Algebra

Course Description:

The curriculum from this course is developed from: common-core-math-standards.pdf. This is a required course. The information in this course overview outlines what students should understand and be able to do by the end of the semester/year.

Core Connections Algebra is the first course in a five-year sequence of college preparatory mathematics courses that starts with Algebra and continues through Calculus. It aims to deepen and extend student understanding built in previous courses by focusing on developing fluency with solving linear equations, inequalities, and systems. These skills are extended to solving quadratic equations, exploring linear, quadratic, and exponential functions graphically, numerically, symbolically, and as sequences, and by using regression techniques to analyze the fit of models to distributions of data. On a daily basis, students in *Core Connections Algebra* use problem-solving strategies, questioning, investigating, analyzing critically, gathering and constructing evidence, and communicating rigorous arguments justifying their thinking. Under teacher guidance, students learn in collaboration with others while sharing information, expertise, and ideas. The course is well balanced among procedural fluency (algorithms and basic skills), deep conceptual understanding, strategic competence (problem solving), and adaptive reasoning (extension and application). The lessons in the course meet all of the content standards of Appendix A of the *Common Core State Standards for Mathematics*. The course embeds the CCSS Standards for Mathematical Practice as an integral part of the lessons in the course.
Key concepts addressed in this course are:

- Representations of linear, quadratic, and exponential relationships using graphs, tables, equations, and contexts.
- Symbolic manipulation of expressions in order to solve problems, such as factoring, distributing, multiplying polynomials, expanding exponential expressions, etc.
- Analysis of the slope of a line multiple ways, including graphically, numerically, contextually (as a rate of change), and algebraically.
- Solving equations and inequalities using a variety of strategies, including rewriting (such as factoring, distributing, or completing the square), undoing (such as extracting the square root or subtracting a term from both sides of an equation), and looking inside (such as determining the possible values of the argument of an absolute value expression).
- Solving systems of two equations and inequalities with two variables using a variety of strategies, both graphically and algebraically.
- Representations of arithmetic and geometric sequences, including tables, graphs, and explicit or recursive formulas.
- Use of exponential models to solve problems, and to compare to linear models.
- Investigation of a variety of functions including square root, cube root, absolute value, piecewise-defined, step, and simple inverse functions.
- Use of function notation.
- Statistical analysis of two-variable data, including determining regression lines, correlation coefficients, and creating residual plots.
- The differences between association and causation, and interpretation of correlation in context.
- Comparison of distributions of one-variable data.

Mastery Standards:

Factor a quadratic expression to reveal the zeros of the function it defines. (CCSS.MATH.CONTENT.HSA.SSE.B.3.A)

Create equations and inequalities in one variable and use them to solve problems.
(CCSS.MATH.CONTENT.HSA.CED.A.1)

Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
(CCSS.MATH.CONTENT.HSA.REI.B.3)

Solve quadratic equations in one variable. (CCSS.MATH.CONTENT.HSA.REI.B.4)

Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. (CCSS.MATH.CONTENT.HSA.REI.C.6)

Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). (CCSS.MATH.CONTENT.HSF.LE.A.2)

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. (CCSS.MATH.CONTENT.HSA.APR.A.1)

Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (CCSS.MATH.CONTENT.HSA.CED.A.2)

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. (CCSS.MATH.CONTENT.HSF.IF.B.4)

Unit	Description of Unit and Learning Targets
Unit 1 Title: Functions Essential Questions: ● Why is it important to identify quantities in situations and describe their relationships using graphs?	Students will……. Learning Targets: ● I can graph an equation ● I can identify key parts of a graph ● I can solve multistep equations with one variable
Unit 2 Title: Linear Relationships Essential Questions: ● Why would I create a representation of a problem, consider the units involved, and understand the meaning of the quantities using tables, graphs and equations?	Students will... Learning Targets: ● I can connect the starting value and growth in geometric tile patterns with the slope and *y*-intercept on a graph. I can measure the steepness of a line on a graph. (up, down, horizontal, or vertical) ● I can represent slope as a rate of change ● I can develop an algebraic method for finding the equation of a line when given only two points on the line.

Unit 3 Title: Simplifying and Solving Essential Questions: ● Why use algebra times and area models help me better understand multiplication?	Students will... Learning Targets: ● I can simplify expressions with exponents by using the number 1. ● I can use algebra tiles to physically and visually represent an equation. ● I can rewrite products of binomials and other polynomials, such as $(3x - 2)(x + 4)$. ● I can solve one-variable equations containing products and absolute value ● I can solve multi-variable equations for one of the variables.
Unit 4 Title: Systems of Equations Essential Questions: ● Why is it important to be able to represent situations using systems of equations?	Students will... Learning Targets: ● I can write and solve mathematical sentences (such as one- and two-variable equations) to solve situational word problems. ● I can solve systems of equations in different forms.
Unit 5 Title: Sequences Essential Questions: ● Why is it important to find shortcuts that lead to equations when patterns are repeated?	Students will... Learning Targets: ● I can use tables, graphs, and equations to represent the growth and decay of a situation. ● I can create multiple representations of arithmetic sequences, including equations for sequences that depend on previous terms. ● I can create multiple representations of geometric sequences and compare sequences to functions.
Unit 6 Title: Modeling Two-Variable Data Essential Questions: ● How is modeling relationships mathematically in order to describe, analyze, make predictions, and draw conclusions useful?	Students will... Learning Targets: ● I can create a scatter plot and use it to come up with the equation of a best fit line.
Unit 7 Title: Exponential Functions Essential Questions: ● Why are making connections between	Students will... Learning Targets:

exponential functions and other relationships beneficial?	• I can identify exponential growth and will be able to apply it to real life situations. • I can find exponential equations that fit given data. In doing so, I will learn about fractional exponents.
Unit 8 Title: Quadratic Functions Essential Questions: • Why is it important to accurately explain Quadratic functions?	Students will... Learning Targets: • I can factor quadratic equations. • I can solve quadratic equations by factoring, taking square root, and completing the square.
Unit 9 Title: Solving Quadratics and Inequalities Essential Questions: • How would we use quadratics to represent patterns or structure in functions?	Students will... Learning Targets: • I can solve quadratic equations using the Quadratic Formula. • I can solve linear inequalities and apply this understanding to solving applications. • I can represent the solutions of two-variable inequalities on an $x \rightarrow y$ graph. • I can apply what I know about systems of equations to help find the solutions to a system of inequalities.
Unit 10 Title: Solving Complex Equations Essential Questions: • Are there multiple methods of solving complex equations using different representations?	Students will... Learning Targets: • I can develop new ways to solve unfamiliar, complicated equations involving fractions, square roots, exponents, and absolute values. • I can determine the number of solutions that are possible for quadratic and absolute value equations without solving them.