Fair Lawn

Public Schools

Fair Lawn, NJ

CCSS Prep Algebra

Adopted August

2015

Revised August 2015
Developed August 2012

The CCSS Prep Algebra course has been designed to coincide with the Algebra 1 CP curriculum and support students in Algebra 1 CP. The course is aligned with the Algebra 1 Common Core State Standards.

CCSS Prep Algebra

Fair Lawn School District

Committee Credits

Algebra 1 CP Team

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CCSS Algebra

I. Course Synopsis

In CCSS Algebra, instructional time should focus on supporting the Algebra 1 curriculum and the four critical areas: (1) Seeing Structure in Expressions; (2) Arithmetic with Polynomials and Rational Functions; (3) Creating Equations; and (4) Reasoning with Equations and Inequalities. Throughout the course, mathematical concepts will be taught with an emphasis on enduring understandings, essential questions, real-world application, technology, and cross-curricular interaction.

II. Philosophy & Rationale

The purpose of CCSS Algebra is to further enhance the students' knowledge and understanding of Algebraic skills in preparation for the Geometry course as well as lay the foundation for the Algebra 2 course to follow as outlined by the Common Core State Standards. Students will also prepare for the PARCC Assessment. Students will be given the opportunity to apply their critical thinking skills in conjunction with the algebraic skills to solve unfamiliar problems. Useful consumer and career topics are presented, helping students understand the uses of mathematics in their everyday life. Students will be introduced to new mathematical language and a variety of mathematical topics which will result in a greater appreciation for the method of problem solving.

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

CCSS.MATH.PRACTICE.MP1 - Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous

problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

CCSS.MATH.PRACTICE.MP2 - Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

CCSS.MATH.PRACTICE.MP3 - Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

CCSS.MATH.PRACTICE.MP4 - Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

CCSS.MATH.PRACTICE.MP5 - Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

CCSS.MATH.PRACTICE.MP6 - Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

CCSS.MATH.PRACTICE.MP7 - Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

CCSS.MATH.PRACTICE.MP8 - Look for and express regularity in repeated reasoning.
Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

III. Scope & Sequence

Unit 1: Solving Equations and Inequalities (3 Weeks):

- Pre-Algebra Skills Review
- Solving Inequalities
- Literal Equations
- Compound Inequalities
- Solving Absolute Value Equations and Inequalities
- Equations and Problem Solving

Unit 2: Functions (6 Weeks):

- Explore using calculator
  - Linear, Quadratic, Exponential, and Absolute Value Graphs
  - Informally discuss shape, minimum, maximum, values, zero values, and intercept values
- Explore without the use of a calculator
  - Linear, Quadratic, Exponential, and Absolute Value Graphs
  - Graph with the use of a table
  - Recognizing patterns
  - Approximate intercepts and non-integer output values
- Domain, Range, and Functions
  - Plot points to graph both linear and non-linear functions, include vertical line test
  - Utilizing graphs, determine domain and range including linear, quadratic, exponential, and absolute value functions
  - Given a function, make a table, create the graph, and determine the domain and range
- Function Rule
  - Evaluating
  - Given a graph, estimate a value
  - Given a table, write a function rule
  - Word problems using function notation
  - Explaining function notation in word problems
- Rate of Change
- Slope-Intercept Form
- Standard Form
- Point-Slope Form and Writing Linear Equations

Parallel and Perpendicular
Translations with Absolute Values and Quadratics

Unit 3: Systems of Equations and Exponents (5 Weeks):

Solve Systems By Graphing
Solving Systems Using Substitution
Solving Systems Using Elimination
Applications of Systems of Equations
Linear Inequalities
Systems of Linear Inequalities
Properties of Exponents
Exponential Growth/Decay
- Formula
- Word Problems
- Recognition of Graphs

Polynomials
- Classifying
- Adding and Subtracting
- Multiplying

Unit 4: Factoring and Quadratics (11 Weeks):

Factoring
Simplifying Radicals
Solving Quadratic Equations
Integrating Algebra Techniques into Solving Quadratics
Graphing Quadratic Equations
Quadratic Equations and Problem Solving

Unit 5: Geometry Introduction (3 Weeks):

The Pythagorean Theorem
Angle and Segment Addition Postulate
Complementary and Supplementary Angles
Vertical, Linear Pairs and Adjacent Angles

IV. Unit Descriptions

Unit 1: Solving Equations and Inequalities

Enduring Understanding

1. Operations can be used to solve equations, inequalities, and literal equations.
2. There can be different strategies to solve a problem, but some are more effective and efficient than others are.
3. Analyzes and represents linear functions and inequalities to solve problems.
4. Uses the language of mathematics to express ideas precisely through reasoning, representations, and communication.

Essential Question(s)

1. What are the differences and similarities between equations and inequalities?
2. How can graphing help us to understand the solution set that an inequality represents?
3. What are the differences between traditional equations and absolute value equations?
4. What is the difference between simplifying an expression and solving an equation?
5. How can word problems be used to model real world situations?
6. How can you use numbers and symbols to represent mathematical ideas?

Learning Objectives

Students will be able to:

1. Review basic skills from Pre-Algebra
2. Solve algebraic equations and inequalities
3. Solve literal equations
4. Solve compound inequalities
5. Solve absolute value equations and inequalities
6. Apply solving equations and inequalities to real world situations
7. Interpret and compare Box and Whisker plots

Common Core State Standards

- **A.CED.1:** Create equations and inequalities in one variable and use them to solve problems.
- **A.CED.4:** Rearrange formulas to highlight a quality of interest, using the same reasoning as in solving equations.
- **A.SSE.3:** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Use the properties of exponents to transform expressions for exponential functions.
- **A.REI.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.3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

- **F.IF.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 S.ID.7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
- **F.LE.1:** Distinguish between situations that can be modeled with linear functions and with exponential functions. Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- **N.RN.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.
- **N.Q.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
- **S.ID.1:** Represent data with plots on the real number line (dot plots, histograms, and box plots)

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Do Now activities
    b. Classwork
    c. Homework
    d. Use of white boards
    e. Unit Test (extended time when needed)
    f. Review Game
    g. Project
    h. Graphic Organizer
    i. Calculator Use
    j. Assistive Technology
    k. PARRC Practice
2. English Language Learners.
    a. Students may use a bilingual dictionary.
    b. Read written instructions.
    c. Students may be provided with note organizers / study guides to reinforce key topics.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
3. Special Education/504 Students.
    a. Students may be provided with note organizers / study guides to reinforce key topics.

b. Extended time on assessments when needed.
c. Preferred seating to be determined by student and teacher.
d. Provide modified assessments when necessary.
e. Student may complete assessments in alternate setting when requested.
f. Establish a non-verbal cue to redirect student when not on task.
g. Maintain strong teacher / parent communication.

4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

New Jersey Core Curriculum Standards – Technology and Career Awareness, Exploration, and Preparation

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Career Readiness Practices

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

Career & Technical Education Content Area: 21st Century Life and Careers Standards

- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.12.ED.1 - Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

Unit 2: Functions

Enduring Understanding

1. Real world situations can be represented symbolically and graphically.
2. Patterns and relationships can be represented numerically, graphically, symbolically, and verbally.
3. Investigates and analyzes linear, quadratic, exponential and absolute value functions.
4. Various graphical and algebraic methods can be used to solve different types of functions.

Essential Question(s)

1. How can functions be utilized to model situations in the real world?
2. What is the appropriate way to model a function – graph, table, function rule?
3. How do you determine if a function is linear, quadratic or exponential?
4. How do graphs of functions related to each other?

5. What does rate of change represent and how is it calculated?
6. What information is needed to determine an equation of a line?
7. How are linear functions used to model real-world situations?
8. Is the given relationship a function? Why or why not?
9. What units, scales and labels must be applied to accurately represent a linear function in the context of a problem situation?

Learning Objectives

Students will be able to:

1. Create linear, quadratic, exponential, and absolute value graphs with use of a calculator
2. Informally discuss shape, minimum, maximum, zero values, and intercept values with the use of a calculator
3. Graph linear, quadratic, exponential, and absolute value graphs with use of a table
4. Determine if a graph, linear and non-linear, is a function by using the vertical line test
5. Determine domain and range of a linear, quadratic, exponential and absolute value graph
6. Given a function, make a table, create the graph, and then determine the domain and range
7. Evaluate a function rule
8. Estimate a value given a graph
9. Solve word problems using function notation
10. Write rules for arithmetic sequences
11. Find rate of change of graphs, tables, and equations
12. Write equations in slope-intercept, point-slope and standard form
13. Write equations that are parallel or perpendicular to a given equation
14. Translate the graphs of absolute value and quadratic functions

Common Core State Standards

- **A.CED.2:** Create equations in two or more variable to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.REI.10:** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line.)
- **A.SSE.1:** Interpret expressions that represent a quantity in term of its context. Interpret parts of an expression, such as terms, factors, and coefficients. Interpret complicated expressions by viewing one or more of their parts as a single entity.
- **F.IF.1:** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph off is the graph of the equation y = f(x).
- **F.IF.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.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.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

- **N.Q.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.
- **S.ID.6abc:** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions to choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. Informally assess the fit of a function by plotting and analyzing residuals. Fit a linear function for a scatter plot that suggests a linear association.
- **S.ID.7:** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
- **S.ID.8:** Compute (using technology) and interpret the correlation coefficient of a linear fit.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Do Now activities
    b. Classwork
    c. Homework
    d. Use of white boards
    e. Unit Test (extended time when needed)
    f. Review Game
    g. Project
    h. Graphic Organizer
    i. Calculator Use
    j. Assistive Technology
    k. PARCC Practice
2. English Language Learners.
    a. Students may use a bilingual dictionary.
    b. Read written instructions.
    c. Students may be provided with note organizers / study guides to reinforce key topics.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
3. Special Education/504 Students.
    a. Students may be provided with note organizers / study guides to reinforce key topics.
    b. Extended time on assessments when needed.
    c. Preferred seating to be determined by student and teacher.

d. Provide modified assessments when necessary.
e. Student may complete assessments in alternate setting when requested.
f. Establish a non-verbal cue to redirect student when not on task.
g. Maintain strong teacher / parent communication.

4. Gifted and Talented Students.
   a. Provide enrichment activities to expand upon the curriculum.
   b. Use higher level questioning techniques in class and on assessments.

New Jersey Core Curriculum Standards – Technology and Career Awareness, Exploration, and Preparation

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Career Readiness Practices

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

Career & Technical Education Content Area: 21st Century Life and Careers Standards

- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.12.ED.1 - Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

Unit 3: Systems of Equations and Exponents

Enduring Understanding

1. There are situations that require two or more equations to be satisfied simultaneously.
2. There are several methods for solving systems of equations.
3. Solutions to systems can be interpreted algebraically, geometrically, and in terms of problem contexts.
4. The number of solutions to a system of equations or inequalities can vary from no solution to an infinite number of solutions.
5. Properties of exponents can be applied to simplify expressions so that they can be written with a single, positive exponent for each different base.
6. Exponential functions are characterized by a rate of change that is proportional to the value of the function. It is a property of exponential functions that whenever the input is increased by one unit, the output is multiplied by a constant factor. Exponential functions connect multiplication to addition through the equation.
7. Geometric Sequences can be written as exponential functions.
8. There is a relationship between the distributive property and polynomial operations.

Essential Question(s)

1. How can systems of equations represent real-life situations?
2. What does it mean to be a solution to a system?
3. How do you choose which method works best when solving a system?
4. How can exponential functions represent real-life situations?
5. How can you apply negative exponents, zero exponents and other properties in order to simplify expressions?
6. How does adding and subtracting polynomials relate to combining like terms?
7. How does the distributive property relate to multiplying polynomials?

Learning Objectives

Students will be able to:

1. Analyze special types of systems.
2. Solve a system of equations by graphing.
3. Solve a system of equations by substitution.
4. Solve a system of equations by elimination.
5. Determine which method is most efficient.
6. Write systems of linear equations.
7. Graph linear inequalities.
8. Solve systems of linear inequalities by graphing.
9. Model real word situations using systems of equations/inequalities.
10. Simplify expressions using properties exponents.
11. Evaluate exponential expressions.
12. Form geometric sequences.
13. Identify the common ratio and write a general rule for the specific geometric sequence.
14. Evaluate and graph exponential functions.
15. Model exponential growth and decay.
16. Classify a polynomial by degree and number of terms.
17. Add and subtract polynomials.
18. Multiply polynomials.

Common Core State Standards

- **A.APR.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.2:** Create equations in two or more variable to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **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.
- **A.REI.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.6:** Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variable.
- **A.REI.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 equation f(x)=g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
- **A.REI.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.
- **A.SSE.1:** Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.
- **A.SSE.3:** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Factor a quadratic expression to reveal the zeros of the function it defines. Complete the square in a quadratic expression to reveal the maximum or minimum. Use the properties of exponents to transform expressions for exponential functions.
- **N.Q.2:** Define appropriate quantities for the purpose of descriptive modeling.
- **N.RN.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.

<u>Suggested Activities/Modifications</u>

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Do Now activities
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    g. Project
    h. Graphic Organizer
    i. Calculator Use
    j. Assistive Technology
    k. PARCC Practice
2. English Language Learners.
    a. Students may use a bilingual dictionary.
    b. Read written instructions.
    c. Students may be provided with note organizers / study guides to reinforce key topics.

   d. Provide modified assessments when necessary.
   e. Student may complete assessments in alternate setting when requested.
3. Special Education/504 Students.
   a. Students may be provided with note organizers / study guides to reinforce key topics.
   b. Extended time on assessments when needed.
   c. Preferred seating to be determined by student and teacher.
   d. Provide modified assessments when necessary.
   e. Student may complete assessments in alternate setting when requested.
   f. Establish a non-verbal cue to redirect student when not on task.
   g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
   a. Provide enrichment activities to expand upon the curriculum.
   b. Use higher level questioning techniques in class and on assessments.

<u>New Jersey Core Curriculum Standards – Technology and Career Awareness, Exploration, and Preparation</u>

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

<u>Career Readiness Practices</u>

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

<u>Career & Technical Education Content Area: 21st Century Life and Careers Standards</u>

- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.12.ED.1 - Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

Unit 4: Factoring and Quadratics

<u>Enduring Understanding</u>

1. Factors are a subset of a product and with the distributive property allow options in solving quadratics.
2. Multiplying and factoring polynomials are related.
3. Factoring a quadratic equation reveals the zeros of the related graph.
4. Changing the way that a function is represented does not change the function, although different representations highlight different characteristics, and some may only show part of the function. Some representations of a function may be more useful than others, depending on the context.

5. Reasoning about the vertex form of a quadratic allows deducing that the quadratic has a maximum or minimum value and that if the zeros of the quadratic are real, they are symmetric about the *x*-coordinate of the maximum or minimum point.
6. For functions that map the real numbers, composing a function with "shifting" or "scaling" functions changes the formula and graph of the function in readily predictable ways.
7. The discriminant indicates the number and type of solution(s) for a quadratic equation.

Essential Question(s)

1. How do quadratic functions model real life situations?
2. How does factoring a polynomial relate to the distributive property?
3. What are the different methods of factoring and how do you determine which method to use?
4. What does it mean to solve a quadratic equation and how does it relate to the graph?
5. How can you determine the number and type of solutions for a quadratic equation?
6. How do the different methods of solving a quadratic equation relate to each other?
7. How do vertex and standard form relate?

Learning Objectives

Students will be able to:

1. Factor trinomials by guess and check.
2. Factor trinomials by grouping.
3. Factor difference of two squares and perfect-square trinomials.
4. Factor polynomials with four terms.
5. Graph quadratic functions in standard form.
6. Graph quadratic inequalities.
7. Solve quadratic equations by graphing.
8. Solve quadratic equations using square roots.
9. Solve quadratic equations by factoring.
10. Solve quadratic equations by completing the square.
11. Solve quadratic equations using the quadratic formula.
12. Choose an appropriate method to solve a quadratic equation.
13. Use the discriminate to identify the number and type of solutions for a quadratic equation.
14. Convert between standard form and vertex form of a quadratic equation.

Common Core State Standards

- **A.APR.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.REI.4ab:** Solve quadratic equations in one variable. 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.
- **A.REI.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 equation f(x)=g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
- **A.SSE.1:** Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.
- **A.SSE.3:** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Factor a quadratic expression to reveal the zeros of the function it defines. Complete the square in a quadratic expression to reveal the maximum or minimum. Use the properties of exponents to transform expressions for exponential functions.
- **F.IF.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.5:** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it 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.
- **F.IF.7a**: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases (a): Graph linear and quadratic functions and show intercepts, maxima, and minima.
- **F.IF.8a:** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (a.): Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
- **F.LE.1:** Distinguish between situations that can be modeled with linear functions and with exponential functions.

<u>Suggested Activities/Modifications</u>

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Do Now activities
    b. Classwork
    c. Homework

   d. Use of white boards
   e. Unit Test (extended time when needed)
   f. Review Game
   g. Project
   h. Graphic Organizer
   i. Calculator Use
   j. Assistive Technology
   k. PARCC Practice
2. English Language Learners.
   a. Students may use a bilingual dictionary.
   b. Read written instructions.
   c. Students may be provided with note organizers / study guides to reinforce key topics.
   d. Provide modified assessments when necessary.
   e. Student may complete assessments in alternate setting when requested.
3. Special Education/504 Students.
   a. Students may be provided with note organizers / study guides to reinforce key topics.
   b. Extended time on assessments when needed.
   c. Preferred seating to be determined by student and teacher.
   d. Provide modified assessments when necessary.
   e. Student may complete assessments in alternate setting when requested.
   f. Establish a non-verbal cue to redirect student when not on task.
   g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
   a. Provide enrichment activities to expand upon the curriculum.
   b. Use higher level questioning techniques in class and on assessments.

<u>New Jersey Core Curriculum Standards – Technology and Career Awareness, Exploration, and Preparation</u>

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

<u>Career Readiness Practices</u>

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

<u>Career & Technical Education Content Area: 21st Century Life and Careers Standards</u>

- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

- 9.3.12.ED.1 - Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

Unit 5: Geometry Introduction

Enduring Understanding

1. Understanding the relationship of sides in a right triangle.
2. Understanding properties and definitions of Angles.
3. Understanding the concept of extraneous when solving radical equations.
4. Geometry is a mathematical system built on accepted facts basic terms and definitions.
5. Special angle pairs can help identify geometric relationships.
6. Algebraic properties of equality are used in Geometry. They will help you solve problems.
7. When a line intersects two or more lines the angles formed at the intersection points create special angle pairs.

Essential Question(s)

1. How can you find the missing side of a right triangle?
2. What are the building blocks of geometry?
3. How can you describe the attributes of a segment or an angle?

Learning Objectives

Students will be able to:

1. Use the Pythagorean Theorem to solve word problems.
2. Use segment and angle addition to set up and solve equations.
3. Fill in all angle measures of a picture given basic information.
4. Use the properties of Complementary and Supplementary Angles.
5. Name Vertical, Linear Pairs and Adjacent Angles given a diagram.

Common Core State Standards

- **G.SRT.8** – Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- **G.C0.1** – Know the precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- **G.MG.1 –** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities

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c. Homework
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Career & Technical Education Content Area: 21st Century Life and Careers Standards

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- 9.3.12.ED.1 - Apply communication skills with students, parents and other groups to enhance learning and a commitment to learning.

V. Course Materials

Textbook: Algebra 1: Prentice-Hall 2004

PH Presentation Pro CD-ROM: Practice Masters, Reteaching Masters, Enrichment Masters

Supplemental materials: PH SuccessNet Teacher Online Access Pack, PH SuccessNet online textbook, Big Ideas Algebra 1

VI. Assessments

Assessments included but not limited to:

- Quizzes
- Tests
- Notebook assessments
- Do Now Exercises
- Homework
- Midterm exam and Final exam
- PARCC Practice
- PARCC Assessment

VII. Cross Curricular Aspects

1. Calculator Use (Science)
2. Projectile Motion Word Problems (Science)
3. Solving Literal Equations (Science)