# SPRING GROVE AREA SCHOOL DISTRICT

## PLANNED COURSE OVERVIEW

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| **Course Title:** Algebra 1 | **Length of Course:** 30 cycles |
| **Grade Level(s):** 7-9 | **Periods Per Cycle:** MS – 6; HS - 9 |
| **Units of Credit:** 1.5 | **Length of Period:** MS – 47 minutes; HS - 43 minutes |
| **Classification:** Required | **Total Instructional Time:** MS – 141 hours; HS 193.5 hours |

## Course Description

This course is the foundation for high school mathematics courses. It is the bridge from the concrete to the abstract study of mathematics. After a review of the properties and rational numbers, the students will solve equations, use proportional reasoning, graph relations and functions, analyze linear equations, data analysis and probability, solve linear inequalities, solve systems of linear equations and inequalities, explore polynomials, and solve quadratic equations.

## Instructional Strategies, Learning Practices, Activities, and Experiences

Anchor Charts
Assessments (Quizzes, Unit, Teacher-Created)
Bell Ringers
Computer Websites and/or Software
Cooperative Learning
Critical Thinking
Cross Curricular Connections
Drill and Practice
Graphic Organizers
Guided Practice
Higher-Level Questioning
Homework
Notes (Templates, Teacher or Student Generated)
Practice Exercises and Tests
Presentations
Projects
Review (Games, Study Guides)
Standardized Test Preparation
Teacher Demonstrations
Teacher Observations
Technology Integration (iPods, iPads, Clickers, Computer Labs)
Vocabulary (Cards, Strategies, and Lists)
Constructed Response

## Assessments

Assessments (Quizzes, Unit, Teacher-Created)
Bell Ringers
Closure
Classroom Diagnostic Tools (CDT)
Evaluation (Summative and Formative)
Higher-Level Questioning
Homework Review
Presentations
State Standardized Assessments
Projects
Teacher Observations

## *Materials/Resources*

Anchor Charts
Calculators
Graphic Organizers
Big Ideas Math: A Bridge to Success Algebra 1, Larson 1st Edition
PDE Keystone Anchors
Quizlet
Keystone Finish Line Algebra 1
Literature
Manipulatives
PDE Keystone Resources
Khan Academy
Resource Books
Online Videos/DVDs
Vocabulary (Cards, Strategies, and Lists)
PDE Keystone Sample Questions
IXL

**Adopted:** 4/20/88
**Revised:** 9/3/91; 9/17/03; 8/17/09; 5/19/14; 5/20/2019

**Equations in One Variable**

**The Standards of Mathematical Practices**

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| **Make sense of problems and persevere in solving them.** | **Reason abstractly and quantitatively.** |
| **Construct viable arguments and critique the reasoning of others.** | **Model with mathematics.** |
| **Use appropriate tools strategically.** | **Attend to precision.** |
| **Look for and make use of structure.** | **Look for and express regularity in repeated reasoning.** |

| CONTENT/KEY CONCEPTS | OBJECTIVES/STANDARDS |
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| **Expressions, Equations, and Functions**<br>A. Expressions, Order of Operations, and Unit Rate<br>• Evaluate algebraic expressions<br>• Use the order of operations to simplify expressions<br>• Read, write, and evaluate powers<br>• Translate a verbal phrase into an algebraic expression<br>• Find the unit rate for a given situation<br><br>B. Equations and Inequalities<br>• Write equations and inequalities for a verbal sentence<br>• Write and solve an equation or inequality for an application problem<br>• Use formulas to solve an application problem<br>• Check solutions to an equation or inequality<br><br>C. Functions, Domain, and Range<br>• Determine if a relation is a function<br>• State the domain, range, independent, and dependent variables<br>• Write a rule for a function given a table of input/ output values<br>• Graph linear functions using a table of values | **CC.2.1.HS.F.2** - Apply properties of rational and irrational numbers to solve real world or mathematical problems.<br>**CC.2.2.HS.D.1** - Interpret the structure of expressions to represent a quantity in terms of its context.<br>**CC.2.2.HS.D.2** - Write expressions in equivalent forms to solve problems.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. |

| **Equations in One Variable (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Properties of Real Numbers**<br>A. Order Real Numbers<br>• Graph real numbers on a number line<br>• Identify categories of real numbers and give examples of each<br>• Find the opposite and absolute value of a real number<br><br>B. Operations with Real Numbers<br>• State the additive and multiplicative properties of real numbers<br>• Add, subtract, multiply, and divide real numbers<br>• Use the distributive property to simplify expressions<br>• Find the mean<br>• Solve real-life problems using operations with real numbers<br><br>C. Find Square Roots and Compare Real Numbers<br>• Approximate square roots<br>• Evaluate expressions with square roots<br>• Order and graph real numbers including square roots<br>• Identify perfect squares<br>• Solve real-life problems using square roots<br><br>D. Operations with Real Numbers<br>• Perform matrix addition, subtraction, and scalar multiplication<br>• Use matrices to model real life application problems | **CC.2.2.HS.D.2** - Write expressions in equivalent forms to solve problems.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br><br>**CC.2.1.HS.F.1** - Apply and extend the properties of exponents to solve problems with rational exponents.<br>**CC.2.1.HS.F.2** - Apply properties of rational and irrational numbers to solve real-world or mathematical problems. |

| **Equations in One Variable (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Data Analysis**<br>A. Data Analysis<br>• Determine bias in a sample<br>• Find the mean, median, and mode of a set of data<br>• Find the range of a set of data<br>• Construct and interpret a stem-and-leaf plot<br>• Construct and interpret a histogram<br><br>**Solving Linear Equations**<br>A. Solve Linear Equations<br>• Solve one-and two-step equations<br>• Solve multi-step equations<br>• Solve equations with variables on both sides<br>• Set up and solve real-life application problems<br><br>B. Rewrite Equations/ Formulas<br>• Rewrite an equation in function form<br>• Solve a formula for a given variable<br>• Rewrite a formula and use to evaluate a real-life problem<br><br>C. Ratios and Proportions<br>• Write ratios and apply to real-life situations<br>• Set up and solve a proportion<br>• Use a proportion to solve real-life problems<br>• Apply proportions to similar figures<br><br>D. Percent Problems<br>• Solve percent problems using proportions<br>• Solve percent problems using an equation<br>• Set up and solve real-life percent problems<br>• Find the percent of change | **CC.2.1.HS.F.3** - Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.<br>**CC.2.1.HS.F.4** - Use units as a way to understand problems and to guide the solution of multi-step problems.<br>**CC.2.1.HS.F.5** - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.<br><br>**CC.2.4.HS.B.1** - Summarize, represent, and interpret data on a single count or measurement variable.<br>**CC.2.4.HS.B.2** - Summarize, represent, and interpret data on two categorical and quantitative variables.<br><br>**CC.2.1.HS.F.3** - Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.<br>**CC.2.1.HS.F.4** - Use units as a way to understand problems and to guide the solution of multi-step problems.<br>**CC.2.1.HS.F.5** - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.<br>**CC.2.1.HS.F.6** - Extend the knowledge of arithmetic operations and apply to complex numbers.<br><br>**CC.2.2.HS.D.2** - Write expressions in equivalent forms to solve problems.<br>**CC.2.2.HS.D.7** - Create and graph equations or inequalities to describe numbers or relationships.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br>**CC.2.2.HS.C.5** - Construct and compare linear, quadratic, and exponential models to solve problems.<br>**CC.2.2.HS.C.6** - Interpret functions in terms of the situations they model.<br><br>**CC.2.3.HS.A.12** - Explain volume formulas and use them to solve problems.<br>**CC.2.3.HS.A.14** - Apply geometric concepts to model and solve real-world problems. |

| **Equations in Two Variables** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Data Analysis**<br>A. Data Analysis<br>• Construct and interpret a box-and-whisker plot<br><br>**Graph Linear Equations and Functions**<br>A. Graph Linear Equations<br>• Plot points in a coordinate plane<br>• Perform and describe transformations in a coordinate plane<br>• Graph a function with a given domain<br>• Determine a continuous verses a discrete function<br>• Graph a linear function using a table of values<br>• Graph a linear function using x- and y-intercepts<br>• Graph vertical and horizontal lines<br><br>B. Find Slope and Graph Using Slope-Intercept Form<br>• Find the slope of a line using two of its points<br>• Interpret slope as a rate of change in a real-life situation<br>• Find the slope and y-intercept of a given equation<br>• Graph a line using slope-intercept form<br>• Identify parallel lines<br><br>C. Direct Variation<br>• Identity direct variation equations<br>• Graph direct variation models<br>• Write a direct variation equation<br>• Use a ratio to model direct variation | **CC.2.1.HS.F.3** - Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.<br><br>**CC.2.2.HS.D.8** - Apply inverse operations to solve equations or formulas for a given variable.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br>**CC.2.2.HS.C.2** - Graph and analyze functions and use their properties to make connections between the different representations.<br>**CC.2.2.HS.C.5** - Construct and compare linear, quadratic, and exponential models to solve problems.<br>**CC.2.2.HS.C.6** - Interpret functions in terms of the situations they model. |

| **Equations in Two Variables (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| D. Graph Linear Functions<br>• Use functions using function notation<br>• Graph a function given in function notation<br>• Determine the domain and range of a function<br>• Graph transformations of the parent linear function<br>• Compare linear functions with the parent linear function<br><br>**Write Linear Equations**<br>A. Write the Equation of a Line in Slope-Intercept Form<br>• Write the equation given the slope and intercept<br>• Write the equation given the slope and one point<br>• Write the equation given two points<br><br>B. Write the Equation of a Line using Function Notation<br>• Write the equation of a line that models a real-life situation<br>• Write the equation of a line using function notation<br><br>C. Scatterplots<br>• Use a scatterplot to graph data<br>• Determine correlation of a scatterplot<br>• Use a line of best fit to model data<br>• Determine the equation of a line of best fit<br>• Apply a line of best fit for a real-life set of data to make a prediction | **CC.2.2.HS.D.6** - Extend the knowledge of rational functions to rewrite in equivalent forms.<br>**CC.2.2.HS.D.7** - Create and graph equations or inequalities to describe numbers or relationships.<br>**CC.2.2.HS.D.8** - Apply inverse operations to solve equations or formulas for a given variable.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br>**CC.2.2.HS.C.1** - Use the concept and notation of functions to interpret and apply them in terms of their context.<br>**CC.2.2.HS.C.2** - Graph and analyze functions and use their properties to make connections between the different representations.<br>**CC.2.2.HS.C.3** - Write functions or sequences that model relationships between two quantities.<br>**CC.2.2.HS.C.5** - Construct and compare linear, quadratic, and exponential models to solve problems.<br>**CC.2.2.HS.C.6** - Interpret functions in terms of the situations they model.<br><br>**CC.2.4.HS.B.1** - Summarize, represent, and interpret data on a single count or measurement variable.<br>**CC.2.4.HS.B.2** - Summarize, represent, and interpret data on two categorical and quantitative variables.<br>**CC.2.4.HS.B.3** - Analyze linear models to make interpretations based on the data.<br><br>**CC.2.1.HS.F.3** - Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. |

| **Equations in Two Variables (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Writing Linear Equations**<br>D. Write the Equation of a Line in Point-Slope Form<br>• Write the equation given one point and the slope<br>• Write the equation given two points<br>• Graph the equation in point-slope form<br><br>E. Write the Equation of a Line in Standard Form<br><br>F. Write and Graph Equations of Parallel and Perpendicular Lines<br>• Write the equations of parallel and perpendicular lines<br>• Graph parallel and perpendicular lines<br><br>**Probability**<br>A. Probability and Odds<br>• Find the probability of an event occurring<br>• Find the odds in favor and odds against an event occurring<br>• Use the formula for the number of permutations or combinations<br>• Find the probabilities using permutations and combinations<br>• Find the probabilities of compound events | **CC.2.4.HS.B.4** - Recognize and evaluate random processes underlying statistical experiments.<br>**CC.2.4.HS.B.5** - Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.<br>**CC.2.4.HS.B.6** - Use the concepts of independence and conditional probability to interpret data.<br>**CC.2.4.HS.B.7** - Apply the rules of probability to compute probabilities of compound events in a uniform probability model. |

| **Equations in Two Variables (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Solve and Graph Linear Inequalities**<br>A. Solving Simple Inequalities<br>• Solve inequalities using addition and subtraction<br>• Solve inequalities using multiplication<br>• Graph linear inequalities on a number line<br>• Solve multi-step inequalities, including variables on both sides<br>• Set up and solve real-life problems using inequalities<br><br>B. Solve Compound Inequalities<br>• Solve both “and” and “or” inequalities<br>• Graph both “and” and “or” inequalities<br>• Set up and solve application problems that involve compound inequalities<br><br>C. Solve Absolute Value Equations and Inequalities<br>• Solve an absolute value equation<br>• Solve an absolute value inequality<br><br>D. Graph Linear Inequalities in Two Variables<br>• Check if a given point is a solution of a linear inequality<br>• Graph a linear inequality on a coordinate plane<br>• Set up and determine solutions of a real-life problem using linear inequalities | **CC.2.2.HS.D.7** - Create and graph equations or inequalities to describe numbers or relationships.<br>**CC.2.2.HS.D.8** - Apply inverse operations to solve equations or formulas for a given variable.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br>**CC.2.2.HS.C.4** - Interpret the effects transformations have on functions and find the inverses of functions.<br>**CC.2.2.HS.C.5** - Construct and compare linear, quadratic, and exponential models to solve problems.<br>**CC.2.2.HS.C.6** - Interpret functions in terms of the situations they model. |

| **Equations in Two Variables (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Systems of Equations**<br>A. Solve a Linear System by Graphing<br>• Determine if an ordered pair is a solution of a system of equations<br>• Find the solution to a system of linear equations by graphing<br><br>B. Solve a Linear System by Substitution<br>• Solve an equation for a given variable<br>• Solve a linear system using substitution<br>• Check solutions to a system<br><br>C. Solve a Linear System by Elimination<br>• Solve when no multiplication is required<br>• Solve a system when multiplication is required first<br><br>D. Solve Application Problems using a System of Equations<br><br>E. Solve Special Types of Linear Systems<br>• Determine when a system is inconsistent<br>• Determine when a system is a consistent dependent system<br><br>**Systems of Inequalities**<br>A. Solve a System of Linear Inequalities | **CC.2.2.HS.D.8** - Apply inverse operations to solve equations or formulas for a given variable.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br>**CC.2.2.HS.C.5** - Construct and compare linear, quadratic, and exponential models to solve problems.<br>**CC.2.2.HS.C.6** - Interpret functions in terms of the situations they model.<br><br>**CC.2.4.HS.B.2** - Summarize, represent, and interpret data on two categorical and quantitative variables. |

| **Exponential and Quadratic Functions** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Exponents and Exponential Functions**<br>A. Properties of Exponents<br>• Apply the exponent properties involving products to simplify expressions<br>• Apply the exponent properties involving quotients to simplify expressions<br>• Use zero and negative exponent properties to simplify expressions<br><br>B. Scientific Notation<br>• Write numbers in both decimal form and scientific notation<br>• Multiply, divide, and find powers of numbers in scientific notation<br>• Use scientific notation to solve real-life application problems | **CC.2.1.HS.F.1** - Apply and extend the properties of exponents to solve problems with rational exponents.<br><br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br>**CC.2.2.HS.C.5** - Construct and compare linear, quadratic, and exponential models to solve problems.<br>**CC.2.2.HS.C.6** - Interpret functions in terms of the situations they model.<br>**CC.2.2.HS.D.1** - Interpret the structure of expressions to represent a quantity in terms of its context. |

| **Exponential and Quadratic Functions (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Polynomials and Factoring**<br>A. Classify Polynomials<br>• Classify polynomials by type<br>• Classify polynomials by degree<br>• Rewrite a polynomial in standard form<br><br>B. Perform Operations with Polynomials<br>• Add and subtract polynomials<br>• Multiply polynomials using the distributive property or box method<br>• Multiply two binomials using the first, outer, inner, last (FOIL) method<br>• Find the special products using the square of a binomial and the sum and difference pattern<br><br>C. Factor Polynomials<br>• Factor out the greatest common factor (GCF) of a polynomial<br>• Factor by grouping<br>• Factor a difference of two squares<br>• Factor a trinomial w/a leading coefficient of 1<br>• Factor a trinomial w/a leading coefficient other than 1<br>• Factor a perfect square trinomial<br><br>D. Solve a Polynomial Equation in Factored Form<br>• Use the zero product property to solve equations | **CC.2.2.HS.D.3** - Extend the knowledge of arithmetic operations and apply to polynomials.<br>**CC.2.2.HS.D.4** - Understand the relationship between zeroes and factors of polynomials to make generalizations about functions and their graphs.<br>**CC.2.2.HS.D.5** - Use polynomial identities to solve problems.<br>**CC.2.2.HS.D.8** - Apply inverse operations to solve equations or formulas for a given variable.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.<br>**CC.2.2.HS.C.6** - Interpret functions in terms of the situations they model. |

| **Exponential and Quadratic Functions (continued)** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| E. Simplify Rational Expressions<br>• Simplify a rational expression by factoring and canceling common factors<br>• Determine the excluded value of a rational expression<br><br>**Solve a Quadratic Equation**<br>A. Solve a Quadratic Equation<br>• Solve a quadratic equation by finding square roots<br>• Solve a quadratic equation by factoring | **CC.2.2.HS.D.1** - Interpret the structure of expressions to represent a quantity in terms of its context.<br>**CC.2.1.HS.F.1** - Apply and extend the properties of exponents to solve problems with rational exponents.<br><br>**CC.2.1.HS.F.7** - Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems.<br><br>**CC.2.2.HS.D.3** - Extend the knowledge of arithmetic operations and apply to polynomials.<br>**CC.2.2.HS.D.4** - Understand the relationship between zeroes and factors of polynomials to make generalizations about functions and their graphs.<br>**CC.2.2.HS.D.5** - Use polynomial identities to solve problems.<br>**CC.2.2.HS.D.9** - Use reasoning to solve equations and justify the solution method.<br>**CC.2.2.HS.D.10** - Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. |

| **Radicals and Rational Functions** | |
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| **CONTENT/KEY CONCEPTS** | **OBJECTIVES/STANDARDS** |
| **Radicals**<br>A. Simplify Radical Expressions<br><br>B. Perform Operations with Radicals | **CC.2.2.HS.D.1** - Interpret the structure of expressions to represent a quantity in terms of its context.<br><br>**CC.2.1.HS.F.1** - Apply and extend the properties of exponents to solve problems with rational exponents. |