MIDLAND PARK PUBLIC SCHOOLS
Midland Park, New Jersey
CURRICULUM

Algebra I

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July 11, 2017

Grade 9 Algebra I Curriculum Overview

Algebra I is taught in eight units throughout the school year. The Algebra I curriculum is a rigorous, open-ended and sequential process of connecting previously learned algebraic topics and expanding them to include polynomial expressions, quadratic equations and exponential functions. As part of the spiraling curriculum, aspects of Pre-Algebra and elementary Geometry are taught throughout the year. A guided inquiry program gives students the opportunity to explore topics and concepts through mathematical investigations. Participating in this rigorous program helps students:

      1. To foster a lifelong enjoyment of learning mathematics.
      2. To observe mathematics in the world around them.
      3. To meet the mathematics standards for New Jersey Public Schools.

Suggested Course Sequence*:

Unit 1: Number Properties and Operations in Algebra: 10 days
Unit 2: Equations and Inequalities: 32 days
Unit 3: Graphing Linear Equations and Functions: 26 days
Unit 4: Writing Linear Equations: 14 days
Unit 5: Systems of Equations and Inequalities: 22 days
Unit 6: Exponents and exponential Functions: 18 days
Unit 7: Polynomials and Factoring: 24 days
Unit 8: Quadratic Equations and Functions: 16 days

Prerequisite: Pre-Algebra

*The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.

Content Area: Algebra I

Unit Title: Unit #1- Number Properties and Operations in Algebra

Grade Level: 9

Unit Summary: In this unit, students will learn the subsets of the real number system and will be able to categorize numbers into designated subcategories. Students will also simplify and evaluate algebraic expressions. They will identify patterns and apply order of operations to solve real-world problems.

Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.
   CRP1. Act as a responsible and contributing citizen and employee.
   CRP2. Apply appropriate academic and technical skills.
   CRP4. Communicate clearly and effectively.
   CRP6. Demonstrate creativity and innovation.
   CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
   CRP9. Model integrity, ethical leadership and effective management.
   CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.N-RN.B.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.
NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.A-SSE.A.1.b	Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*
NJSLS.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* $(x^2 - y^2)(x^2 + y^2)$.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions.

Unit Essential Question(s):	Unit Enduring Understandings:
- What are the different sets of numbers that make up the number system? - What are the rules of algebra and how are they used? - How are pattern identified and used in real life?	- There are different sets of numbers: natural, whole, integers, rational, irrational, and real. - The number line represents the entire set of real numbers. - When opposites are added, the sum is always zero. - The sum of zero and a number is always that number. - To subtract a number, add its opposite. - The product and quotient of two numbers with the same sign is positive.

	• The quotient and product of two numbers with opposite signs is negative.
	• There is a specific order for performing arithmetic operations.
	• All real numbers can be used in certain patterns, called properties: commutative, associative, and distributive.
	• To evaluate a variable expression, replace the variable with a number.

Unit Learning Targets/Objectives:

Students will...

- Be able to identify and classify numbers in the real number system according to sets.
- Be able to order the numbers on a number line.
- Be able to add, subtract, multiply, and divide real numbers.
- Be able to identify and apply the properties of algebra to simplify expressions.
- Be able to write an algebraic expression when given the verbal phrase.
- Be able evaluate expressions by using direct substitution.
- Be able to use a picture, diagram, or model to represent a pattern.
- Be able to apply order of operations and properties of algebra to solve real world problems.

Formative Assessments:

- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):

- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):

Larson Algebra I Teacher Resources

www.njctl.org/courses/math/algebra/

Modifications:

- **Special Education Students**
  - Allow errors
  - Rephrase questions, directions, and explanations
  - Allow extended time to answer questions, and permit drawing, as an explanation
  - Accept participation at any level, even one word
  - Consult with Case Managers and follow IEP accommodations/modifications
- **English Language Learners**
  - Assign a buddy, same language or English speaking
  - Allow errors in speaking

- **At-Risk Students**
  - Provide extended time to complete tasks
  - Consult with Guidance Counselors and follow I&RS procedures/action plans
  - Consult with classroom teacher(s) for specific behavior interventions
  - Provide rewards as necessary
- **Gifted and Talented Students**
  - Provide extension activities
  - Build on students' intrinsic motivations
  - Consult with parents to accommodate students' interests in completing tasks at their level of engagement

- o Rephrase questions, directions, and explanations
- o Allow extended time to answer questions
- o Accept participation at any level, even one word

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
The Real Number System	Students will be able to define, classify, and use whole numbers, natural numbers, integers, rational numbers, irrational numbers, and real numbers.	2 days
Order of Operations	Students will be able to apply order of operations to simplify arithmetic expressions and to solve real-world problems.	2 days
Properties of Algebra	Students will be able to apply the properties of algebra to simplify expressions.	4 days
Algebraic Expressions	Student will be able to evaluate algebraic expressions by using direct substitution and will write algebraic expressions.	2 days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Algebra I

Unit Title: Unit #2- Equations and Inequalities

Grade Level: 9

Unit Summary: In this unit, students will learn the differences and similarities between an expression, an equation, an inequality, and absolute value equations and inequalities. They will be able to solve linear equations and inequalities in one variable by applying inverse operations. They will be able to represent the solution set of a linear equation or an inequality in one variable both algebraically and graphically on a number line. They will learn that the similarities and differences between equations and inequalities are reflected in the use of different symbols, procedures for determining the solution(s), and the type/number of solution(s). They will learn the properties of the absolutes value functions and the uniqueness of its solution set within equations and inequalities. Students will also be able to use linear equations and inequalities in one variable to solve real-life problems.

Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

CRP1. Act as a responsible and contributing citizen and employee.
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CRP4. Communicate clearly and effectively.
CRP6. Demonstrate creativity and innovation.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.A-SSE.A.1.b	Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.*
NJSLS.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 $(x^2 - y^2)(x^2 + y^2)$.*
NJSLS.A-CED.1	Create equations and inequalities in one variable and use them to solve problem. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
NJSLS.A-CED.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.*
NJSLS.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.*
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions.

Unit Essential Question(s):	Unit Enduring Understandings:
• What are the relationships between expression and equations? • What are equations and inequalities? How are they solved? How can their solutions be represented? • How are variables, expressions, equations, inequalities and their solutions used to represent real world phenomena?	• Like terms can be combined. • An equation is a statement that two numbers or expressions are equal. • Addition and subtraction are inverse operations. • Multiplication and division are inverse operations. • Variables, expressions, and equations are used to translate, the representation of real world situations from verbal to symbolic which often models the extension of a specific instance to a general formula. • Similarities and differences between equations and inequalities are reflected in the use of different symbols and procedures for determining the solution(s) and the type/number of solution(s). • The solutions of an equation are the values of the variable that make the equation true. • Equations and inequalities may have one solution, infinitely many solutions, or no solutions. • A solution set for an equation or an inequality can be represented symbolically, algebraically, and graphically.

Unit Learning Targets/Objectives:
Students will...
- Be able to identify the solution set when given a replacement set.
- Be able to solve one and two step equations by applying order of operations and inverse operations.
- Be able to write a mathematical equation and/or statement for a given verbal sentence.
- Be able to solve multi-step equations with rational coefficients, including equations with variables on both sides.
- Be able to determine whether the solution set of an equation is an identity, the null set, or a unique solution.
- Be able to solve literal equations or formulas for given variables, including complex formulas (e.g. $A = \pi r^2$ where students need to solve for r).
- Be able to use formulas and equations to solve real life problems.
- Be able to write inequalities to describe a given situation or write inequalities given a graph.
- Be able to solve one variable multi-step inequalities and graph the solution set on a number line.
- Be able to explain the difference between disjunctions and conjunctions.

Formative Assessments:
- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):
- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
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Modifications:

- Special Education Students
  - Allow errors
  - Rephrase questions, directions, and explanations
  - Allow extended time to answer questions, and permit drawing, as an explanation
  - Accept participation at any level, even one word
  - Consult with Case Managers and follow IEP accommodations/modifications
- English Language Learners
  - Assign a buddy, same language or English speaking
  - Allow errors in speaking
  - Rephrase questions, directions, and explanations
  - Allow extended time to answer questions
  - Accept participation at any level, even one word

- At-Risk Students
  - Provide extended time to complete tasks
  - Consult with Guidance Counselors and follow I&RS procedures/action plans
  - Consult with classroom teacher(s) for specific behavior interventions
  - Provide rewards as necessary
- Gifted and Talented Students
  - Provide extension activities
  - Build on students' intrinsic motivations
  - Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Solution Sets and Mathematical Statements	Students will be able to identify the solution set when given a replacement set and will be able to write the mathematical statements for given verbal phrases.	2 day
One and Two Step Equations	Students will be able to solve one and two step equations by applying order of operations and inverse operations.	3 days
Multi-Step Equations	Students will be able to solve multi-step equations with rational coefficients, including equations with variables on both sides.	5 days
Absolute Value Equations	Students will be able to solve multi-step absolute value equations and will graph the solution sets.	4 days
Solve Literal Equations	Students will be able to solve literal equations or formulas for given variables, including complex formulas (e.g. $A = \pi r^2$ where students need to solve for r).	2 day
Writing and Graphing Inequalities	Students will be able to write an inequality to describe a given situation and will write inequalities for given graphs.	3 days
Solving Multi-Step Inequalities	Students will be able to solve one variable multi-step inequalities and	5 days

	graph the solution set on a number line.	
Absolute Value Inequalities	Students will be able to solve multi-step inequalities and will graph the solution sets, paying particular attention to conjunction and disjunction solution sets.	5 days
Applications of Equations and Inequalities	Students will be able to use formulas, equations, and will apply inequalities to solve real life problems.	3 days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Algebra I

Unit Title: Unit #3-Graphing Linear Equations and Functions

Grade Level: 9

Unit Summary: The unit covers how to graph linear equations and different different forms the equations can be written in. Students will also learn how write the equation of a line with given qualities. The relationships between in vertical and horizontal lines, parallel lines, and perpendicular lines will be covered.

Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting

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        CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
        CRP9. Model integrity, ethical leadership and effective management.
        CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.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.*
NJSLS.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).
NJSLS.A-REI.D.12	Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
NJSLS.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.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions

Unit Essential Question(s):	Unit Enduring Understandings:
What is meant by the slope of a line, and how can knowing a line's slope help to graph a line and find parallel and perpendicular lines?	- Slope (rate of change) - How to graph a line. - Know the different forms the equation of a line can take - Intercepts of a line - Horizontal and vertical lines - Parallel lines and their slopes - Perpendicular lines and their slopes - How to write the equation of a line given characteristics of line.

Unit Learning Targets/Objectives:
Students will...
- Be able to graph a line given different forms of the equation.
- Be able to identify parallel and perpendicular lines from their slopes.
- Be able to describe how slope relates to horizontal and vertical lines.
- Be able to write the equation of a line given information about it.

Formative Assessments:
- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment (s):
- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
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www.njctl.org/courses/math/algebra/

Modifications:
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  - Allow errors
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  - Allow extended time to answer questions, and permit drawing, as an explanation
  - Accept participation at any level, even one word
  - Consult with Case Managers and follow IEP accommodations/modifications
- English Language Learners
  - Assign a buddy, same language or English speaking
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  - Allow extended time to answer questions
  - Accept participation at any level, even one word

- At-Risk Students
  - Provide extended time to complete tasks
  - Consult with Guidance Counselors and follow I&RS procedures/action plans
  - Consult with classroom teacher(s) for specific behavior interventions
  - Provide rewards as necessary
- Gifted and Talented Students
  - Provide extension activities
  - Build on students' intrinsic motivations
  - Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Plotting Points in a Coordinate Plane	To identify and plot points in a coordinate plane	1 day
Graphing Linear Equations	To graph linear equations in a coordinate plane	4 days

Graphing Using Intercepts	To graph a linear equation using intercepts	3 days
Finding Slope and Rate of Change	To find the slope of a line and interpret slope as a rate of change.	5 days
Graphing Using Slope-Intercept Form	To graph linear equations using slope-intercept form	3 days
Modeling Direct Variation	To write and graph direct variation equations	1 day
Graphing Linear Function	To use function notation	4 days
Graphing Linear Inequalities in Two Variables	To graph linear inequalities in two variables	5 days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Algebra I
Unit Title: Unit #4- Writing Linear Equations
Grade Level: 9

Unit Summary: This unit covers writing equations of lines in slope-intercept form, given three situations: the slope and y-intercept; the slope and a point; or two points. Writing and graphing equations using the slope and a point, using a graph of the line, or using real world data. Writing equations of lines in standard form, and using these equations to solve real-world problems. Writing and finding equations of lines parallel or perpendicular to a given line. Make scatter plots of data, and use lines of fit and the best-fitting line to model data and to make predictions

Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.
- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9. Model integrity, ethical leadership and effective management.
- CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.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 $n \geq 1$.*
NJSLS.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.*
NJSLS.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*
NJSLS.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.
NJSLS.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases, and using technology for more complicated cases.
NJSLS.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.*
NJSLS.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
NJSLS.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.*
NJSLS.F-BF.A.1	Write a function that describes a relationship between two quantities.
NJSLS.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

NJSLS.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions

Unit Essential Question(s):	Unit Enduring Understandings:
• How can equations of lines be used to solve real world problems? How can models of data be used to make predictions?	• Take a word problem, identify a variable, draw a diagram. Write an equation, solve the equation, and answer the problem. •

Unit Learning Targets/Objectives:
Students will...
• Be able to write equations of lines.
• Be able to write an equation of a line using point on the line.
• Be able to write linear equations in point-slope form.
• Be able to write equations in standard form
• Be able to write equations of parallel & perpendicular lines
• Be able to make scatter plots & write equations to model data
• Be able to make predictions using best-fitting lines

Formative Assessments:
• Quizzes
• Homework
• On spot checking for understanding activities
• Entry/Exit tickets

Summative/Benchmark Assessment(s):
• Tests
• Projects

Resources/Materials (copy hyperlinks for digital resources):
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Modifications:
• Special Education Students	• At-Risk Students
o Allow errors	o Provide extended time to complete tasks
o Rephrase questions, directions, and explanations	o Consult with Guidance Counselors and follow I&RS procedures/action plans
o Allow extended time to answer questions, and permit drawing, as an explanation	o Consult with classroom teacher(s) for specific behavior interventions
o Accept participation at any level, even one word	o Provide rewards as necessary

- o Consult with Case Managers and follow IEP accommodations/modifications
- English Language Learners
  - o Assign a buddy, same language or English speaking
  - o Allow errors in speaking
  - o Rephrase questions, directions, and explanations
  - o Allow extended time to answer questions
  - o Accept participation at any level, even one word

- Gifted and Talented Students
  - o Provide extension activities
  - o Build on students' intrinsic motivations
  - o Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Writing Linear Equations in Slope-Intercept Form	To write equations of lines	2 days
Using Linear Equations in Slope-Intercept Form	To write an equation of a line using points on the line	2 days
Writing Linear Equations in Point-Slope Form	To write linear equations in point-slope form	3 days
Writing Linear Equations in Standard Form	To write equations in standard form	3 days
Writing Equations of Parallel and Perpendicular Lines	To write equations of parallel and perpendicular lines	2 days
Fitting a Line to Data	To make scatter plots & write equations to model data.	1 day
Predicting with Linear Models	To make predictions using best-fitting lines	1 day

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Algebra I
Unit Title: Unit #5- Systems of Equations and Inequalities
Grade Level: 9

Unit Summary: This unit uses graphing, substitution, and elimination to solve systems of linear equations. In this unit students will also identify linear systems as having one solution, no solution, or infinitely many solutions. Solving systems of linear inequalities will also be covered.

Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting

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        CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
        CRP9. Model integrity, ethical leadership and effective management.
        CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.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.
NJSLS.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.*
NJSLS.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.
NJSLS.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.
NJSLS.A-REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of the equations $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/ or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
NJSLS.A-REI.D.12	Graph the solution to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
NJSLS.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions

Unit Essential Question(s):	Unit Enduring Understandings:
• How can real world situations be modeled by systems? • How can solutions be found to a system?	• The point at which lines intersect is the solution to the system with those lines. • That the overlap of the half planes of a system of inequalities is the solution set of the system.

Unit Learning Targets/Objectives:
Students will...
- Be able to graph systems of linear equations or inequalities to find a solution.
- Be able to translate real world problems into a system.
- Be able to solve a system of equations by using substitution and elimination.
- Be able to identify the number of solutions of a linear system.
- Be able to solve systems of linear inequalities

Formative Assessments:
- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):
- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
Larson Algebra I Teacher Resources
www.njctl.org/courses/math/algebra/

Modifications:
- Special Education Students
  - Allow errors
  - Rephrase questions, directions, and explanations
  - Allow extended time to answer questions, and permit drawing, as an explanation
  - Accept participation at any level, even one word
  - Consult with Case Managers and follow IEP accommodations/modifications
- English Language Learners
  - Assign a buddy, same language or English speaking
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- At-Risk Students
  - Provide extended time to complete tasks
  - Consult with Guidance Counselors and follow I&RS procedures/action plans
  - Consult with classroom teacher(s) for specific behavior interventions
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- Gifted and Talented Students
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  - Build on students' intrinsic motivations
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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Solving Linear Systems by Graphing	To graph and solve systems of linear equations	4 days
Solving Linear Systems by Substitution	To solve systems of linear equations by substitution	4 days
Solving Linear Systems by Adding or Subtracting	To solve linear systems using elimination	3 day
Solving Linear Systems by Multiplying First	To solve linear systems by multiplying first	4 days
Solving Special Types of Linear Systems	To identify the number of solutions of a linear system	2 days
Solving Systems of Linear Inequalities	To solve systems of linear inequalities in two variables	5 days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Algebra I
Unit Title: Unit #6- Exponents and Exponential Functions
Grade Level: 9

Unit Summary: The unit examines uses of properties of exponents involving products and quotients. Students will apply the product of powers property, the power of a power property, the power of a product property, the quotient of powers property, and the power of a quotient property. Students will also use zero and negative exponents, scientific notation, and will write and graph rules for exponential functions, including exponential growth and decay.

Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

> CRP1. Act as a responsible and contributing citizen and employee.
> CRP2. Apply appropriate academic and technical skills.
> CRP4. Communicate clearly and effectively.
> CRP6. Demonstrate creativity and innovation.
> CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
> CRP9. Model integrity, ethical leadership and effective management.
> CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.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.
NJSLS.A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.5^t *can be written as* $(1.5^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions

Unit Essential Question(s):	Unit Enduring Understandings:
- How can we apply properties of exponents to simplify expressions? - How can we write and graph exponential functions?	- Understand properties of exponents and product properties. - Understand the rules for exponents. - Understand what exponential growth and exponential decay is. - Understand the different between growth rate and a growth factor.

Unit Learning Targets/Objectives:
Students will...
- Be able to identify exponential relationships from a table, a graph, and an equation.
- Be able to calculate the growth rates and factors.
- Be able to identify exponential decay.

- Be able to simplify expressions using rules of exponents.
- Be able to apply the products and quotients of properties.
- Be able to write and graph rules for exponential functions.

Formative Assessments:
- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):
- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
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www.njctl.org/courses/math/algebra/

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- Gifted and Talented Students
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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Applying Exponents Properties Involving Products	To use properties of exponents involving products	4 days
Applying Exponent Properties	To use properties of exponents involving quotients	4 days

Involving Quotients		
Defining and Using Zero and Negative Exponents	To use zero and negative exponents	4 days
Writing and Graphing Exponential Growth Functions	To write and graph exponential growth models	3 days
Writing and Graphing Exponential Decay Functions	To write and graph exponential decay functions	3 days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Algebra I
Unit Title: Unit #7- Polynomials and Factoring
Grade Level: 9

Unit Summary: In this unit, students will explore the operations that can be done with polynomials. They will define, classify, add, subtract, and multiply polynomial expressions. Students will use the distributive property to find products and patterns, including the FOIL pattern, the square of a binomial pattern, and the sum and difference patterns. Students will use polynomials to describe and solve real world problems, as well as solve polynomial equations. They will factor polynomials in order to solve equations, to find zeros of functions, and to find the roots of equations.
 	
 Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting
 	
 21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.
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          CRP2. Apply appropriate academic and technical skills.
          CRP4. Communicate clearly and effectively.
          CRP6. Demonstrate creativity and innovation.
          CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
          CRP9. Model integrity, ethical leadership and effective management.
          CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.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 $(x^2 - y^2)(x^2 + y^2)$.*
NJSLS.A-SSE.B.3.a	Factor a quadratic expression to reveal the zeros of the function it defines.
NJSLS.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.
NJSLS.A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
NJSLS.A-APR.D.6	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x)+r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.
NJSLS.A-REI.B.4	Solve quadratic equations in one variable.
NJSLS.A-REI.B.4.b	Solve quadratic equations by inspection (e.g. $x^2 = 49$), 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.
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions.

Unit Essential Question(s):	Unit Enduring Understandings:
- What is a polynomial? - What operations and/or procedures can be used to simplify polynomial expressions? - How are polynomials applied to real-life situations? - How is mathematical language use to describe a nonlinear change?	- If the product of two factors is zero, one of the factors is zero. - To add or subtract polynomials, only like terms can be combined. - To multiply polynomials, each term of one polynomial is multiplied to each term of the second polynomial. - Factoring is another way or rewriting a polynomial. - Polynomials are constant, linear, and nonlinear expressions that have specific characteristics.

Unit Learning Targets/Objectives:
Students will...
- Be able to describe and identify monomials, polynomials, and degrees of polynomials.
- Be able to add, subtract, multiply, and divide polynomials.
- Be able to factor recognize and factor monomials out of a polynomial.
- Be able to factor quadratic equations when a=1 and when a>1.
- Be able to solve equations by factoring completely.
- Be able to solve real-life problems involving polynomial expressions and operations.

Formative Assessments:
- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):
- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
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- At-Risk Students
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- o Rephrase questions, directions, and explanations
- o Allow extended time to answer questions
- o Accept participation at any level, even one word

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Classifying Polynomials	Students will be able to define and use the terms polynomial, monomial, binomial, and trinomial to classify polynomials and will also find degrees of polynomial expressions and write expressions in standard form.	1 day
Add and Subtract Polynomials	Students will be able to add and subtract polynomial expressions by identifying and combining like terms.	2 days
Multiply Polynomials	Students will be able to multiply polynomial expressions by using the distributive property.	4 days
Special Products of Polynomials	Students will be able to identify and recognize special patterns within multiplication of polynomials, including difference of two squares and perfect square trinomials.	2 days
Factor Quadratic Equations	Students will be able to factor quadratic equations, recognizing the differences in the methods when the trinomial has a=1 and when a>1.	8 days
Factoring Special Products	Students will be able to identify and utilize special patterns when factoring polynomials, including difference of two squares and perfect square trinomials.	2 days
Factor Polynomials Completely	Students will be able to factor polynomials by taking out a greatest monomial factor first, and by factoring by grouping.	5 days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Algebra I	
Unit Title: Unit #8- Quadratic Equations and Functions	
Grade Level: 9	

Unit Summary: In this unit, students will compare and contrast quadratic equations and the parent function. They will be able to look at a graph of a quadratic functions and recognize the axis of symmetry, the vertex, and minimum/maximum values. Students will solve quadratic equations by factoring, graphing, using square roots, and using the quadratic formula. They will use the discriminant to determine the number and type of solutions of a quadratic equation. Students will be able to present linear, exponential, and quadratic expressions as models for different sets/types of data.

Interdisciplinary Connections: Sports, Architecture, Various topics in Science, Finance and Accounting

21st Century Themes and Skills: Creativity and Innovation, Communication and Collaboration, Critical Thinking & Problem Solving, Information, Media, and Technology Skills, Life and Career Skills.

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CRP9. Model integrity, ethical leadership and effective management.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS.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.
NJSLS.A.REI.B.4.b	Solve quadratic equations by inspections (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.
NJSLS.A.REI.D.11	Explain why x coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x)=g(x). Find the solutions approximately, eg. using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
NJSLS.FIF.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.*
NJSLS.FIF.C.7.a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
NJSLS.F.BF.B.3	Identify the effect on the graph by replacing f(x) by f(x)+k, kf(x), f(kx), and f(x+h) for specific values of k(both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
Tech Standard: 8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
Tech Standard: 8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.

Tech Standard: 8.2.12.C.4	Explain and identify interdependent systems and their functions.

Unit Essential Question(s):	Unit Enduring Understandings:
- How do we solve quadratic equations? - How do we solve systems with quadratic equations? - How can we compare linear, exponential, and quadratic models? - How do we model relationships?	- Know how to graph quadratic functions. - Compare quadratic functions to the parent graph. - Find the axis of symmetry, the vertex, and minimum and maximum values. - Solve quadratic equations by factoring, graphing, using square roots, and using the quadratic formula. - Determine number and type of solutions of a quadratic equation. - Determine whether a linear, exponential, or quadratic function best models a set of data.

Unit Learning Targets/Objectives:
Students will...
- Be able to graph quadratic functions.
- Be able to compare quadratic functions to the parent graph.
- Be able to find the axis of symmetry, the vertex, and maximum and minimum values.
- Be able to solve quadratic equations by factoring, graphing, using square roots, and using the quadratic formula.
- Be able to use the discriminant to determine number and type of solutions of a quadratic equation.
- Be able to determine whether a linear, exponential, or quadratic function best models a set of data.

Formative Assessments:
- Quizzes
- Homework
- On spot checking for understanding activities
- Entry/Exit tickets

Summative/Benchmark Assessment(s):
- Tests
- Projects

Resources/Materials (copy hyperlinks for digital resources):
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www.njctl.org/courses/math/algebra/

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    - Allow extended time to answer questions, and permit drawing, as an explanation
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    - Provide rewards as necessary
- Gifted and Talented Students
    - Provide extension activities
    - Build on students' intrinsic motivations

- o Allow errors in speaking
- o Rephrase questions, directions, and explanations
- o Allow extended time to answer questions
- o Accept participation at any level, even one word

- o Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Graphing Quadratic Functions	Students will be able to graph quadratic functions by completing a table of points and will compare quadratic functions to the parent function.	3 days
Solving Quadratic Equations by Graphing	Students will be able to solve quadratic equations by graphing the parabola and identifying the zeros, or points that cross the x-axis.	2 days
Use Square Roots to Solve Quadratic Equations	Students will be able to solve quadratic equations by isolating the variable and taking the square root, being mindful that the solution has a positive and negative value.	3 days
The Quadratic Formula	Students will be able to recognize when a quadratic equation is not factorable, and will use the quadratic formula to find the solutions.	4 days
Solving Systems with Quadratic Equations	Students will be able to solve systems of equations involving quadratic equations by comparing the strategies to solving systems of linear equations.	2 days
Compare Linear, Exponential, and Quadratic Models	Students will be able to compare and contrast linear, exponential, and quadratic functions and will use the appropriate function to model real-world relationships.	2 days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit: