on two quantitative variables on a scatter plot and describe how the variables are related. a. Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential	NJ: 2020 SLS: Science NJ: Grades 9-12 • HS-ETS1 Engineering Design • Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	• 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 • Speaking and Listening Domain • Speaking and Listening

models. S.ID.C. Interpreting Categorical and Quantitative Data Interpret linear models S.ID.C.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. Algebra A.CED.A. Creating Equations ★ Create equations that describe numbers or relationships 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. 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.REI.A. Reasoning with Equations and Inequalities Understand solving equations as a process of reasoning and explain the reasoning A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.B. Reasoning with Equations and Inequalities Solve equations and inequalities in one variable A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.			

A.REI.D. Reasoning with Equations and Inequalities Represent and solve equations and inequalities graphically A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.D.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. ★ Functions F.IF.B. Interpreting Functions Interpret functions that arise in applications in terms of the context F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. ★			
Differentiation			
Differentiation for Support and General Curriculum (504, ELL, Special Education, Struggling Learners)	**Differentiation for Enrichment**		

Modifications for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate **Modifications for Homework and Assignments**: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments **Modifications for Assessments:** Extended time on classroom assessments	Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production Substituting written texts with project-based learning Student-directed learning/ independent studies Extension activities **Further Modifications for Honors Students** Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher

Activities

Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible

Hands-on & Interactive Game Examples

- **Math War (Cards):** Students play with cards to practice multiplication or addition, trying to get the highest result.
- **Math Bingo:** A fun way for students to practice multiplication, division, or addition in a group setting.
- **Dice Rolling Games:** Roll dice to create and solve numbers, or use them to build shapes and towers.

Movement-Based Math

- **Math Scavenger Hunt:** Hide numbers or equations around the room or outside for children to find
- **Math Relay Races:** Students run to solve problems in teams, combining physical activity with mental calculation.
- **Human Number Line:** Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers.

Creative & Visual Projects

- **Nature Sorting:** Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability.
- **Marshmallow Geometry:** Using marshmallows and toothpicks to build 3D shapes.

Digital & Cognitive Activities

- **Virtual Manipulatives:** Using online tools like geoboards or fraction bars.
- **Brain Teasers/Riddles:** Daily puzzles that encourage logical thinking and problem-solving skills.
- **Virtual Escape Rooms:** Engaging, technology-based puzzles for older students.

Unit 2	
Solving & Graphing Linear Inequalities	
Timeframe	Week4-7
Unit Overview	1. The solution to a problem is sometimes not a single solution but rather a range of values. 2. Real-life situations that involve the ideas of "at most" and "at least" can be modeled using inequalities. 3. For many situations, there is not just one answer but a range of possible answers. These situations are often represented using inequalities, not equations.
Essential Questions	1. How is solving inequalities the same or different from solving equations? 2. How are compound inequalities solved differently than non-compound inequalities? 3. What real life novel situations would require solutions as a range of values? 4. Why do you solve linear inequalities in two variables by graphing? 5. When would it be appropriate to use absolute value functions and compound inequalities to model real-life situations? 6. How does graphing a linear inequalities in one variable differ from graphing a linear inequality in two variables?
Unit Focus	• the characteristics and elements of inequalities • The graph of an inequality is the set of all points that represent all solutions of the inequality. • Inequalities can be solved using addition, subtraction, multiplication, and division. • Compound inequalities consist of two separate inequalities joined by *and* or *or.* • The graph of a compound inequality with *and* is the intersection of the graphs of the inequalities. • The graph of a compound inequality with *or* is the union of the graphs of the inequalities. • A number is a solution of a compound inequality with *and* if the number is a solution to BOTH inequalities.

	• A number is a solution of a compound inequality with *or* if the number is a solution of AT LEAST ONE of the inequalities. • An absolute value equation is an equation that contains an absolute value expression • The characteristics and elements of linear inequalities in two variables. • A solution of an inequality in two variables is an ordered pair (x,y) that produces a true statement when the values of x and y are substituted into the inequality. • The graph of an inequality in two variables is the set of all points that represent all solutions of the inequality. • The boundary line of a linear inequality divides the coordinate plane into two half-planes, one of which contains the points that represent the solutions of the inequality. • .
Interdisciplinary Connections	• NJSLS-9.4 Life Literacies and Key Skills
Common Assessments	• Assessment Suite chapter quizzes and tests

Materials

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New Jersey Student Learning Standards (NJSLS)

Subject Area **Mathematics**	Technology	21st Century Life and Careers	ELA Companion
A.CED.A. Creating Equations ★ Create equations that describe numbers or relationships	NJ: 2020 SLS: Science NJ: Grades 9-12	• 9.4.2.CI.1: Demonstrate openness to new ideas and	NJ: 2023 SLS: English Language Arts

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. 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.B. Reasoning with Equations and Inequalities Solve equations and inequalities in one variable A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A.REI.D. Reasoning with Equations and Inequalities Represent and solve equations and inequalities graphically A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.D.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.REI.D.12. Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	• HS-ETS1 Engineering Design • Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	NJ: Grades 11-12 • Speaking and Listening Domain • Speaking and Listening
Differentiation			
Differentiation for Support and General Curriculum		**Differentiation for Enrichment**	

(504, ELL, Special Education, Struggling Learners)	
Modifications for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate **Modifications for Homework and Assignments**: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments **Modifications for Assessments:** Extended time on classroom assessments	Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production Substituting written texts with project-based learning Student-directed learning/ independent studies Extension activities **Further Modifications for Honors Students** Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher
Activities	
Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible **Hands-on & Interactive Game Examples** • **Math War (Cards):** Students play with cards to practice multiplication or addition, trying to get the highest result. • **Math Bingo:** A fun way for students to practice multiplication, division, or addition in a group setting. • **Dice Rolling Games:** Roll dice to create and solve numbers, or use them to build shapes and towers. **Movement-Based Math** • **Math Scavenger Hunt:** Hide numbers or equations around the room or outside for children to find • **Math Relay Races:** Students run to solve problems in teams, combining physical activity with mental calculation. • **Human Number Line:** Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers. **Creative & Visual Projects** • **Nature Sorting:** Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability. • **Marshmallow Geometry:** Using marshmallows and toothpicks to build 3D shapes. **Digital & Cognitive Activities** • **Virtual Manipulatives:** Using online tools like geoboards or fraction bars.	

• **Brain Teasers/Riddles:** Daily puzzles that encourage logical thinking and problem-solving skills. • **Virtual Escape Rooms:** Engaging, technology-based puzzles for older students.	

Unit 3	
Systems of Equations and Inequalities	
Timeframe	Week 8-12
Unit Overview	1. Systems of equations can have a variety of answers (one solution, no solution, infinitely many solutions). 2. Systems of equations and systems of inequalities can be used to model scenarios and solve problems in real-life in which there is more than one unknown. 3. There are multiple strategies for solving systems of equations each with its on benefits and drawbacks. 4. The intersection of the graphs in a system is the solution to all equations or inequalities in the system. 5. The value of the graphical representation of the solution to a system of linear equations or inequalities depends on the real world situations the system models
Essential Questions	1. How do the characteristics of the system of linear equations affect its answer (solutions)? 2. How can a system of equations be used to solve real-world problems? 3. Why is one method more efficient than another when solving a system of equations?
Unit Focus	• A system of linear equations consists of two or more linear equations in the same variables. • A solution of a system of linear equations in two variables is an ordered pair that satisfies each equation in the system. • A system of linear equations may have one solution, no solution, or infinitely many solutions. • Methods of solving a system of equations including: graphing, substitution, elimination by addition or subtraction, and multiplication wit elimination. • A system of linear inequalities consists of two or more linear inequalities in the same variables. • A solution of a system of linear inequalities is an ordered pair that is a solution of each inequality in the system. • The graph of a system of linear inequalities is the graph of all solutions of the system.

	• A system of linear inequalities may have an intersection of two half- planes (the solution) or no solution if the half-plans do not intersect
Interdisciplinary Connections	• NJSLS-9.4 Life Literacies and Key Skills
Common Assessments	• Assessment Suite chapter quizzes and tests

Materials

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Subject Area	Technology	21st Century Life and Careers	ELA Companion
A.CED.A. Creating Equations ★ Create equations that describe numbers or relationships 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.C. Reasoning with Equations and Inequalities	NJ: 2020 SLS: Science NJ: Grades 9-12 • HS-ETS1 Engineering Design • Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	• 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 • Speaking and Listening Domain • Speaking and Listening

Solve systems of equations A.REI.C.5. (+) Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. A.REI.C.6. Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables. A.REI.D. Reasoning with Equations and Inequalities Represent and solve equations and inequalities graphically A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.D.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.REI.D.12. Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.		problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	

Differentiation	
Differentiation for Support and General Curriculum (504, ELL, Special Education, Struggling Learners)	**Differentiation for Enrichment**
Modifications for Classroom:	Use of higher level questioning techniques

Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate **Modifications for Homework and Assignments**: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments **Modifications for Assessments:** Extended time on classroom assessments	Provide assessments that require higher level thinking Increased production Substituting written texts with project-based learning Student-directed learning/ independent studies Extension activities **Further Modifications for Honors Students** Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher
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Unit 4	
Exponents and Exponential Functions	
Timeframe	Week 13-16
Unit Overview	1. Equivalent expressions can be represented in a variety of forms. 2. Properties of exponents help us simplify, estimate, compare, and evaluate data. 3. Scientific notation is helpful when computing with extremely large or small numbers. 4. Exponential relationships are non-linear where the rate of change increases rapidly over time. 5. Real world situations involving exponential relationships can be solved using graphs and equations.
Essential Questions	1. How do you know when an expression is simplified? 2. How can properties of exponents help us simplify expressions? 3. Why is scientific notation helpful and how can we use it to problem solve? 4. How can we model situations involving exponential relationships?
Unit Focus	• Properties of exponents using products • Properties of exponents involving quotients • Zero and negative exponents. • Scientific notation • Exponential growth models • Exponential decay functions
Interdisciplinary Connections	• NJSLS-9.4 Life Literacies and Key Skills
Common Assessments	• Assessment Suite chapter quizzes and tests

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Khan academy	

New Jersey Student Learning Standards (NJSLS)			
Subject Area	**Technology**	**21st Century Life and Careers**	**ELA Companion**
N.Q.A. Quantities Reason quantitatively and use units to solve problems 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. N.Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Algebra A.REI.D. Reasoning with Equations and Inequalities Represent and solve equations and inequalities graphically A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.SSE.B. Seeing Structure in Expressions Write expressions in equivalent forms to solve problems	NJ: 2020 SLS: Science NJ: Grades 9-12 • HS-ETS1 Engineering Design • Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	• 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 • Speaking and Listening Domain • Speaking and Listening

A.SSE.B.3.a Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★ a. Factor a quadratic expression to reveal the zeros of the function it defines. Functions F.IF.A. Interpreting Functions Understand the concept of a function and use function notation F.IF.A.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). F.IF.C. Interpreting Functions Analyze functions using different representations F.IF.C.8.a 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. F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). F.LE.A. Linear, Qudratic and Exponential Models Construct and compare linear and exponential models and solve problems F.LE.A.1.a 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. F.LE.A.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F.LE.B. Linear, Qudratic and Exponential Models Interpret expressions for functions in terms of the situation they model F.LE.B.5. Interpret the parameters in a linear or exponential function in terms of a context.			

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Creative & Visual Projects

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Digital & Cognitive Activities

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Unit 5
Polynomials and Factoring

Timeframe	Week 18-22
Unit Overview	1. Factoring an algebraic expression is the process of finding some set of two or more other expressions that can be multiplied together to get the original. 2. You can perform operations on polynomials by adding, subtracting, and multiplying 3. Factoring is opposite of multiplication 4. Factoring a polynomial completely means to break it down into expressions that are all prime polynomials 5. Factoring is a method used to solve equations with more than one solution 6. You can write polynomials hat model real-world situations in order to solve problems.
Essential Questions	• How do operations of addition, subtraction and multiplication apply to polynomial expressions? • How and why do we factor polynomials? • What are the benefits of factoring expressions completely? • How can we use factoring to solve polynomial equations and how can it be applied to real world problems?
Unit Focus	• Characteristics of and classifying polynomials including: monomials, binomials, and trinomials, degree of a polynomial. • Polynomials can be added, subtracted, or multiplied. • The zero product property is used to solve an equation when one side is zero and the other side is a product of polynomial factors. • Factoring Polynomials using a variety of techniques • Special products of polynomials (square of a binomial patter and sum and difference pattern) • Real world applications for polynomial expressions and equations
Interdisciplinary Connections	• NJSLS-9.4 Life Literacies and Key Skills
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New Jersey Student Learning Standards (NJSLS)			
Subject Area **Mathematics**	**Technology** *8.1: Educational Technology* *8.2: Technology Education, Engineering, Design and Computational Thinking - Programming*	**21st Century Life and Careers** *Career Ready Practices* *9.1: Personal Financial Literacy* *9.2: Career Awareness, Exploration, and Preparation*	**ELA Companion** *Secondary Science and Social Studies Only* N/A
A.APR.A. Arithmetic with Polynomials and Rational Expressions Perform arithmetic operations on polynomials 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. Arithmetic with Polynomials and Rational Expressions Understand the relationship between zeros and factors of 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.REI.B. Reasoning with Equations and Inequalities Solve equations and inequalities in one variable A.REI.B.4.a 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	NJ: 2020 SLS: Science NJ: Grades 9-12 • HS-ETS1 Engineering Design • Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	• 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 • Speaking and Listening Domain • Speaking and Listening

form $(x-p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. A.SSE.A. Seeing Structure in Expressions Interpret the structure of expressions A.SSE.A.1.a Interpret expressions that represent a quantity in terms of its context. ★ a. Interpret parts of an expression, such as terms, factors, and coefficients. A.SSE.A.2. Use the structure of an expression to identify ways to rewrite it. A.SSE.B. Seeing Structure in Expressions Write expressions in equivalent forms to solve problems A.SSE.B.3.a Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★ a. Factor a quadratic expression to reveal the zeros of the function it defines.			
Differentiation			
Differentiation for Support and General Curriculum (504, ELL, Special Education, Struggling Learners)	**Differentiation for Enrichment**		

Modifications for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate **Modifications for Homework and Assignments**: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments **Modifications for Assessments:** Extended time on classroom assessments	Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production Substituting written texts with project-based learning Student-directed learning/ independent studies Extension activities **Further Modifications for Honors Students** Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher

Activities

Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible

Hands-on & Interactive Game Examples

- **Math War (Cards):** Students play with cards to practice multiplication or addition, trying to get the highest result.
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- **Dice Rolling Games:** Roll dice to create and solve numbers, or use them to build shapes and towers.

Movement-Based Math

- **Math Scavenger Hunt:** Hide numbers or equations around the room or outside for children to find
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Creative & Visual Projects

- **Nature Sorting:** Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability.
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Digital & Cognitive Activities

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Unit 6	
Quadratic Equations and Functions	
Timeframe	Weeks 23-31
Unit Overview	1. Change does not always occur at a constant (linear) rate. 2. Real world situations involving quadratic relationships can be modeled and solved using multiple representations 3. Quadratic equations can be solved using a variety of methods 4. Real life situations can be modeled using quadratic functions in order to optimize situations, predict behavior, and design systems.
Essential Questions	1. Is one method of solving a quadratic equation better than another? 2. How do the characteristics of a quadratic function affect its graph? 3. When would it be appropriate to use a quadratic function to model a real-life situation? 4. Why are quadratic functions expressed in different forms and what characteristics of the parabola does each form reveal?
Unit Focus	• All real numbers can be classified as rational or irrational • The sum or product of two rational numbers is rational • The sum of a rational number and an irrational number is irrational • The product of a nonzero rational number and an irrational number is irrational • Radical expressions can be simplified • The graph of the quadratic equation is a parabola • The leading coefficient determines whether the quadratic function has a minimum or a maximum • Standard form of the quadratic function reveals the y-intercept • Vertex form of the quadratic function reveals the vertex • Factored form of the quadratic function reveals the x-intercepts • Quadratic equations can be solved using inverse operations if the variable can be isolated • Quadratic equations can be solved by completing the square • Quadratic equations can be solved using a quadratic formula • Quadratic equations cab be solved by graphing with the use of technology • Quadratic equations sometimes have 2, 1, or zero real roots • The nature of the roots is based upon the value of the discriminant • Quadratic functions can be represented numerically, algebraically, graphically or in a table
Interdisciplinary Connections	• NJSLS-9.4 Life Literacies and Key Skills

Common Assessments	• Assessment Suite chapter quizzes and tests

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A.REI.D. Reasoning with Equations and Inequalities Represent and solve equations and inequalities graphically A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.D.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. Seeing Structure in Expressions Write expressions in equivalent forms to solve problems 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.C. Interpreting Functions Analyze functions using different representations F.IF.C.7.a 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.IF.C.8.a 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		diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	

the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). • F.LE.A. Linear, Qudratic and Exponential Models Construct and compare linear and exponential models and solve problems F.LE.A.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (m A.SSE.B.3.a Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★ a. Factor a quadratic expression to reveal the zeros of the function it defines. Functions F.BF.B. Building Functions Build new functions from existing functions F.BF.B.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.A. Interpreting Functions Understand the concept of a function and use function notation F.IF.A.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the			

input x. The graph of f is the graph of the equation y = f(x). F.IF.B. Interpreting Functions Interpret functions that arise in applications in terms of the context F.IF.B.4. For a function that models a ore generally) as a polynomial function.			

Differentiation	
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• **Dice Rolling Games:** Roll dice to create and solve numbers, or use them to build shapes and towers. **Movement-Based Math** • **Math Scavenger Hunt:** Hide numbers or equations around the room or outside for children to find • **Math Relay Races:** Students run to solve problems in teams, combining physical activity with mental calculation. • **Human Number Line:** Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers. **Creative & Visual Projects** • **Nature Sorting:** Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability. • **Marshmallow Geometry:** Using marshmallows and toothpicks to build 3D shapes. **Digital & Cognitive Activities** • **Virtual Manipulatives:** Using online tools like geoboards or fraction bars. • **Brain Teasers/Riddles:** Daily puzzles that encourage logical thinking and problem-solving skills. • **Virtual Escape Rooms:** Engaging, technology-based puzzles for older students.	

Unit 7	
Functions and Transformations	
Timeframe	Week 32-36
Unit Overview	1. Function can represented in various ways such as equations, order pairs, graphs, tables, sequences. 2. Functions are a mathematical way to describe the relationships between two quanttities that vary 3. Performing the same transformation on any of the 5 parent functions will result in the same result
Essential Questions	1. How can you represent and describe functions? 2. How can functions describe real world situations, model predictions and solve problems? 3. How can you graph new functions using transformations of the 5 parent functions? 4. How do piecewise-defined functions relate to parent functions? 5. How can transformations and completing the square help us graph circles in a coordinate plane?

Unit Focus	• Real world data can be modeled with a function. • Functions can be written in various forms, including graph, and equations. • All functions from the same family share the same properties as the parent function. • Transformations have the same affect on parent function • Any function can be graphed by using key points form the parent function along with the transformations • Piece-wise functions are built by taking a function and restricting its domain. • A circle with the center (h, k) and radius r has an equation $(x-h)^2 + (y-k)^2 = r^2$ • Completing the square can be used to reveal the center and the radius of a circle.
Interdisciplinary Connections	21st Century Life Skills and Careers • NJSLS-9.4 Life Literacies and Key Skills
Common Assessments	• Assessment Suite chapter quizzes and tests

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G.GPE.A. Expressing Geometric Properties with Equations	NJ: 2020 SLS: Science NJ: Grades 9-12	• 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a,	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12

Translate between the geometric description and the equation for a conic section G.GPE.A.1. (+) Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. Statistics and Probability S.ID.B. Interpreting Categorical and Quantitative Data Summarize, represent, and interpret data on two categorical and quantitative variables S.ID.B.6.a Represent data on two quantitative variables on a scatter plot and describe how the variables are related. a. Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models. Algebra A.REI.D. Reasoning with Equations and Inequalities Represent and solve equations and inequalities graphically A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). Functions F.BF.A. Building Functions Build a function that models a relationship between two quantities. ★ F.BF.A.1.a 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.	• HS-ETS1 Engineering Design • Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	• Speaking and Listening Domain • Speaking and Listening

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relationship, or two input-output pairs (include reading these from a table).			

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- **Virtual Manipulatives:** Using online tools like geoboards or fraction bars.
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Unit 8	
Data Analysis and Statistics	
Timeframe	Week 37-40
Unit Overview	1. Statisticians summarize, represent, and interpret categorical and quantitative data in multiple ways since one method can reveal or create a different impression than another.
Essential Questions	• What statistics can you use to characterize and compare the center and spread of data sets? • Which statistics are most affected by outliers, and what shapes can data distributions have? • What conclusions can be made from data displayed in a histogram? • How can you compare data sets using box plots? • How can the properties of data be communicated to illuminate its important features?

Unit Focus	• The three main measures of central tendency: mean, median, mode, describe a different indication of central value in a distribution. • Box-and-whisker plots and their five point summaries min, lower quartile, median, upper quartile and max, are helpful in interpreting the distribution of data.
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S.ID.A. Interpreting Categorical and Quantitative Data Summarize, represent, and interpret data on a single count or measurement variable S.ID.A.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	NJ: 2020 SLS: Science NJ: Grades 9-12 HS-ETS1 Engineering Design Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more	• 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 • Speaking and Listening Domain • Speaking and Listening

S.ID.A.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. S.ID.A.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S.ID.B. Interpreting Categorical and Quantitative Data Summarize, represent, and interpret data on two categorical and quantitative variables S.ID.B.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. S.ID.C. Interpreting Categorical and Quantitative Data Interpret linear models S.ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit. S.ID.C.9. Distinguish between correlation and causation.	manageable problems that can be solved through engineering. NJ: 2020 SLS: Computer Science & Design Thinking NJ: End of Grade 12 8.2 Design Thinking: Effects of Technology on the Natural World Development and modification of any technological system needs to take into account how the operation of the system will affect natural resources and ecosystems. Impacts of technological systems on the environment need to be monitored and must inform decision-making. Many technologies have been designed to have a positive impact on the environment and to monitor environmental change over time. 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.	• 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	
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