Algebra Grade 8

Unit 1 Foundations of Algebra

Content Area: Mathematics

Course & Grade Level: Algebra, Grade 8

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.

Recommended Pacing

8 days

New Jersey Student Learning Standards for Mathematics

Standard 4.8.NS The Number System

CPI #	Cumulative Progress Indicator (CPI)
1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

Standard 4.A-SSE Seeing Structure in Expressions

CPI #	Cumulative Progress Indicator (CPI)
1	Interpret expressions that represent a quantity in terms of its context.
2	Use the structure of an expression to identify ways to rewrite it.
3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

New Jersey Student Learning Standards for English Language Arts Companion Standards

Standard: Science Key Ideas and Details

CPI #	Cumulative Progress Indicator (CPI)
RST.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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	
Career Ready Practices	
CPI #	**Cumulative Progress Indicator (CPI)**
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.
New Jersey Student Learning Standards for Technology	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Instructional Focus

Unit Enduring Understandings

- Equivalent expressions can be represented in a variety of forms
- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole
- Many real world problems can be solved through the use of algebraic representation and reasoning

Unit Essential Questions

- What are the different ways that numbers can be represented and classified?
- How can numerical operations and properties be extended to algebraic expressions?
- What makes an algebraic algorithm both effective and efficient?
- How can I represent real life situations algebraically?

Objectives

Students will know:

- The order of operations
- The concept of solution space as it applies to equations and inequalities
- The different classifications of real numbers and how they relate to one another
- the definition of like terms

Students will be able to:

- Translate words into algebraic expressions, equations, and inequalities
- Determine if a given value is a solution to an equation or inequality
- Use the order of operations to evaluate both numerical and algebraic expressions including rational numbers and exponents
- Use algebraic properties to simplify expressions
- Compare and order real numbers on a number line
- Simplify expressions by combining like terms

Evidence of Learning			
Assessment			
Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of MAP and NJSLA data.			
Competencies for 21st Century Learners			
	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner
Resources			
Core Text: Holt McDougal Algebra I **Suggested Resources:**			

Unit 2: Solving One Variable and Absolute Value Equations and Inequalities	
Content Area: Mathematics	
Course & Grade Level: Algebra, Grade 8	
Summary and Rationale	
This unit involves the study of single variable equations and inequalities. Modeling inequalities, absolute value equations and inequalities using words, tables, number lines, and symbols will enable students to apply their algebraic thinking to real world contexts.	
Recommended Pacing	
21 days	
New Jersey Student Learning Standards for Mathematics	
Standard 4.A-CED Creating Equations	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Create equations and inequalities in one variable and use them to solve problems.
Standard 4.A-REI Reasoning with Equations and Inequalities	
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.
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.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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	
Career Ready Practices	
CPI #	**Cumulative Progress Indicator (CPI)**
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.

Standard: Strand A: Income and Careers Number Standard Statement	
CPI #	**Cumulative Progress Indicator (CPI)**
9.1.8.A.1	Explain the meaning and purposes of taxes and tax deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay.
New Jersey Student Learning Standards for Technology	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Instructional Focus

Unit Enduring Understandings

- Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns
- 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 equations and inequalities so solutions can be found to solve problems
- Proportionality involves a relationship in which the ratio of two quantities remains constant as the corresponding values of the quantities change

Unit Essential Questions

- How can patterns and equations be used as tools to best describe and help explain real-life situations?
- What makes an algebraic algorithm both effective and efficient?
- How can arithmetic operations be extended to solve algebraic equations and inequalities?
- When is it appropriate to use proportions to model relationships in the real world?

Objectives

Students will know:

- Procedures for simplifying, solving and graphing one, two and multi-step single variable equations and inequalities
- Procedures for simplifying, solving and graphing single variable inequalities
- Single variable equations and inequalities may have infinitely many (identity), no real number solutions (empty set) or a unique solution

Students will be able to:

- Simplify, solve and graph one, two and multi-step single variable equations and inequalities, with rational coefficients and solutions
- Simplify, solve and graph single variable inequalities
- Graph the solution set to a single variable inequality on a number line, including infinitely many solutions (identity), no real number solution (empty set) and a unique solution
- Solve single variable equations and inequalities with variables on both sides

- Transform literal equations
- Model and solve real life problems using rates, ratios, proportions and percents

Evidence of Learning

Assessment

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

Competencies for 21st Century Learners

	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner

Resources

Core Text: Holt McDougal Algebra I
Suggested Resources:

Unit 3: Functions and Linear Equations

Content Area: Mathematics

Course & Grade Level: Algebra, Grade 8

Summary and Rationale

This unit involves solving and graphing the solution sets of linear equations and inequalities. Words, tables, graphs, and symbols are used to represent, analyze and model linear functions. In contextual problems graphing and interpretation of results in terms of the context will be explored.

Recommended Pacing

26 days

New Jersey Student Learning Standards for Mathematics

Standard 4.A-CED Creating Equations

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.
3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.

Standard 4.A-REI Reasoning with Equations and Inequalities

CPI #	Cumulative Progress Indicator (CPI)
3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Standard 4.F-IF Interpreting Functions

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.
2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
5	Relate the domain of a function to its graph and where applicable, to the quantitative relationship it describes.
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.

New Jersey Student Learning Standards for English Language Arts Companion Standards

Standard: Science Key Ideas and Details

CPI #	Cumulative Progress Indicator (CPI)
RST.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

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

Career Ready Practices

CPI #	Cumulative Progress Indicator (CPI)
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.

New Jersey Student Learning Standards for Technology

CPI #	Cumulative Progress Indicator (CPI)
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Instructional Focus

Unit Enduring Understandings

- Functions are a special type of relationship or rule that uniquely associates members of one set with members of another set
- Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns of change
- The value of a particular representation depends on its purpose
- 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
- Linear and absolute value graphs and equations can be used to model and describe physical relationships

Unit Essential Questions

- How can change be best represented mathematically?
- How can we use mathematical language to describe linear change?
- How can we use mathematical models to describe change or change over time?
- How are patterns of change related to the behavior of functions?
- How are functions and their graphs related?

Objectives

Students will know:

- Terminology and notation for functions
- Slope as a rate of change
- The procedures for writing the equation of line in slope-intercept, standard and point slope form

Students will be able to:

- Graph and analyze the graph of the solution set of a two variable equation and inequality
- Recognize, express and solve problems that can be modeled using two variable linear functions, equations and inequalities. Interpret solutions in terms of the context of the problem

- Describe, analyze and use key characteristics of linear functions and their graphs (such as determine slope, x and y intercepts, independent and dependent variables)
- Recognize, describe and represent linear relationships using words, tables, numerical patterns, graphs and equations
- Write and transform linear equations between slope-intercept, standard and point slope form
- Write the equation of a line using varying criteria
- Determine if a relation is a function

Evidence of Learning

Assessment

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

Competencies for 21st Century Learners

	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner

Resources

Core Text: Holt McDougal Algebra I
Suggested Resources:

Unit 4 Data Analysis and Probability

Content Area: Mathematics

Course & Grade Level: Algebra, Grade 8

Summary and Rationale

This unit provides the language and techniques for analyzing situations involving interpreting data, chance and uncertainty. Students will have the opportunity to make predictions based on experimental probabilities and their analysis of data. A firm grasp of data analysis and probability is a critical component of making decisions and justifying these decisions in the real world.

Recommended Pacing

14 days

New Jersey Student Learning Standards for Mathematics

Standard 4.S-ID Interpreting Categorical and Quantitative Data	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range) of two or more different data sets.
3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
Standard 4.S-IC Making Inferences and Justifying Conclusions	
CPI #	**Cumulative Progress Indicator (CPI)**
1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
2	Decide if a specified model is consistent with results from a given data-generating process, e.g. using simulation.
Standard 4.S-CP Conditional Probability and the Rules of Probability	
1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
2	Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
9	Use permutations and combinations to compute probabilities of compound events and solve problems.

New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard: Science Key Ideas and Details	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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	
Career Ready Practices	
CPI #	**Cumulative Progress Indicator (CPI)**
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.
New Jersey Student Learning Standards for Technology	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
New Jersey Student Learning Standards for Science	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-ESS2-3	Analyze and interpret data on the distribution of fossils, rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
Instructional Focus	
Unit Enduring Understandings	
• Students can judge the validity of the representation of data • The message conveyed by the data depends on the display • The results of a statistical investigation can be used to support or refute an argument • Probability is about prediction over the long term rather than predictions of individual events	
Unit Essential Questions	
• How do I know that the data I am looking at is fair and accurate? • How can the representation of data influence decisions? • How is probability related to real world events? • How can experimental and theoretical probabilities be used to make predictions or draw conclusions?	

Objectives

Students will know:

- The difference between experimental and theoretical probability
- The difference between dependent and independent and inclusive and excusive events

Students will be able to:

- Find measures of central tendency
- Interpret measures of central tendency to best represent the data
- Organize and interpret data in displays such as matrices, frequency tables, histograms, stem and leaf plots, box and whisker plots, bar graphs, circle graphs, pictographs, and line graphs
- Implement different methods of counting outcomes
- Find the probability of compound events
- Make and justify decisions based on data

Evidence of Learning

Assessment

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

Competencies for 21st Century Learners

	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner

Resources

Core Text: Holt McDougal Algebra I
Suggested Resources:

Unit 5: Solving Systems of Linear Equations and Inequalities

Content Area: Mathematics

Course & Grade Level: Algebra, Grade 8

Summary and Rationale

This unit involves the study of systems of linear equations and inequalities. 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.

Recommended Pacing

13 days

New Jersey Student Learning Standards for Mathematics

Standard 4.A-REI Reasoning with Equations and Inequalities

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.
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).
12	Graph the solutions of a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables, as the intersection of the corresponding half-planes.

New Jersey Student Learning Standards for English Language Arts Companion Standards

Standard: Science Key Ideas and Details

CPI #	Cumulative Progress Indicator (CPI)
RST.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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

Career Ready Practices

CPI #	Cumulative Progress Indicator (CPI)
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason

CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.

New Jersey Student Learning Standards for Technology

CPI #	Cumulative Progress Indicator (CPI)
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Instructional Focus

Unit Enduring Understandings

- A system of equations or inequalities can be used to model and solve world situations
- The value of the graphical representation of the solution to a system of linear equations or inequalities depends on the real world situation the system models

Unit Essential Questions

- How can you solve systems of equations or inequalities?
- How can systems of equations and inequalities be used to solve real life situations?

Objectives

Students will know:

- Procedures for solving systems of linear equations and inequalities.

Students will be able to:

- Solve systems of equations and inequalities using algebraic and graphic procedures
- 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. Solve and interpret the system in terms of the context of the problem
- Analyze a system of linear equations or inequalities and determine the most appropriate method of solution

Evidence of Learning

Assessment

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

Competencies for 21st Century Learners

	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner

Resources

Core Text: Holt McDougal Algebra I
Suggested Resources:

Unit 6: Exponents, Polynomials and Factoring

Content Area: Mathematics

Course & Grade Level: Algebra, Grade 8

Summary and Rationale

This unit involves knowledge and skills relative to polynomials, the basic building blocks of algebraic expressions. Using previous knowledge of the properties of numbers students will be able to transform polynomial expressions into equivalent forms. The concepts covered in this unit are foundational in finding solutions to quadratic equations and functions.

Recommended Pacing

20 days

New Jersey Student Learning Standards for Mathematics

Standard 4.A-SSE Seeing Structure in Expressions

CPI #	Cumulative Progress Indicator (CPI)
2	Use the structure of an expression to identify ways to rewrite it.

Standard 4.A-APR Arithmetic with Polynomials and Rational Expressions

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.
2	Know and apply the Remainder Theorem. For a polynomial p(x) and a number a, the remained on division by x – a is p(a), so p(a) =0 if and only if (x-a) is a factor of p(x).

New Jersey Student Learning Standards for English Language Arts Companion Standards

Standard: Science Key Ideas and Details

CPI #	Cumulative Progress Indicator (CPI)
RST.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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

Career Ready Practices

CPI #	Cumulative Progress Indicator (CPI)
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason

CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.

New Jersey Student Learning Standards for Technology

CPI #	Cumulative Progress Indicator (CPI)
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Instructional Focus

Unit Enduring Understandings

- Rules of algebra can be used together with equivalents to transform expressions
- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole

Unit Essential Questions

- How do the operations of addition, subtraction and multiplication apply to polynomial expressions?
- What makes an algebraic algorithm both effective and efficient?

Objectives

Students will know:

- Procedures for adding, subtracting, multiplying and factoring polynomial expressions
- The correct terminology for identifying polynomial expressions by degree and number of terms

Students will be able to:

- Add, subtract and multiply polynomial expressions
- Completely factor polynomial expressions using the appropriate method
- Identify polynomial expressions by degree and number of terms
- Simplify expressions with exponents
- Use scientific notation to solve problems involving very large and very small numbers

Evidence of Learning

Assessment

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

Competencies for 21st Century Learners

	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner

Resources

Core Text: Holt McDougal Algebra I
Suggested Resources:

Unit 7 Radical Expressions

Content Area: Mathematics

Course & Grade Level: Algebra, Grade 8

Summary and Rationale

This unit of study provides the language and techniques for representing, analyzing, and interpreting expressions and equations involving exponents and radicals. 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.

Recommended Pacing

9 days

New Jersey Student Learning Standards for Mathematics

Standard 4.A-SSE Seeing Structure in Expressions

CPI #	Cumulative Progress Indicator (CPI)
3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. c. Use the properties of exponents to transform expressions for exponential functions.

Standard 4.F-IF Interpreting Functions

CPI #	Cumulative Progress Indicator (CPI)
8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions.

New Jersey Student Learning Standards for English Language Arts Companion Standards

Standard: Science Key Ideas and Details

CPI #	Cumulative Progress Indicator (CPI)
RST.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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

Career Ready Practices

CPI #	Cumulative Progress Indicator (CPI)
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason

CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.

New Jersey Student Learning Standards for Technology

CPI #	Cumulative Progress Indicator (CPI)
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Instructional Focus

Unit Enduring Understandings

- Equivalent expressions can be represented in a variety of forms
- Mathematical models can be used to describe non-linear physical relationships
- We can use radicals to model and solve real-life geometric problems

Unit Essential Questions

- How do you know when an expression is simplified?
- How can we model situations using exponents and radicals?
- How are the Pythagorean Theorem and distance formula applied in solving geometric problems?

Objectives

Students will know:

- The Pythagorean theorem, midpoint formula and distance formula

Students will be able to:

- Add, subtract, multiply and divide numbers in radical form.
- Use the Pythagorean theorem, midpoint formula and distance formula to solve problems

Evidence of Learning

Assessment

Common Assessment 8.1

Competencies for 21st Century Learners

	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner

Resources

Core Text: Holt McDougal Algebra I
Suggested Resources:

Unit 8 Quadratic Equations and Functions

Content Area: Mathematics

Course & Grade Level: Algebra, Grade 8

Summary and Rationale

This unit will be an extension of skills that will model real world situations with quadratic functions and equations. In addition to the algebraic methods for solving quadratic equations, the unit will explore graphical representations of quadratic equations and analyze and extrapolate pertinent information from these graphs.

Recommended Pacing

12 days

New Jersey Student Learning Standards for Mathematics

Standard 4.A-SSE Seeing Structure in Expressions

CPI #	Cumulative Progress Indicator (CPI)
4	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. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Standard 4.A-REI Reasoning with Equations and Inequalities

CPI #	Cumulative Progress Indicator (CPI)
4	Solve quadratic equations in one variable. a. Use the method of completing square to transform any quadratic equation in x into an equation of the form (x-p) squared = q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection, 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 3 bi for real numbers a and b.

New Jersey Student Learning Standards for English Language Arts Companion Standards

Standard: Science Key Ideas and Details

CPI #	Cumulative Progress Indicator (CPI)
RST.6-8.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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	
Career Ready Practices	
CPI #	**Cumulative Progress Indicator (CPI)**
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.
New Jersey Student Learning Standards for Technology	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Instructional Focus	
Unit Enduring Understandings	
• Real world situations involving quadratic relationships can be modeled and solved using multiple representations • Quadratic equations and functions can be solved using a variety of methods	
Unit Essential Questions	
• How can we use mathematical language to describe non-linear change? • What are the characteristics of a quadratic function? • How can you solve a quadratic equation?	
Objectives	
Students will know: • Procedures for solving quadratic equations and functions • A parabola is the graphical representation of a quadratic function **Students will be able to:** • Solve quadratic equations and functions using the appropriate method • Interpret the solution in context of the original problem • Sketch a graph of a quadratic function given the equation • Analyze the graph of a quadratic equation and determine the key characteristics • Recognize and solve problems that can be modeled using a quadratic function • Predict the number of real number solutions to a quadratic equation or function	

Evidence of Learning			
Assessment			
Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of MAP and NJSLA data.			
Competencies for 21st Century Learners			
	Collaborative Team Member		Effective Communicator
	Globally Aware, Active, & Responsible Student/Citizen		Information Literate Researcher
	Innovative & Practical Problem Solver		Self-Directed Learner
Resources			
Core Text: Holt McDougal Algebra I **Suggested Resources:**			