Branchburg Township Public Schools

Office of Curriculum and Instruction

Algebra 7 Math Curriculum

Adopted by the Board of Education October 2022

This curriculum is aligned with the 2016 New Jersey Student Learning Standards in Mathematics

Curriculum Scope and Sequence			
Content Area	**Math**	**Course Title/Grade Level:**	**Algebra Grade 7**

Topic/Unit Name		Suggested Pacing (Days/Weeks)
Topic/Unit #1	Relationships between Quantities (Chapters 0-2)	24 days
Topic/Unit #2	Linear Relationships Part 1 (Chapters 3,4)	27 days
Topic/Unit #3	Linear Relationships Part 2 (Chapters 5,6)	31 days
Topic/Unit #4	Exponential and Radical Relationships (Chapters 7,10)	26 days
Topic/Unit #5	Quadratic and Rational Relationships(Chapters 8,9,11)	52 days

Topic/Unit Title	Relationships between Quantities	Approximate Pacing	24 days

STANDARDS

NJSLS (Math)

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.
A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A.CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

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

Interdisciplinary Connections:

L.7.3.A. Use knowledge of language and its conventions when writing, speaking, reading, or listening. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy. *When students write math reflections, they produce their work online which can be easily shared with others.*

Computer Science & Design Thinking:	Career Readiness, Life Literacies and Key Skills
8.1.8.DA.5: Test, analyze, and refine computational models *For example, Students complete the "Absolute value equations and inequalities" gizmo, where students vary the terms of the*	**9.2.8.CAP.2:** Develop a plan that includes information about career areas of interest. **9.4.8.TL.6:** Collaborate to develop and publish work that provides perspectives on a real-world problem

absolute-value function and vary the value that they are comparing it to. Then explore how the graph and solution set change in response. **8.1.8.DA.1**: Organize and transform data collected using computational tools to make it usable for a specific purpose. *For example: Students utilize tech platforms <u>daily</u> for Do Now activities and formative assessments.* **8.2.8.ED.7:** Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). *Students complete "Reflection" open-ended assignments to demonstrate understanding of and connections between skills through digital explanation/presentation.*	**Discussion:** Consider short term goals for high school and college, and how a student's performance in middle school has an effect on achieving those goals. **Ongoing Formative Assessments:** Students utilize various tech platforms daily to demonstrate their understanding of prior learning. This platform allows students to efficiently and consistently self-assess and reflect upon their own knowledge.

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

Essential Questions:

Chapter 1:

How do you evaluate numerical expressions by using the order of operations?
How do you use the Distributive Property to evaluate and simplify expressions?
How do you determine whether a relation is a function?
How can mathematical ideas be represented?

Chapter 2:

How do you solve one-step and multi-step equations with various operations?
How do you solve proportions?
How can we use formulas to solve real-world problems?
Why is it helpful to represent the same mathematical idea in different ways?

Students will understand:

Chapter 1:

* how verbal phrases translate into algebraic expressions
* how to identify a function
* when a function is positive versus negative
* how to identify whether a function is increasing or decreasing

Chapter 2:
* when solving equations that involve absolute values, there are two cases to consider
* when solving equations, it is critical to perform the same operation on both sides to keep the equation balanced

STUDENT LEARNING OBJECTIVES	
Key Knowledge	**Process/Skills/Procedures/Application of Key Knowledge**
Students will know: ***Chapter 0:*** integer, absolute value, opposites, reciprocal ***Chapter 1:*** algebraic expression, variable, term, power, coefficient, equation, solution, identity, relation, domain, range, independent variable, dependent variable, function, intercept ***Chapter 2:*** formula, solve an equation, equivalent expressions, multi-step equation, identity, ratio, proportion, rate, unit rate, percent of change, literal equation	***Students will be able to:*** * solve equations by using addition or subtraction * solve equations by using multiplication and division * solve equations involving more than one operation * solve equations involving consecutive integers * solve equations with the variable on each side * solve equations involving grouping symbols * evaluate absolute value expressions * solve absolute value equations * compare ratios * solve proportions * solve equations for given variables * use formulas to solve real-world problems

ASSESSMENT OF LEARNING	
Summative Assessment (Assessment at the end of the learning period)	Chapter Tests and Quizzes
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	Do Nows/Exit slips using digital platforms such as Edulastic.com, Kahoot.com, and Quizzizz.com to check understanding of a single lesson/concept Teacher observations of student work and learning
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to	Open-Ended Reflection Assignments Leveled worksheets/activities

demonstrate their knowledge, understanding and proficiency)	Project-based learning (extensions) Modified assessments as per IEPs
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	Math MAP Assessment given in the Fall, Winter, and Spring Math Cumulative midterm (winter) and final exam (spring)
RESOURCES	
Core instructional materials: Glencoe McGraw-Hill Algebra 1 textbook	
Supplemental materials: Explore Learning Gizmo Simulations CME Algebra Project resources Diversity - (TpT) practice worksheet with biographical passage connection	
Modifications for Learners	
See appendix	

Topic/Unit Title	Linear Relationships Part 1	Approximate Pacing	27 days

STANDARDS

NJSLS (Math)

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.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
F.IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
F.IF.C.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.BF.A.1. Write a function that describes a relationship between two quantities.
F.BF.A.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
F.BF.B.4.a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2x3 or f(x) = (x+1)/(x–1) for x ≠1.
F.LE.A.1.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.1.b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
F.LE.A.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
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.

STANDARDS FOR MATHEMATICAL PRACTICES:
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
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

Interdisciplinary Connections:

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
Activity: Utilize linear and nonlinear functions to represent trends in weather data.

Computer Science & Design Thinking:	Career Readiness, Life Literacies and Key Skills
8.1.8.DA.5: Test, analyze, and refine computational models *Students complete the "Solving Equations by Graphing Each Side " gizmo, where students vary the coefficients in the equation by sliding a scale and explore how the graph changes in response.* **8.1.8.DA.1**: Organize and transform data collected using computational tools to make it usable for a specific purpose. *Students utilize tech platforms daily for Do Now activities and formative assessments.* **8.2.8.ED.7:** Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). *Students complete "Reflection" open-ended assignments to demonstrate understanding of and connections between skills through digital explanation/presentation.*	**9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).** Activity: Analyze electronic banking records and discuss similarities and differences between that and a linear function table. **Ongoing Open-Ended Assignments:** Students utilize their communication skills on a "weekly" basis to clearly articulate their understanding of concepts learned (and the interrelatedness of concepts) by responding to open-ended, higher-order thinking questions.

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

Essential Questions:
Chapter 3:
How do you graph linear equations?
How do you find the slope of a line?
How do you write and graph direct variation equations?
Why are graphs useful?

Chapter 4:
How do you write and graph equations in slope-intercept form?

How do you write equations in point-slope form?
Why is math used to model real-world situations?

Students will understand:
Chapter 3:
* how to find rate of change / slope
* how to identify the graph of a direct variation
* how to identify a proportional relationship

Chapter 4:
* the appropriate form in which to write a linear equation if given the slope and a point versus given two points
* how slope is related to parallel and perpendicular lines

STUDENT LEARNING OBJECTIVES

Key Knowledge	Process/Skills/Procedures/Application of Key Knowledge
Students will know: ***Chapter 3:*** linear equation, standard form, constant, x-intercept, y-intercept, linear function, parent function, family of graphs, rate of change, slope, direct variation, constant of variation, arithmetic sequence ***Chapter 4:*** slope-intercept form, point-slope form, parallel lines, perpendicular lines, inverse relation, inverse function	***Students will be able to:*** * identify linear equations, intercepts, and zeros * graph linear equations * use rate of change to solve problems * find the slope of a line * write and graph direct variation equations * solve problems involving direct variation * recognize arithmetic sequences * relate arithmetic sequences to linear functions * write an equation for a proportional relationship * write an equation for a non-proportional relationship * write and graph linear equations in slope-intercept form * model real-world data with equations in slope-intercept form * write an equation of a line in slope-intercept form given the slope and one point * write an equation of a line in slope-intercept form given two points * write equations of lines in point-slope form * write linear equations in different forms * write an equation of the line that passes through a given point, parallel to a given line

	* write an equation of the line that passes through a given point, perpendicular to a given line
ASSESSMENT OF LEARNING	
Summative Assessment (Assessment at the end of the learning period)	Chapter Tests and Quizzes
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	Do Nows/Exit slips using digital platforms such as Edulastic.com, Kahoot.com, and Quizzizz.com to check understanding of a single lesson/concept Teacher observations of student work and learning
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge, understanding and proficiency)	Open-Ended Reflection Assignments Leveled worksheets/activities Project-based learning (extensions) Modified assessments as per IEPs
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	Math MAP Assessment given in the Fall, Winter, and Spring Math Cumulative midterm (winter) and final exam (spring)
RESOURCES	
Core instructional materials: Glencoe McGraw-Hill Algebra 1	
Supplemental materials: Explore Learning Gizmo Simulations CME Algebra Project resources Diversity - (TpT) practice worksheet with biographical passage connection	
Modifications for Learners	
See appendix	

Topic/Unit Title	Linear Relationships Part 2	Approximate Pacing	31 days

STANDARDS

NJSLS (Math)

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.CED.A.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
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 exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
A.REI.D.12. Graph the solutions to linear inequalities 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.

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

Interdisciplinary Connections:

MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
Discussion: Class will have a discussion about how constraints in the design process compare and contrast with the constraints in equations/inequalities.

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.1.8.DA.5: Test, analyze, and refine computational models *Students complete the "Solving Linear Inequalities in One Variable" gizmo, where students solve one-step inequalities in one variable. Graph the solution on a number line using the simulation.* **8.1.8.DA.1**: Organize and transform data collected using computational tools to make it usable for a specific purpose. *Students utilize tech platforms daily for Do Now activities and formative assessments.* **8.2.8.ED.7:** Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). *Students complete "Reflection" open-ended assignments to demonstrate understanding of and connections between skills through digital explanation/presentation.*	**9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life (e.g. teenager, young adult, family).** **Activity:** Construct a graph of a linear system of equations to represent possible spending plans for compare and contrast purposes via class discussion. **Activity:** Students will work collaboratively in groups to use problem solving strategies and persevere through higher-order thinking questions during a Systems of Equations "Escape Room".

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

Essential Questions:

Chapter 5:

How do you solve linear inequalities by using various operations?
How do we graph inequalities?
How do we graph inequalities that incorporate the words "or" and "and", or include an absolute value?
How are symbols used in mathematics?

Chapter 6:

How do you solve systems of equations by graphing?
How do you solve systems of equations using substitution or elimination?
How can you find the solution to a math problem?

Students will understand:

Chapter 5:

* the general practices for representing solutions of an inequality using a graph

Chapter 6:
* how to determine the number of solutions a system of equations has
* how to determine an appropriate method for solving a system of equations

STUDENT LEARNING OBJECTIVES	
Key Knowledge	**Process/Skills/Procedures/Application of Key Knowledge**
Students will know: ***Chapter 5:*** inequality, compound inequality, intersection, union, boundary, half-plane, closed half-plane, open half-plane ***Chapter 6:*** system of equations, consistent, independent, dependent, inconsistent, substitution, elimination, system of inequalities	***Students will be able to:*** * solve linear inequalities by using addition * solve linear inequalities by using subtraction * solve linear inequalities by using multiplication * solve linear inequalities by using division * solve linear inequalities involving more than one operation * solve linear inequalities involving the Distributive Property * solve compound inequalities containing the word and and graph their solution set * solve compound inequalities containing the word or and graph their solution set * solve and graph absolute value inequalities (<) * solve and graph absolute value inequalities (>) * graph linear equalities on the coordinate plane * solve inequalities by graphing * determine the number of solutions a system of linear equations has, if any * solve systems of linear equations by graphing * solve systems of equations by using substitution * solve real-world problems involving systems of equations by using substitution * solve systems of equations by using elimination with addition * solve systems of equations by using elimination with subtraction * solve systems of equations by using elimination with multiplication * solve real-world problems involving systems of equations * determine the best method for solving systems of equations

	* apply systems of equations * solve systems of linear inequalities by graphing * apply systems of linear inequalities
ASSESSMENT OF LEARNING	
Summative Assessment (Assessment at the end of the learning period)	Chapter Tests and Quizzes
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	Do Nows/Exit slips using digital platforms such as Edulastic.com, Kahoot.com, and Quizzizz.com to check understanding of a single lesson/concept Teacher observations of student work and learning
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge, understanding and proficiency)	Open-Ended Reflection Assignments Leveled worksheets/activities Project-based learning (extensions) Modified assessments as per IEPs
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	Math MAP Assessment given in the Fall, Winter, and Spring Math Cumulative midterm (winter) and final exam (spring)
RESOURCES	
Core instructional materials: Glencoe McGraw-Hill Algebra 1	
Supplemental materials: Explore Learning Gizmo Simulations CME Algebra Project resources Diversity - (TpT) practice worksheet with biographical passage connection	
Modifications for Learners	
See appendix	

Topic/Unit Title	Exponential and Radical Relationships	Approximate Pacing	26 days

STANDARDS

NJSLS (Math)

N.RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5(^{1/3})^3$ to hold, so $(5^{1/3})^3$ must equal 5.
N.RN.A.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
A.SSE.A.2. Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.
A.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.B.4.a Solve quadratic equations in one variable.Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
F.IF.A.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.
F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
F.IF.C.7.b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
F.IF.C.7.e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
F.IF.C.8.b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.
F.BF.A.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
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).

STANDARDS FOR MATHEMATICAL PRACTICES:

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

Interdisciplinary Connections:

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Activity: Investigate population trends in regards to consumption of natural resources. Utilize exponential functions to predict potential future consequences.

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. *Students utilize tech platforms daily for Do Now activities and formative assessments.* **8.2.8.ED.7:** Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).	**9.1.8.FI.2: Determine the most appropriate use of various financial products and services to borrow and access money for making purchases (e.g., ATM, debit cards, credit cards, check books, online/mobile banking).** **Discussion:** Investigate the effect compound interest has on the balance of a credit card and formulate a strategy for how you will use your first credit card. **Discussion:** Investigate the effect compound interest has on the balance of a credit card and formulate a strategy for how you will use your first credit card.

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

Essential Questions:

Chapter 7:

What are the properties of exponents?

How do you express numbers in scientific notation?
How do you compute products and quotients using scientific notation?
How do you graph exponential functions?

Chapter 10:
How do you simplify radical expressions?
What is the Pythagorean Theorem and how do you use it?

Students will understand:
Chapter 7:
* how to translate standard form to scientific notation and vice versa
* how to distinguish between exponential growth versus exponential decay
* how to identify the graph of an exponential function

Chapter 10:
* how to calculate the unknown length of a side of a right triangle

STUDENT LEARNING OBJECTIVES

Key Knowledge	Process/Skills/Procedures/Application of Key Knowledge
Students will know: ***Chapter 7:*** monomial, constant, zero exponent, negative exponent, rational exponent, cube route, nth root, exponential equation, scientific notation, exponential function, exponential growth, exponential decay, compound interest, geometric sequence, common ratio, recursive formula ***Chapter 10:*** radicand, radical function, conjugate, radical equations, hypotenuse, legs	***Students will be able to:*** * multiply monomials using the properties of exponents * simplify expressions using the multiplication properties of exponents * divide monomials using the properties of exponents * simplify expressions containing negative and zero exponents * evaluate and rewrite expressions involving rational exponents * solve equations involving expressions with rational exponents * express numbers in scientific notation * find products and quotients of numbers expressed in scientific notation * graph exponential functions * identify data that display exponential behavior * solve problems involving exponential growth * solve problems involving exponential decay * graph and analyze dilations of radical functions * graph and analyze reflections and translations of radical functions * simplify radical expressions by using the Product Property of Square Roots * simplify radical expressions by using the Quotient Property of Square Roots

	* add and subtract radical expressions * multiply radical expressions * solve problems by using the Pythagorean Theorem * determine whether a triangle is a right triangle
ASSESSMENT OF LEARNING	
Summative Assessment (Assessment at the end of the learning period)	Chapter Tests and Quizzes
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	Do Nows/Exit slips using digital platforms such as Edulastic.com, Kahoot.com, and Quizzizz.com to check understanding of a single lesson/concept Teacher observations of student work and learning
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge, understanding and proficiency)	Open-Ended Reflection Assignments Leveled worksheets/activities Project-based learning (extensions) Modified assessments as per IEPs
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	Math MAP Assessment given in the Fall, Winter, and Spring Math Cumulative midterm (winter) and final exam (spring)
RESOURCES	
Core instructional materials: Glencoe McGraw-Hill Algebra 1	
Supplemental materials: Explore Learning Gizmo Simulations “Looking For Pythagoras” Connected Mathematics 2 Unit CME Algebra Project resources Diversity - (TpT) practice worksheet with biographical passage connection	
Modifications for Learners	
See appendix	

Topic/Unit Title	Quadratic and Rational Relationships	Approximate Pacing	52 days

STANDARDS

NJSLS (Math)

A.SSE.A.1.a Interpret expressions that represent a quantity in terms of its context.
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. For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.
A.SSE.B.3.a. Factor a quadratic expression to reveal the zeros of the function it defines.
A.SSE.B.3.b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
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.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.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.4. Solve quadratic equations in one variable.
A.REI.B.4.b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
F.IF.C.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.IF.C.7.b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
F.IF.C.8.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.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

STANDARDS FOR MATHEMATICAL PRACTICES:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
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Interdisciplinary Connections:

1.4.8.A.7: Analyze the form, function, craftsmanship, and originality of representative works of dance, music, theatre, and visual art.

Project: Students will create a "patch" containing various linear and nonlinear patterns which will then be translated into equation form to allow others to recreate the image.

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. *Students utilize tech platforms daily for Do Now activities and formative assessments.* **8.2.8.ED.7:** Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).	**9.2.8.CAP.19: Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level.** **Discussion:** Consider some possible career paths that students are interested in that utilize math. Discuss education requirements, average salary, etc. **Discussion:** Consider some possible career paths that students are interested in that utilize math. Discuss education requirements, average salary, etc.

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

Essential Questions:

Chapter 8:
How do we simplify expressions and solve equations involving polynomials (monomials, binomials, and trinomials)?
How do you factor polynomials?
When could a nonlinear function be used to model a real-world situation?

Chapter 9:
How do you graph quadratic functions?
What is the quadratic formula?
How do you identify if a function is linear, quadratic, or exponential?

Chapter 11:
How do you identify, use, and graph inverse variations?
How do you simplify rational expressions?
How do you use rational equations to solve problems?
How can simplifying mathematical expressions be useful?

Students will understand:
Chapter 8:
* how to distinguish between the square of a sum, the square of a difference, and the product of a sum and a difference
* how to determine the appropriate factoring method to be used

Chapter 9:
* how to identify the graph of a quadratic function
* the general differences between linear, exponential, and quadratic functions
* how to determine the number of solutions a quadratic equation has using its graph

Chapter 11:
* the difference between and distinguishing characteristics of direct and inverse variations

STUDENT LEARNING OBJECTIVES	
Key Knowledge	**Process/Skills/Procedures/Application of Key Knowledge**
Students will know: ***Chapter 8:*** polynomial, binomial, trinomial, degree of a monomial, degree of a polynomial, standard form of a polynomial, leading coefficient, FOIL method, quadratic expression, factoring, factoring by grouping, Zero Product Property, quadratic equation, prime	***Students will be able to:*** * write polynomials in standard form * add and subtract polynomials * multiply a polynomial by a monomial

polynomial, difference of two squares, perfect square trinomial, Square Root Property ***Chapter 9:*** quadratic function, parabola, axis of symmetry, vertex, minimum, maximum, double root, transformation, completing the square, Quadratic Formula, discriminant, step function, absolute value function ***Chapter 11:*** inverse variation, product rule, excluded value, rational function, asymptote, rational expression, least common multiple, least common denominator, complex fraction, mixed expression, rational equation, extraneous solutions	* solve equations involving the products of monomials and polynomials * multiply binomials by using the FOIL method * multiply polynomials by using the Distributive Property * find squares of sums and differences * find the product of a sum and a difference * use the Distributive Property to factor polynomials * solve quadratic equations of the form $ax^2 + bx = 0$ * factor trinomials of the form $x^2 + bx + c$ * solve equations of the form $x^2 + bx + c = 0$ * factor trinomials of the form $ax^2 + bx + c$ * solve equations of the form $ax^2 + bx + c = 0$ * factor binomials that are the difference of squares * use the difference of squares to solve equations * factor perfect square trinomials * solve equations involving perfect squares * analyze the characteristics of the graphs of quadratic functions * graph quadratic functions * solve quadratic equations by graphing * estimate solutions of quadratic equations by graphing * apply translations of quadratic functions * apply dilations and reflections to quadratic functions * complete the square to write perfect square trinomials * solve quadratic equations by completing the square * solve quadratic equations by using the Quadratic Formula * use the discriminant to determine the number of solutions to a quadratic equations * identify linear, quadratic, and exponential functions from given data * write equations that model data * identify and graph step functions * identify and graph absolute value and piecewise-defined functions * identify and use inverse variations * graph inverse variations
ASSESSMENT OF LEARNING	

Summative Assessment (Assessment at the end of the learning period)	Chapter Tests and Quizzes
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	Do Nows/Exit slips using digital platforms such as Edulastic.com, Kahoot.com, and Quizzizz.com to check understanding of a single lesson/concept Teacher observations of student work and learning
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge, understanding and proficiency)	Open-Ended Reflection Assignments Leveled worksheets/activities Project-based learning (extensions) Modified assessments as per IEPs
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	Math MAP Assessment given in the Fall, Winter, and Spring Math Cumulative midterm (winter) and final exam (spring)
RESOURCES	
Core instructional materials: Glencoe McGraw-Hill Algebra 1	
Supplemental materials: Explore Learning Gizmo Simulations CME Algebra Project resources Diversity - (TpT) practice worksheet with biographical passage connection	
Modifications for Learners	
See appendix	