Howell Township Public Schools

Proud of our schools. Concerned for our children.

Algebra Curriculum
Grades 7 & 8

Based on the Common Core State Standards

Board approved: October 16, 2013

Table of Contents

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Introduction

In 2010, the New Jersey Department of Education adopted the Common Core State Standards in Mathematics. The implementation for the Common Core State Standards spanned across three years concluding in grades sixth through eighth in 2013. All grade levels are now part of the Common Core Initiative.

The Common Core State Standards provide a consistent, clear understanding of what the students are expected to learn in both Mathematics and English Language Arts. The standards are equitable with high expectations for all learners that will prepare them for the future. Additionally, the Common Core State Standards or CCSS carefully connect the learning within and across grades so that students can build new understanding onto previously learned foundations. Deeper conceptual understanding of the content will occur through articulation across grade levels. This opportunity coupled with strong mathematical practices will prepare students for an ever changing world.

This document outlines the CCSS in algebra along with the alignment of our resources. This is a rigorous course that meets the expectations of a high school course. Students that complete the Algebra I course successfully will matriculate to the Geometry course.

Philosophy

The Howell Township School District is committed to providing challenging educational opportunities necessary to fulfill each student's potential for personal and academic success.

The philosophy of this algebra course is a belief that mathematics is accessible, meaningful, and connected to both previous mathematics learning and the real world. Students will explore Algebra skills through real-life experiences, manipulatives, problem-solving, and modern technology. It will engage and develop students' imaginations, common sense, and critical thinking skills, while meeting individual needs. It will provide comprehensive instruction that underlies the appreciation and recognition the role mathematics plays in the real world.

Each lesson will have two distinct goals: first the goal will help the student to understand the math skill and the second goal will show the learner how the skill is applied to daily life. Students working collaboratively, communicating mathematically, and using technology will be some of the strategies incorporated as an integral part of the learning process.

Standards for Mathematical Practices

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).

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x2 + 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.

8. 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)(x2 + x + 1), and (x – 1)(x3 + 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.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word “understand” are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards which set an expectation of understanding are potential “points of intersection” between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics

Common Core State Standards Initiative:

http://www.corestandards.org/Math/Content/HSA/introduction

Mathematics | High School—algebra

Expressions

An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the order of operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, p + 0.05p can be interpreted as the addition of a 5% tax to a price p. Rewriting p + 0.05p as 1.05p shows that adding a tax is the same as multiplying the price by a constant factor.

Algebraic manipulations are governed by the properties of operations and exponents, and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, p + 0.05p is the sum of the simpler expressions p and 0.05p. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure.

A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Equations and inequalities

An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.

An equation can often be solved by successively deducing from it one or more simpler equations. For example, one can add the same constant to both sides without changing the solutions, but squaring both sides might lead to extraneous solutions. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature and number of solutions.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of x + 1 = 0 is an integer, not a whole number; the solution of 2x + 1 = 0 is a rational number, not an integer; the solutions of x 2 – 2 = 0 are real numbers, not rational numbers; and the solutions of x 2 + 2 = 0 are complex numbers, not real numbers.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, A = ((b1 +b2)/2)h, can be solved for h using the same deductive process.

Inequalities can be solved by reasoning about the properties of inequality. Many, but not all, of the properties of equality continue to hold for inequalities and can be useful in solving them.

Connections to Functions and Modeling

Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

Scope and Sequence

The Common Core State Standards in mathematics were used to develop the following Algebra I Scope and Sequence. Foundations for the concepts and skills mastered in grades 7 and 8 are developed beginning in kindergarten by providing experiences that help children understand the meaning of numbers, ways of representing them, and their relationships.

Units of Study	Week(s)
Chapter 1: Expressions, Equations, and Functions Chapter 2: Properties of Real Numbers	1 – 3
Chapter 3: Solving Linear Equations	4 – 6
Chapter 4: Graphing Linear Equations and Functions	7 – 9
Chapter 5: Writing Linear Equations	10 – 12
Chapter 6: Solving and Graphing Linear Inequalities	13 – 16
Midterm Exam	Week 17
Chapter 7: Systems of Equations and Inequalities	17 – 19
Chapter 8: Exponents and Exponential Functions	20 – 22
Chapter 9: Polynomials and Factoring	23 - 25
Chapter 10: Quadratic Equations and Functions	26 – 28
Chapter 11: Radicals and Geometry Connections	29 - 30
NJASK 7^{th} and 8^{th}	31
Chapter 12: Rational Equations and Functions	32 – 34
Chapter 13: Probabilities and Data Analysis	35 - 36
Final Exam	37

Common Core State Standards - Overview

Seeing Structure in Expressions

• Interpret the structure of expressions

• Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Expressions

• Perform arithmetic operations on polynomials

• Understand the relationship between zeros and factors of polynomials

• Use polynomial identities to solve problems

• Rewrite rational expressions

Creating Equations

• Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities

• Understand solving equations as a process of reasoning and explain the reasoning

• Solve equations and inequalities in one variable

• Solve systems of equations

• Represent and solve equations and inequalities graphically

Common Core Standards

Quantities N – Q

Reason quantitatively and use units to solve problems.

2. Define appropriate quantities for the purpose of descriptive modeling.

Vector and Matrix Quantities N – VM

Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.

Seeing Structure in Expressions A - SSE

Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.

    a. Interpret parts of an expression, such as terms, factors, and coefficients.

    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.*

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* $(x^2 - y^2)(x^2 + y^2)$.

Write expressions in equivalent forms to solve problems

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

    a. Factor a quadratic expression to reveal the zeros of the function it defines.

Arithmetic with Polynomials and Rational Expressions A – APR

Perform arithmetic operations on polynomials

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.

Use polynomial identities to solve problems

4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*

Rewrite rational expressions

7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Creating Equations A – CED

Create equations that describe numbers or relationships

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.*

2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

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.*

Reasoning with Equations and Inequalities A - RE I

Understand solving equations as a process of reasoning and explain the reasoning

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.

2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

4. Solve quadratic equations in one variable.

    a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

    b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.

Solve systems of equations

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line* $y = –3x$ and the circle $x^2 + y^2 = 3$.

Represent and solve equations and inequalities graphically

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).

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.

Interpreting Functions F- IF

Understand the concept of a function and use function notation

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then $f(x)$ denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation $y = f(x)$.

2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Interpret functions that arise in applications in terms of the context

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.*

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.

Analyze functions using different representations

7. 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.

    b. Graph absolute value functions.

Building Functions F- BF

Build a function that models a relationship between two quantities

1. Write a function that describes a relationship between two quantities.

    a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

    b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

    c. (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*

Linear, Quadratic, and Exponential Models F – LE

Construct and compare linear, quadratic, and exponential models and solve problems

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

    a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

    b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

    c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

2. Construct linear functions given two input-output pairs (include reading these from a table).

Interpret expressions for functions in terms of the situation they Model

5. Interpret the parameters in a linear or exponential function in terms of a context.

Interpreting Categorical and Quantitative Data S - ID

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Summarize, represent, and interpret data on two categorical and quantitative variables

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

    a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*

    b. Informally assess the fit of a function by plotting and analyzing residuals.

    c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

9. Distinguish between correlation and causation.

Conditional Probability and the Rules of Probability S-CP

Understand independence and conditional probability and use them to interpret data

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

2. Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

Use the rules of probability to compute probabilities of compound events in a uniform probability model

9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

Units of Study

- Expression, Equations & Functions
- Properties of Real Numbers
- Solving Linear Equations
- Graphing Linear Equations & Functions
- Writing Linear Equations
- Solving & Graphing Linear Inequalities
- Systems of Equations & Inequalities
- Exponents & Exponential Functions
- Polynomials & Factoring
- Quadratic Equations & Functions
- Radicals & Geometry Connections
- Rational Equations & Functions
- Probabilities & Data Analysis

Units of Study

Expressions, Equations, and Functions
Properties of Real Numbers

Variables, Function Patterns, and Graphs; Rational Numbers

Goal(s)/Objective(s): use variables to transform English phrases into mathematical expressions; use the order of operations to simplify expressions; explore function rules and learn to identify relationships with functions; extend ability to calculate with whole numbers, decimals, and fractions to include integers; use the order of operations and the distributive property to simplify expressions, learn how to calculate with theoretical and experimental probability.

Essential Question(s): How do the tools of algebra relate to equations and modeling relationships in graph or chart form? How can you use operations on and properties of real numbers?

Instructional Objectives/Skills Trace:
The student will:

- Write and evaluate algebraic expressions
- Use expressions to write equations and inequalities
- Perform operations with Real Numbers
- Apply properties of Real Numbers
- Evaluate expressions using exponents
- Use the order of operations to evaluate expressions
- Translate verbal sentences into expressions, equations, and inequalities
- Apply Distributive Properties of Real Numbers
- Combining Like Terms

Academic Vocabulary:

absolute value	algebraic expression	coefficient	Constant
equation	evaluate	expression	inequality
integer	irrational numbers	like terms	power exponent base
rational numbers	real numbers	terms	variable
whole numbers			

Suggested Resources:

Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008
Holt McDougal Mathematics. Explorations in Core Math for Common Core.

Note-taking Guide	eEdition	Algebra 1 Toolkit
Activity Generator CD-ROM	Animated Technology	Classzone.com
PowerPoint Presentations CD-ROM		

Suggested Assessments:

- Formative Assessments
- Quizzes
- On-line quiz (classzone.com)
- Unit Test
- Mid-term and Final Exam

Common Core State Standards Alignment

A – SSE 1a
F – IF 1
F – FI 2
F – FI 4

Solving Linear Equations

Solving Equations

Goal(s)/Objective(s): solve equations, including those with variables on both sides, using properties of equality; develop the ability to solve problems by defining variables, relating them to one another, and writing an equation; use proportions to measure objects indirectly;

Essential Question(s): How can we utilize equations to solve problems?

Instructional Objectives/Skills Trace:

The student will:

- Solve equations using one variable
- Solve multi-step equations
- Write and solve proportions
- Solve percent problems
- Recognize and solve literal equations

Academic Vocabulary:

cross product	equivalent equations	inverse operations	literal equations
proportion	ratio	reciprocals	

Suggested Resources:

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Holt McDougal Mathematics. Explorations in Core Math for Common Core.

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Activity Generator CD-ROM Animated Technology Classzone.com
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Suggested Assessments:

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- Quizzes
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- Unit Test
- Mid-term and Final Exam

Common Core State Standards Alignment
A – REI 1 A – REI 3 A – CED 1 A – CED 4
S – SE 3
G – C 1

Graphing Linear Equations and Functions

Graphs and Functions

Goal(s)/Objective(s): move from the specific case of equations in one variable to the study of functions
in two variables; learn about function rules, and model data using equations, tables, and graphs; learn how to use inductive reasoning for recognizing number patterns called sequences;

Essential Question(s): What are some types of relationships that can be modeled by graphs?

Instructional Objectives/Skills Trace:

The student will:

- Identify the components of the Coordinate Plane
- Graph Linear Equations using tables
- Graph Linear Equations using quick intercepts
- Find the slope of a line
- Graph Linear Equations using Slope Intercept Form

Academic Vocabulary:

Coordinate Plane	Linear Function	Ordered Pair	parallel lines
Quadrant	Slope Intercept Form	Standard Form/General Linear Form	slope
x-intercept	y-intercept		

Suggested Resources:

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Suggested Assessments:

- Formative Assessments
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Common Core Standards Alignment

F – IF 1 **F – FI 2** **F – IF 4** **F – IF 5** **F – IF 6**
A – CED 2 **A – REI 10**
S – ID 7 **S – SE 3**

Writing Linear Equations

Linear Equations and Their Graphs

Goal(s)/Objective(s): learn how to write linear equations and recognize them in different forms; understand how the slope of a line can be interpreted in real-world situations; determine whether the graphs of two linear equations are parallel or perpendicular.

Essential Question(s): What types of relationships can be modeled by linear graphs?

Instructional Objectives/Skills Trace:

The student will:
- Write equations of a line in Slope Intercept Form
- Write equations of a line in Point Slope form
- Write equations in standard form/General Linear Form
- Write equations of parallel and perpendicular lines

Academic Vocabulary:

conditional statement	converse
perpendicular lines	point slope form

Suggested Resources:
Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

Holt McDougal Mathematics. Explorations in Core Math for Common Core.

Note-taking Guide	eEdition	Algebra 1 Toolkit
Activity Generator CD-ROM	Animated Technology	Classzone.com
PowerPoint Presentations CD-ROM		

Suggested Assessments:
- Formative Assessments
- Quizzes
- On-line quiz (classzone.com)
- Unit Test
- Mid-term and Final Exam

Common Core Standards Alignment

A – CED 2	**A – CED 3**		
F – LE 5	**F – BF 1a**	**F – LE 5**	
S – SE 3	**S – ID 1**	**S – ID 6a-c**	**S – ID 8, 9**

Solving and Graphing Linear Inequalities

Solving Inequalities

Goal(s)/Objective(s): graph inequalities; solve inequalities, noting the differences from the methods used for solving equations; write and solve compound inequalities by interpreting phrases that use and/or or.

Essential Question(s): Why do we want to compare rather than get an exact answer?

***Instructional Objectives/Skills Trace*:**
The student will:

- Solve inequalities using addition and subtraction
- Solve inequalities using multiplication and division
- Solve Multi-Step Inequalities
- Solve Compound Inequalities
- Solve Absolute Value Equations
- Solve Absolute Value Inequalities
- Graph Linear Inequalities

***Academic Vocabulary*:**

Absolute Deviation	Absolute Value	compound inequality	equivalent inequalities
Graph of an inequality	half plane	inequalities	solution
test points			

Suggested Resources:
Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

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Note-taking Guide eEdition Algebra 1 Toolkit
Activity Generator CD-ROM Animated Technology Classzone.com
PowerPoint Presentations CD-ROM

Suggested Assessments:
- Formative Assessments
- Quizzes
- On-line quiz (classzone.com)
- Unit Test
- Mid-term and Final Exam

Common Core Standards Alignment
A – CED 1 **A – CED 2** **A – CED 3** **A – REI 3**
S – SE 3
F – IF 7b **F – IF 5**

Systems of Equations and Inequalities

Systems of Equations and Inequalities

Goal(s)/Objective(s): extend ability to solve equations to include solving a system of two equations in two variables; learn methods of solving a linear system, including graphing, substitution, and elimination, and how to determine which method is best for a given situation.

Essential Question(s): What can we do with a system of equations/inequalities that we cannot do with a single equation/inequality?

Major Objectives/Skills Trace:

The student will:

- Solve Linear Systems by Graphing
- Solve Linear Systems by Substitution
- Solve Linear Systems by adding or subtracting
- Solve Linear Systems with opposite constants (multiplication)
- Solve special types of Linear Systems
- Solve systems of Linear Inequalities

Academic Vocabulary:

Consistent dependent system	consistent independent system	Dependent system	infinitely many solutions
inconsistent system	systems of equations	system of inequalities	

Suggested Resources:

Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

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PowerPoint Presentations CD-ROM		

Suggested Assessments:

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- Quizzes
- On-line quiz (classzone.com)
- Unit Test
- Mid-term and Final Exam

Common Core Standards Alignment
S – SE 3
A – CED 2 **A – CED 3** **A – REI 6** **A – REI 11** **A – REI 5**
F – IF 5

Exponents and Exponential Functions

Exponents and Exponential Functions; Polynomials and Factoring

Goal(s)/Objective(s): extend knowledge about exponents to include zero and negative exponents; learn the properties of exponents, and how exponents are used to write a geometric sequence; graph exponential functions by making a table; categorize polynomials by their degree and number of terms; perform operations with polynomials.

Essential Question(s): Why do we need to use exponential notation to model situations? Why should we factor? How does the graph of a quadratic function relate to its algebraic equation?

Instructional Objectives/Skills Trace:

The student will:
- Use Properties of Exponents involving Products
- Use Properties of Exponents involving Quotients
- Use Zero and Negative Exponents

Academic Vocabulary:

exponent	negative	order of magnitude	power exponent base
product	quotient	reciprocal	zero exponent

Suggested Resources:
Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

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PowerPoint Presentations CD-ROM		

Suggested Assessments:
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- Quizzes
- On-line quiz (classzone.com)
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Common Core Standards Alignment
A – SSE 1b A – CED 2 A – CED 3 A – REI 10
F – IF 5 F – LE 5

Polynomials and Factoring

Polynomials and Factoring; Quadratic Equations and Functions

Goal(s)/Objective(s): categorize polynomials by their degree and number of terms; perform operations with polynomials, examine quadratic equations and their graphs; solve quadratic equations by various techniques such as factoring, finding square roots, completing the square, and applying the quadratic formula; determine an appropriate linear, quadratic, or exponential model for real-world data.

Essential Question(s): Why should we factor? How does the graph of a quadratic function relate to its algebraic equation?

Instructional Objectives/Skills Trace:

The student will:
- Add and subtract polynomials
- Multiply polynomials
- Use special product patterns to multiply polynomials
- Factor trinomials completely
- Factor special products
- Solve second degree equations by factoring
- Recognize Zero Product Rule

Academic Vocabulary:

binomial	closure	constant	degree of monomial
degree of polynomial	difference of perfect squares	Factor	greatest common factor
leading coefficient	monomial	perfect-square trinomial	polynomial
radical	radical expression	rational exponent	roots
trinomial	vertical motion (velocity) model	Zero Product Property	

Suggested Resources:
Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

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Note-taking Guide eEdition Algebra 1 Toolkit
Activity Generator CD-ROM Animated Technology Classzone.com
PowerPoint Presentations CD-ROM

Suggested Assessments:
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- Quizzes
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- Unit Test
- Mid-term and Final Exam

Common Core Standards Alignment
A – SSE 1a **A – SSE 1b** **A – APR 1** **A – APR 4** **A – CED 1**
A – CED 2 **A – CED 3** **A – REI 4b**
F – BF 1a

Quadratic Equations and Functions

Quadratic Equations and Functions; Radical Expressions and Equations

Goal(s)/Objective(s): examine quadratic equations and their graphs; solve quadratic equations by various techniques such as factoring, finding square roots, completing the square, and applying the quadratic formula; determine an appropriate linear, quadratic, or exponential model for real-world data. Simplify expressions containing radicals; solve radical equations;

Essential Question(s): How are rational and irrational numbers the same and different?

Instructional Objectives/Skills Trace:

The student will:
- Graph simple quadratic functions
- Solve quadratic equations using the quadratic formula
- Use square roots to solve quadratic equations

Academic Vocabulary:

axis of symmetry	completing the square	discriminant	minimum/maximum value
parabola	parent quadratic function	quadratic equation	quadratic formula
quadratic function	vertex of a parabola	x-intercept	y-intercept

Suggested Resources:
Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

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PowerPoint Presentations CD-ROM		

Suggested Assessments:
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- On-line quiz (classzone.com)
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Common Core Standards Alignment

A – SSE 1a	**A – CED 1**	**A – CED 2**	**A – CED 3**	**A – APR 4**	**A – REI 4b**	**A – REI 10**
F – IF 4	**F – IF 5**	**F – IF 7a**	**F – IF 9**	**F – LE 1a**	**F – LE 1b**	**F – LE 1c**
F – LE 2						

Radicals and Geometry Connections

Quadratic Equations and Functions; Radical Expressions and Equations

Goal(s)/Objective(s): examine quadratic equations and their graphs; solve quadratic equations by various techniques such as factoring, finding square roots, completing the square, and applying the quadratic formula; determine an appropriate linear, quadratic, or exponential model for real-world data. Simplify expressions containing radicals; solve radical equations;

Essential Question(s): How are rational and irrational numbers the same and different?

Instructional Objectives/Skills Trace:
The student will:

- Simplify radical expressions
- Solve radical equations
- Use Pythagorean Theorem
- Use Distance Formula
- Use Midpoint Formula

Academic Vocabulary:

extraneous solution	hypotenuse	leg	midpoint
radical equation	radical expressions	rationalizing the denominator	simplest form of a radical expression

Suggested Resources:
Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

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PowerPoint Presentations CD-ROM		

Suggested Assessments:

- Formative Assessments
- Quizzes
- On-line quiz (classzone.com)
- Unit Test
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Common Core Standards Alignment

A – CED 1	**A – REI 2**	**A – REI 10**	**A – SSE 1a**
F – IF 5	**F – IF 7a**		

Rational Equations and Functions

Rational Expressions and Functions

Goal(s)/Objective(s): combine rational expressions using addition, subtraction, multiplication, and division; graph and solve equations involving rational expressions; use permutations and combinations to find the number of outcomes of real-world situations.

Essential Question(s): Why should we solve rational equations?

Instructional Objectives/Skills Trace:
The student will:

- Simplify rational expressions
- Multiply and divide rational expressions
- Solve rational equations (proportion based)
- Simplify complex fractions
- Divide polynomials

Academic Vocabulary:

complex fraction	cross products	excluded value	multiplicative inverse
rational expression	simplest form	undefined	

Suggested Resources:
Textbook: Boswell, Kanold, Larson, and Stiff. Algebra I. Illinois: McDougal Littell. 2008

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Suggested Assessments:
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- Unit Test
- Mid-term and Final Exam

Common Core Standards Alignment
A – APR 7
A – SSE 1a
A – CED 1
A – REI 2