West Windsor-Plainsboro Regional School District
Algebra 1/Algebra 1 Honors
August 2021

Unit 1: Equations & Inequalities	
Content Area: Mathematics	
Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8 -9	
Summary and Rationale	
This unit involves the study of real numbers and the language of algebra. Using the language and mechanics of algebra to analyze, compare and communicate is foundational to representing and solving real world situations. Students will apply their understanding of balancing an equation to solve multi-step linear equations with variables on both sides of the equals sign and exponents. When solving linear equations, they work with equations that have one solution, no solution or infinitely many solutions. Students will revisit solving linear inequalities to represent a solution set using both graphs and written inequality solutions. They will also learn to solve for a given variable in literal and absolute value equations.	
Recommended Pacing	
19 days	
New Jersey Student Learning Standards for Mathematics	
Standard: Standards for Mathematical Practice	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Standard: N-RN. B Use properties of rational and irrational numbers	
CPI #	**Cumulative Progress Indicator (CPI)**
3	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational
Standard: A-CED.A Create equations that describe numbers or relationships	
CPI #	**Cumulative Progress Indicator (CPI)**
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.
Standard: A-REI.A Understand solving equations as a process of reasoning and explain the reasoning	
CPI #	**Cumulative Progress Indicator (CPI)**
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
Standard: A-REI.B Solve equations and inequalities in one variable	
CPI #	**Cumulative Progress Indicator (CPI)**

3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
Standard: Critical Thinking and Problem Solving	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
Interdisciplinary Standards Science	
HS.ESS1	Science examples: (1) Rearrange a formula (such as E = mc 2) in order to highlight a quantity of interest. (2) Use Kepler's third law to write and solve an equation in order to solve a problem involving orbital motion. (NGSS, Appendix L, page 32)
Instructional Focus	
Unit Enduring Understandings	
● Many real world problems can be solved through the use of algebraic representation and reasoning. ● Rules of arithmetic and algebra can be used together with the concept of equivalence to transform expressions, equations and inequalities so solutions can be found to solve problems.	
Unit Essential Questions	
● How are arithmetic and algebra related? ● How can arithmetic operations be extended to solve algebraic equations and inequalities? ● How are the number of solutions to an equation or inequality determined?	
Content Understandings	
● Equations and inequalities model real-life situations and help us solve problems. ● Equations do not always have one solution. ● Solution(s) can be verified by substituting them into the equation to see if it remains true. ● When there are infinitely many solutions, the solution set is all real numbers. ● The structure of an equation determines the procedure for solving.	
Content Questions	
● How are rational and irrational numbers identified? ● How are the properties of equality used throughout the solving process to isolate the variable and determine the value of the unknown? ● What is the goal of solving equations and inequalities? ● What do solutions to equations and inequalities tell us?	
Objectives	
Students will know: ● Procedures for simplifying, solving, and graphing one, two, and multi-step single variable equations and inequalities. ● Procedures for simplifying and solving single variable absolute value equations. ● Single variable equations and inequalities can have infinitely many (identity), no real number solutions (empty set) or one unique solution.	

Students will be able to:

- Classify numbers in the real number system.
- Apply properties of real numbers in order to solve linear equations and inequalities.
- Solve multi-step linear equations and inequalities resulting in one solution, no solution, and all real numbers.
- Solve equations with exponents resulting in one solution, two solutions, and no solution.
- Solve absolute value equations, including ones with no solution.
- Isolate a variable when solving literal equations.
- Explain the differences between infinitely many solutions and all real numbers.

Evidence of Learning

Assessment

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.

Resources

Core Text: EdGems Algebra

Unit 2: Introduction to Functions

Content Area: Mathematics

Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8 -9

Summary and Rationale

This unit will focus on the study of functions and relations. Function notation is used to describe relationships in terms of a dependent and independent variable. By studying the domain, range and rate of change of a function, mathematicians can describe and analyze relationships. This understanding can provide the foundation to make

decisions and reasonable predictions. Students will learn how to determine whether or not a graph or table of values represents a function. Students will evaluate functions for a given variable as well as find a missing input value when given the output.	
Recommended Pacing	
13 days	
New Jersey Student Learning Standards for Mathematics	
Standard: Standards for Mathematical Practice	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Standard: F-IF.A Understand the concept of a function and use function notation	
CPI #	**Cumulative Progress Indicator (CPI)**
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.
Standard: F-IF.C Analyze functions using different representations	
CPI #	**Cumulative Progress Indicator (CPI)**
7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
Standard: Critical Thinking and Problem Solving	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).

Standard: Technology Literacy	
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.

Instructional Focus

Unit Enduring Understandings

- Function relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same idea. The value of a particular representation depends on its purpose.
- Functions are a special type of relationship or rule that uniquely associates members of one set with members of another set.
- Characteristics of functions impact the behavior of their multiple representations.
- Many real world problems can be solved through the use of algebraic representation and reasoning.

Unit Essential Questions

- How can mathematical models be used as tools to best describe change and help represent real-life situations?
- How are relationships represented mathematically?
- How are patterns of change related to the behavior of functions?

Content Understandings

- A function is a relation where every input is paired with exactly one output.
- Functions can be evaluated to help create multiple representations and analyze patterns.
- Domain of a function is a set of input values, and the range is the set of output values.

Content Questions

- What is the difference between a function and a relation?
- What is a reasonable domain and range for a given function?
- What is function notation and why is it used?
- How can a rule be generated when given a table or mapping of values?
- How are relationships depicted or communicated?
- How can functions be represented?
- How can functions be used to model real world situations?

Objectives

Students will know:

- That a function has multiple representations.
- The difference between a relation and function.
- That a function is a rule that assigns each input exactly one output.
- Terminology and notation for functions.
- The structure of a function will impact the function's representations.

Students will be able to:

- Sketch a function to model a relationship between two variables in a real world scenario.
- Identify independent and dependent variables of given functions.
- Represent functions as a table, graph, or equation.
- Distinguish between discrete and continuous data.
- Determine if a relation is a function.
- Identify the domain and range of a given function.
- Use f(x) and y to represent the output of a function.
- Evaluate functions from a table, graph & equation given function notation.
- Interpret the input and output of a function in context of a situation.

Evidence of Learning

Assessment

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.
Resources
Core Text: EdGems Algebra

Unit 3: Linear Functions
Content Area: Mathematics
Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8 -9
Summary and Rationale
In this unit, students will complete an in-depth study of linear functions as well as look at a variety of non-linear functions. Functions are a unifying concept in all mathematics and display relationships among phenomena in everyday life. The study of equations helps students to link specific concrete arithmetic skills to broader conceptual cases. Students will work closely with the equations that define linear and nonlinear functions and their graphs. Students will describe qualitative features of a graph such as increasing, decreasing, linear and nonlinear. When working with linear functions, students will graph linear functions from an equation as well as write equations for linear functions based on graphs or key information. The unit also includes describing nonlinear functions.
Recommended Pacing

19 days	
New Jersey Student Learning Standards for Mathematics	
Standard: Standards for Math Practice	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Standard: A-CED.A Create equations that describe numbers or relationships	
CPI #	**Cumulative Progress Indicator (CPI)**
2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
Standard: A-REI.D Represent and solve equations and inequalities graphically	
CPI #	**Cumulative Progress Indicator (CPI)**
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).
Standard: F-IF.B Interpret functions that arise in applications in terms of the context	
CPI #	**Cumulative Progress Indicator (CPI)**
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
Standard: F-IF.C Analyze functions using different representations	
CPI #	**Cumulative Progress Indicator (CPI)**
7a	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
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	

Standard: Critical Thinking and Problem Solving	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
Standard: Technology Literacy	
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.

Instructional Focus

Unit Enduring Understandings

- Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns and identifying solutions.
- Functional relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same idea. The value of a particular representation depends on its purpose.
- Rules of arithmetic and algebra can be used together with the concept of equivalence to transform expressions, equations and inequalities so solutions can be found to solve problems.
- Many real world problems can be solved through the use of algebraic representation and reasoning.

Unit Essential Questions

- How can mathematical models be used as tools to best describe change and help represent real-life situations?
- How does the structure of a function affect its graph?

Content Understandings

- Linear functions have a constant rate of change and create a line when graphed.
- There are different forms of linear equations and there is a purpose to each form.
- The only kind of linear equation that is not a linear function is a vertical line.
- Characteristics of a linear equation impact its graphical and numerical representations.
- The relationship between two variables in a real world scenario can be modeled using linear functions.

Content Questions

- How can you determine whether or not a function is linear?
- What does it mean to have a constant rate of change?
- What is the meaning of slope and how can it be determined given two points, a graph or an equation of a line?
- How does the process of graphing a linear equation change based on the form in which the function is written?
- How can the characteristics of a linear function be used to write an equation?

Objectives

Students will know:

- The characteristics and behaviors of linear functions.
- Types of slope including situations of positive, negative, zero, and undefined slopes.
- Slope as a rate of change of a linear function.
- Slope can be identified in various ways.
- Linear relationships can be represented in different ways (graphs, tables, equations of various forms, etc).
- The procedures for writing the equation of line in slope-intercept, standard and point slope form.

Students will be able to:

- Determine if a function is linear or nonlinear.
- Calculate and compare the rate of change and slope.
- Graph linear functions in various forms.
- Write a linear equation in various forms given specific information.

● Represent a linear function in multiple ways (equation, table, verbally, graph, mapping diagram, ordered pairs) ● Identify the x- and y- intercepts from multiple representations.
Evidence of Learning
Assessment
Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.
Resources
Core Text: EdGems Algebra

Unit 4: Systems of Equations and Inequalities	
Content Area: Mathematics	
Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8 -9	
Summary and Rationale	
This unit involves the study of systems of linear equations and inequalities. A key idea when studying systems is the linking of the graphical interpretation of the system and the solution of the system. Connecting numerical solutions and graphical interpretation is an underpinning of their future study of calculus. Transfer of knowledge is another important goal. By learning to solve the systems both algebraically and graphically and to appropriately interpret their solutions students will be able to apply systems to model real world situations. Students will start the unit by looking at systems of two linear equations and determining whether the lines are parallel, intersecting or the same line. After this understanding of systems is developed, students will learn three methods for solving systems of equations. Students will then write and solve systems for real world situations. Finally, students will wrap up the unit by graphing linear inequalities and systems of inequalities.	
Recommended Pacing	
23 days	
New Jersey Student Learning Standards for Mathematics	
Standard: Standards for Math Practice	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Standard: A-REI.C Solve systems of equations	
CPI #	**Cumulative Progress Indicator (CPI)**
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 exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for 21st Century Life and Careers	
Standard: Critical Thinking and Problem Solving	

CPI #	Cumulative Progress Indicator (CPI)
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
Standard: Technology Literacy	
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.

Instructional Focus

Unit Enduring Understandings

- Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns and identifying solutions.
- Rules of arithmetic and algebra can be used together with the concept of equivalence to transform expressions, equations and inequalities so solutions can be found to solve problems.

Unit Essential Questions

- What are the possible relationships that can occur with simultaneous equations and inequalities?
- How can patterns and equations be used as tools to best describe and help explain real-life situations?
- How is the most efficient and appropriate method for solving problems determined?

Content Understandings

- A solution of a system of linear equations in two variables can be an ordered pair (point of intersection), no solution, or infinitely many solutions.
- There are different methods to solve systems.
- The structure of a system indicates the most efficient method for determining the solution.
- A system of equations or inequalities can be used to model and solve world situations.
- Linear inequalities have an infinite number of solutions.
- The overlapping shaded region of a graphed system of linear inequalities represents the solution set of the system.

Content Questions

- How are parallel or perpendicular lines determined?
- How can a system of equations be solved?
- How is the most efficient way to solve a system of equations determined?
- How are systems of equations and inequalities used to represent real-life problems?
- What are reasonable solutions to linear inequalities and systems of linear inequalities?
- How are systems of equations that have no solution or infinitely many solutions interpreted?

Objectives

Students will know:

- Parallel lines have the same slope but different y-intercepts.
- Perpendicular lines have opposite reciprocal slopes.
- Procedures for solving systems of linear equations and inequalities.
- Procedures for creating systems of linear equations and inequalities for real life situations.

Students will be able to:

- Write and identify the equations of parallel and perpendicular lines.
- Solve a system of linear equations using the methods of graphing, substitution and elimination.
- Interpret the solution set to a system of linear equations and inequalities both algebraically and graphically.
- Write a system of equations or inequalities to model a real world situation.
- Analyze a system of linear equations or inequalities and determine the most appropriate method of solution.
- Solve and interpret the system in terms of the context of a real world problem.

Evidence of Learning

Assessment

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.
Resources
Core Text: EdGems Algebra

Unit 5: Exponents, Polynomials & Factoring	
Content Area: Mathematics	
Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8 -9	
Summary and Rationale	
This unit involves knowledge and skills relative to polynomials, the basic building blocks of algebraic expressions. Students will begin the unit by using properties of exponents to simplify expressions. Using previous understanding of simplifying expressions students will be able to simplify more complex expressions. They will learn to use more precise language to describe expressions and rewrite them in standard form. Students will add, subtract and multiply polynomials using multiple methods for each operation. Then they will reverse the multiplication of polynomials by factoring. The concepts covered in this unit are foundational in finding solutions to quadratic equations and functions and will be further developed with the study of exponential & polynomial functions.	
Recommended Pacing	
23 days	
New Jersey Student Learning Standards for Mathematics	
Standard: Standards for Math Practice	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Standard: F-IF.C Analyze functions using different representations	
CPI #	**Cumulative Progress Indicator (CPI)**
7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude
8b	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t , y = (0.97)t , y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay
Standard: F-LE.A Construct and compare linear and exponential models and solve problems	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
1c	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.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
Standard: Critical Thinking and Problem Solving	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
Standard: Technology Literacy	
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
Instructional Focus	
Unit Enduring Understandings	
● Rules of arithmetic and algebra can be used together with the concept of equivalence to transform expressions. ● Various forms of an expression have different benefits based on its extending concept.	
Unit Essential Questions	
● How and when is an expression simplified? ● Are the operations of addition, subtraction and multiplication universal? ● Which is the best form for a polynomial? ● How does the structure of the polynomial help to determine a method for factoring?	
Content Understandings	
● Exponents provide a special way of writing repeated multiplication. ● Apply the properties of integer exponents to generate equivalent numerical expressions. ● A number written in exponential notation has a base and an exponent, and each of these parts provides information for finding the value of the expression. ● Multiplying and factoring polynomials are inverse operations. ● Multiply and factor polynomials using different methods.	
Content Questions	
● When is an exponential expression simplified completely? ● What is the most efficient way to simplify exponential expressions? ● How can polynomials be simplified and applied to solve problems? ● How are operations and factoring real numbers performed when expressed as polynomial expressions? ● How is a polynomial factored completely? ● How are special products recognized and factored?	
Objectives	
Students will know: ● The language and properties of exponents. ● The correct terminology for identifying polynomial expressions by degree and number of terms. ● Procedures for adding, subtracting, multiplying and factoring polynomial expressions.	

- Procedures for the application of polynomial expressions in real life situations.

Students will be able to:

- Apply the properties of exponents to simplify expressions.
- Classify polynomials by the number of terms and degrees.
- Simplify expressions by applying operations of addition, subtraction & multiplication with polynomials.
- Write polynomials into factored form as the multiplication of two or more polynomials.
- Recognize special products.
- Apply different methods of factoring in order to factor a polynomial completely.

Evidence of Learning

Assessment

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.

Resources

Core Text: EdGems Algebra

Unit 6: Quadratic Functions

Content Area: Mathematics

Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8 -9

Summary and Rationale

In this unit, students will learn multiple ways to solve quadratic equations including graphing, factoring and the Quadratic Formula. After finding solutions, students will explore the different forms in which quadratic functions can be written and how each form gives information about the graph and behavior of the function. Understanding

the relationships between the characteristics of a quadratic and its equation will forge the connections between the method of graphing a quadratic function based on its algebraic form. This will be extended through applications to real world scenarios. This learning will create a foundationational understanding of quadratics that will be further developed in future mathematics courses by the inclusion of complex numbered solutions, nonlinear systems, and the study of other polynomial functions.	
Recommended Pacing	
23 days	
New Jersey Student Learning Standards for Mathematics	
Standard: Standards for Math Practice	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Standard: A-CED..A Create equations that describe numbers or relationships	
CPI #	**Cumulative Progress Indicator (CPI)**
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.
Standard: A-REI.B Solve equations and inequalities in one variable	
CPI #	**Cumulative Progress Indicator (CPI)**
4	Solve quadratic equations in one variable.
Standard: F-IF.C Analyze functions using different representations	
CPI #	**Cumulative Progress Indicator (CPI)**
7a	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.
8a	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.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics

RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for 21st Century Life and Careers	
Standard: Critical Thinking and Problem Solving	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
Standard: Technology Literacy	
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
Instructional Focus	
Unit Enduring Understandings	
● Rules of arithmetic and algebra can be used together with the concept of equivalence to transform expressions, equations and inequalities so solutions can be found to solve problems. ● Function relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same idea. The value of a particular representation depends on its purpose. ● Characteristics of functions, such as transformations and type, impact the behavior of their multiple representations. ● Many real world problems can be solved through the use of algebraic representation and reasoning.	
Unit Essential Questions	
● How does the structure of a function affect its graph? ● How can mathematical models be used as tools to best describe change and help represent real-life situations? ● How is the most efficient and appropriate method for solving problems determined?	
Content Understandings	
● Some radical expressions represent irrational numbers. ● Quadratic equations and functions can be solved using a variety of methods, each having advantages and disadvantages. ● There are three different forms of quadratic equations (standard, vertex, and factored form) each revealing characteristics of the graph. ● A parabola is the graph of a quadratic function. ● Every parabola has an axis of symmetry, which includes its vertex, the minimum or maximum point. ● The discriminant determines the number of real zeros of an equation, solutions, or the number of x-intercepts of a graph. ● If the graph of a parabola does not intercept the x-axis, the solution(s) to the quadratic equation are non-real.	
Content Questions	
● How can a quadratic equation be solved? ● How is the most efficient way to solve a quadratic equation determined? ● How is the axis of symmetry determined from a graph, table and equation and how is it related to the vertex? ● How are the number of solutions, roots, x-intercepts, and zeros related? ● What does the value of the discriminant determine? ● How can you use a graph to solve a quadratic equation in one variable? ● What are some of the characteristics of the graph of a quadratic function? ● How are quadratic functions used to represent and solve real world equations?	
Objectives	
Students will know:	

- The number of solutions for a quadratic equation.
- Procedures for solving quadratic equations by factoring, the quadratic formula and graphing.
- A parabola is the graphical representation of a quadratic function.
- The advantages and disadvantages of each method for solving quadratic equations.
- How the characteristics for each form of the quadratic function affects the attributes of its corresponding graph.
- When an estimate is an appropriate solution in a real-life situation.

Students will be able to:

- Approximate square roots.
- Solve quadratic equations by factoring, square roots, graphing and the quadratic formula.
- Identify and apply characteristics of quadratic functions to create a graph, table or an equation.
- Graph quadratic functions in standard, vertex, and factored form.
- Algebraically convert between different quadratic forms.
- Use the discriminant to determine the number of roots of a quadratic equation.
- Choose and use the most efficient method of solution for a quadratic equation.
- Apply quadratics to represent and solve real world problems.

Evidence of Learning

Assessment

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.

Resources

Core Text: EdGems Algebra

Unit 7: Exponential Functions & Transformations of Functions

Content Area: Mathematics

Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8 -9

Summary and Rationale

This unit of study provides a review of function families learned throughout the year and introduces exponential functions. Students will study data, graphs, and equations to determine if it represents a linear, quadratic, or exponential relationship. Next, they will learn to graph exponential functions and write exponential functions from tables and real-world scenarios. Expressing non-linear quantities gives us the power to recognize and describe patterns, make generalizations, and draw and justify conclusions. Non-linear representations enable us to model many real-life situations and represent them abstractly. Finally, students will review the function families and connect how changes to a parent function impact the behavior of its graph. Functions will be translated and reflected in this unit. This learning will connect to future families of functions and additional transformations that will be covered later in future courses.

Recommended Pacing

12 days

New Jersey Student Learning Standards for Mathematics	
Standard: Standards for Math Practice	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Standard: N-RN.A Extend the properties of exponents to rational exponents.	
CPI #	**Cumulative Progress Indicator (CPI)**
2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
Standard: A-SSE.A Interpret the structure of expressions	
CPI #	**Cumulative Progress Indicator (CPI)**
1a	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients
2	Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2) 2 – (y2) 2 , thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2).
Standard: A-SSE.B Write expressions in equivalent forms to solve problems	
CPI #	**Cumulative Progress Indicator (CPI)**
3a	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.
Standard: A-APR.A Perform arithmetic operations on polynomials	
CPI #	**Cumulative Progress Indicator (CPI)**
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.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
Standard: Critical Thinking and Problem Solving	
CPI #	**Cumulative Progress Indicator (CPI)**

9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
Standard: Technology Literacy	
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
Interdisciplinary Standards Science	
HS-PS4	Science example: (1) Write expressions in equivalent forms to solve problems. For example, relate the formulas c = f and c = /T by seeing that /T = (1/T) = f, instead of remembering both forms separately. (2) See the conceptual and structural similarities between formulas such as c = /T and v = d/t. How do these formulas relate to the formula (running speed) = (stride length) × (stride frequency) which is sometimes found in track-and-field coaching manuals? (NGSS Appendix L, page 30)

Instructional Focus

Unit Enduring Understandings

- Equivalent expressions can be represented in a variety of forms.
- Rules of arithmetic and algebra can be used together with the concept of equivalence to transform expressions, equations and inequalities so solutions can be found to solve problems.
- Function relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same idea. The value of a particular representation depends on its purpose.
- Characteristics of functions, such as transformations and type, impact the behavior of their multiple representations.
- Many real world problems can be solved through the use of algebraic representation and reasoning.
- Function transformations can shift the graph, change its size, shape and/or orientation.

Unit Essential Questions

- How can mathematical models be used as tools to best describe change and help represent real-life situations?
- How does the structure of a function affect its graph?
- How are patterns of change related to the type or behavior of functions?

Content Understandings

- Linear, quadratic and exponential models can be characterized by their rates of change.
- Exponential functions can be used to express repeated multiplication.
- Characteristics of an exponential function impact its graphical and numerical representations.
- Functions can be evaluated to help create multiple representations and analyze patterns.
- Function transformations can shift the graph, change its size, shape and/or orientation.

Content Questions

- How is the type of function determined from a table, graph, equation or situation?
- What are some of the characteristics of an exponential function?
- How do transformations impact a function?

Objectives

Students will know:

- The major differences between linear, quadratic and exponential functions.
- The structure of an exponential function will impact the function's representations.
- How function transformations impact the graph and equation.

Students will be able to:

- Analyze rate of change to determine if data is best represented by a linear, quadratic or exponential model.

- Write and graph exponential functions from equations, tables, and real life situations.
- Write and graph transformed function given a specific rigid transformation to a parent function.
- Describe the (rigid) transformation of a parent function that would yield the graph of a given function.

Evidence of Learning

Assessment

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.

Resources

Core Text: EdGems Algebra

Unit 8: Two Variable Statistics

Content Area: Mathematics

Course & Grade Level: Algebra 1 & Algebra 1 Honors, Grades 8-9

Summary and Rationale

Statistics is studied so students can understand how data is best analyzed to help us make decisions and predictions. Students will create scatter plots to display two variable data in this unit. They will look for positive or negative associations in the data and whether the data shows a linear or nonlinear association. For linear associations, students will informally fit a line to data and find the equations that best describe the data. They will also use technology to calculate linear models and analyze correlation coefficients. These equations of linear models will be used to make predictions when solving problems in real-world contexts. Lastly, they will finish the unit looking at data in two-way tables and find relative and conditional frequencies to see if there are associations in the data.

Recommended Pacing

8 days

New Jersey Student Learning Standards for Mathematics

Standard: Standards for Math Practice

CPI #	Cumulative Progress Indicator (CPI)
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics

5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning
Summarize, represent, and interpret data on two categorical and quantitative variables	
CPI #	**Cumulative Progress Indicator (CPI)**
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
6a	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.
6c	Fit a linear function for a scatter plot that suggests a linear association.
Standard: S-ID.C Interpret linear models	
7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
8	Compute (using technology) and interpret the correlation coefficient of a linear fit.
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
Standard: Critical Thinking and Problem Solving	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
Standard: Technology Literacy	
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
Interdisciplinary Standards Science	
MS-PS3	Science example: Analyze an ideal set of bivariate measurement data for kinetic energy vs. mass (holding speed constant). (NGSS, Appendix L, page 22)
Instructional Focus	
Unit Enduring Understandings	
● Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns and identifying solutions. ● Many real world problems can be solved through the use of algebraic representation and reasoning. ● Data displays are used to organize data, interpret relationships, and make predictions.	

Unit Essential Questions

- How can mathematical models be used as tools to best describe change and help represent real-life situations?
- How are data displays used to organize and interpret information?

Content Understandings

- Linear functions have a constant rate of change and create a line when graphed.
- The relationship between two variables in a real world scenario can be modeled using scatter plots or two-way frequency tables.
- The equation of a linear model can be used to solve problems in real world contexts.

Content Questions

- How can scatter plots and linear models be used to identify trends, relationships, and make predictions for numerical data sets?
- How is the strength of correlation measured?
- How is categorical data analyzed to identify frequencies?

Objectives

Students will know:

- Types of correlation including situations of positive, negative, and no correlation.
- The difference between correlation and causation.
- Scatter plots and linear models can be used to make predictions for sets of numerical data.
- Sets of data can be displayed as a table or scatter plot to help identify the type of correlation.
- The procedures for writing an equation for a linear model.
- The correlation coefficient measures the strength of the linear relationship.
- The differences and uses of relative and conditional frequencies when working with bivariate categorical data.

Students will be able to:

- Read, create & describe the associations in scatter plots.
- Determine if a correlation is linear or nonlinear.
- Calculate and interpret the slope and the intercept of a linear model in the context of the data.
- Draw a trendline for a set of data and use the line to make predictions.
- Write an equation for a linear model and use the equation to make predictions.
- Model the relationship between two variables in a real world scenario using scatter plots and/or lines that best describe the data.
- Use technology to calculate the linear model and interpret the correlation coefficient.
- Organize bivariate categorical data in a two-way frequency table.
- Describe associations between two sets of data using relative and conditional frequencies.

Evidence of Learning

Assessment

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of standardized test and NJSLA data.

Resources

Core Text: EdGems Algebra