



Curriculum & Instruction

SUMMIT PUBLIC SCHOOLS

Content Area: Mathematics

Course: Algebra 1B (H224)

Grade(s): 9

Course Overview

This course represents the foundations of Algebra 1. It will provide students the opportunity to truly master algebraic and mathematics skills that will lead to greater achievement in subsequent courses. Students will create and use numerical, algebraic, graphical, and verbal representations and analyze sophisticated patterns, relations, and functions. They will represent linear functions numerically, algebraically, graphically and verbally and work with and interpret these representations. They will deepen their understanding of relations and functions and expand their repertoire in working with them. Students will develop insight and understanding of the algebraic properties that govern the manipulation of symbols in expressions, equations, and inequalities. Functions will be introduced as mathematical modeling tools providing students with a versatile and powerful means for analyzing and solving complex, multi-step, real world problems. Students will also learn the appropriate use of technology, such as graphing calculators and spreadsheet utilities to model and analyze a wide range of mathematical relationships.

Prerequisite: Pre-Algebra

New Jersey State Learning Standards

Summit Public Schools curriculum aligns with the [New Jersey Student Learning Standards](#).

Content Area Standards:

- A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- A-CED.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A-CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

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- A-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
- A-REI.A.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.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A-REI.B.4 Solve quadratic equations in one variable.
- A-REI.C.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
- A-REI.C.6. Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
- A-REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
- A-REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the 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.D.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
- A-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.
- A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it.
- A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
- F.BF.A.1 Write a function that describes a relationship between two quantities.
- F.BF.A.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
- F.BF.B.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- F.IF.A.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 $y = f(x)$.
- F.IF.A.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.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

- F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
- F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
- F.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- F.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
- F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- F.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.
- F.LE.A.2 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).
- F.LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
- F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.
- N-Q.A.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..
- N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
- N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- N-RN.A.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-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- N-RN.B.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
- S-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).
- S-ID.A.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.
- S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- S-ID.B.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.

- S-ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
- S-ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
- S-ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.
- S-ID.C.9 Distinguish between correlation and causation.

Interdisciplinary Standards:

- RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.
- RST.9-10.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Career Readiness, Life Literacies and Key Skills Standards:

- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas
- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
- 9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.
- 9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education
- 9.1.12.CDM.2: Compare and contrast the advantages and disadvantages of various types of mortgages.
- 9.1.12.CDM.6: Compute and assess the accumulating effect of interest paid over time when using a variety of sources of credit. (e.g., student loans, credit cards, auto loans, mortgages, etc.).
- 9.1.12.PB.2: Prioritize financial decisions by considering alternatives and possible consequences.
- 9.1.12.PB.6: Describe and calculate interest and fees that are applied to various forms of spending, debt and saving.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving
- 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.
- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

Computer Science and Design Thinking Standards:

- 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.

Career Readiness, Life Literacies and Key Skills Standards:

- CRP 1. Act as a responsible and contributing citizen and employee.
- CRP 2. Apply appropriate academic and technical skills.
- CRP 3. Attend to personal health and financial well-being.
- CRP 4. Communicate clearly and effectively and with reason.
- CRP 5. Consider the environmental, social and economic impacts of decisions.
- CRP 6. Demonstrate creativity and innovation.
- CRP 7. Employ valid and reliable research strategies.
- CRP 8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP 9. Model integrity, ethical leadership and effective management.
- CRP 10. Plan education and career paths aligned to personal goals.
- CRP 11. Use technology to enhance productivity.
- CRP 12. Work productively in teams while using cultural global competence.

New Jersey Curriculum Mandates:

This curriculum integrates lessons that address the following interdisciplinary New Jersey Curriculum Mandates:

- [Diversity and Inclusion](#) (Grades K - 12)
 - C.18A:35-4.36a: Curriculum to include instruction on diversity and inclusion.
 - (3) encourage safe, welcoming, and inclusive environments for all students regardless of race or ethnicity, sexual and gender identities, mental and physical disabilities, and religious beliefs.

Learning Objectives

Learning objectives are clear, specific statements that define what students should know, understand, and be able to do by the end of a lesson or course.

Students will be able to...

- Use the order of operations to solve multi-step problems.
- Solve multistep linear equations and use them to solve real-life problems.
- Use unit analysis to model real-life problems.
- Solve linear equations with a variable on one side or both sides, and identify equations with no solution or infinitely many solutions.
- Solve absolute value equations involving one or two absolute values, and identify equations with extraneous solutions.
- Rewrite and use literal equations and common formulas for function input.
- Solve inequalities using basic operations, including multiplying or dividing by negative numbers.
- Understand the meaning of inequalities and the mathematical rules that govern them.
- Identify when the solution set is inclusive of the boundary and how to show that visually and graphically.
- Solve multi-step, compound, and absolute value inequalities.

- Use inequalities to solve real-life problems.
- Identify linear functions, using graphs, tables, and equations.
- Use function notation to evaluate, interpret, and graph functions.
- Find the slope of a line and use it to write a linear equation in slope-intercept form.
- Solve real-life problems using function notation, linear equations, slopes, and y-intercepts.
- Write linear inequalities from graphs.
- Translate, reflect, stretch, and shrink graphs of linear and absolute functions, and combine transformations of graphs of linear and absolute functions.
- Identify, write, and use linear equations in standard, slope-intercept, and point-slope form.
- Identify, write, and use equations for parallel and perpendicular lines.
- Write and graph linear inequalities.
- Evaluate, graph, and write piecewise functions, including step and absolute value functions.
- Solve systems of linear equations by graphing, by substitution, and by elimination.
- Solve absolute value equations by graphing.
- Graph and write systems of linear inequalities.
- Use systems of linear equations and linear inequalities to solve real-life problems.
- Evaluate and simplify expressions with exponents, including rational exponents; find n th roots.
- Identify, evaluate, and graph exponential functions; use, identify, interpret, and rewrite exponential growth and decay functions; solve real-life problems.
- Solve exponential equations with common bases.
- Classify, add, and subtract polynomials.
- Use algorithms, the square of a binomial pattern, and the sum and difference pattern to multiply binomials; multiply binomials and trinomials.
- Solve polynomial equations by using the Zero-Product Property and by factoring out the GCF.
- Factor $x^2 + bx + c$, $ax^2 + bx + c$, the difference of two squares, and perfect square trinomials
- Use sums, differences, products, and complete factoring of polynomials to solve real-life problems.
- Graph and use quadratic functions in standard form, vertex form, intercept form, factored form
- Find maximum and minimum values of quadratic functions.
- Use intercept form to find zeros of functions.
- Choose functions to model data and solve real-life problems using different function types.
- Simplify expressions and perform operations, using the properties of radicals.
- Solve quadratic equations by graphing, using square roots, completing the square, and using the Quadratic Formula.
- Approximate solutions of quadratic equations and of nonlinear systems and equations.
- Solve systems of nonlinear equations by graphing and algebraically.
- Solve real-life problems using graphs of quadratic functions and by completing the square.
- To find a particular term of an arithmetic sequences, you can first write the general rule
- Geometric sequences are discrete versions of exponential functions restricted to natural number domains.

Units of Study

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Units of study are organized collections of lessons and learning experiences focused on a specific topic and set of skills within a course. Each unit is guided by a set of essential questions.

Unit 1: Solving Linear Equations (~15 Days)

- How does the concept of balance help us solve equations?
- What does a solution to an equation really tell us about a real-world problem?
- Why is it important to check our solutions?
- How can we use equations to make predictions or informed decisions about the world around us?
- What's the difference between an equation with one solution, no solution, or infinite solutions?

Unit 2: Solve and Graph Linear Inequalities (~14 Days)

- What does an inequality represent, and how is its solution different from the solution of an equation?
- How does the visual representation of an inequality on a number line or coordinate plane help us understand its solution?
- Why is it sometimes necessary to reverse the inequality sign when solving?
- How can inequalities be used to model and solve real-world problems with a range of possible solutions?
- How do compound inequalities and absolute value inequalities relate to each other and to single inequalities?

Unit 3: Solving Linear Equations (~22 Days)

- How can a linear function be used to model and predict real-life situations?
- What does it mean for a relationship to be a function, and what does this tell us about its domain and range?
- How do the different representations of a linear function (graph, table, equation) relate to one another?
- How do changes to an equation affect the graph of a linear function?
- What are the unique characteristics of parallel and perpendicular lines, and how do they help us solve problems?

Unit 4: Systems of Linear Equations and Inequalities (~15 Days)

- What does the solution to a system of equations or inequalities represent?
- How can we use systems to model and solve real-world problems with two or more unknowns?
- Why is it useful to solve systems using different methods (graphing, substitution, elimination)?
- How can we predict the number of solutions a system will have by analyzing its equations?
- How is the solution to a system of inequalities different from the solution to a system of equations?

Unit 5: Exponential Functions (~15 Days)

- How is exponential change fundamentally different from linear change?
- How can we use exponential functions to model and predict real-world phenomena?
- What do the components of an exponential function's equation tell us about its growth or decay?
- How does the graph of an exponential function reveal its unique characteristics, such as asymptotes?
- How do we decide whether a linear or exponential model is a more appropriate fit for a given situation or set of data?

Unit 6: Polynomial Equations & Factoring (~17 Days)

- How is factoring a polynomial related to multiplying polynomials?
- How can recognizing patterns help us factor polynomials?
- Why is factoring a polynomial a useful tool for solving equations and real-world problems?
- How can we determine the most effective strategy for factoring a given polynomial?
- What does the Zero Product Property tell us about the solutions to a polynomial equation?

Unit 7: Quadratic Equations (~17 Days)

- What does the graph of a quadratic function reveal about its solutions and key characteristics?
- How can we use the characteristics of parabolas to model and solve real-life problems?
- Why are there multiple methods for solving a quadratic equation, and how do you choose the best one?
- What does a quadratic equation's solution (or lack thereof) tell us about the real-world problem it represents?
- How do the different forms of a quadratic equation help us understand and work with its graph?

Unit 8: Statistics (~7 Days)

- How do we choose the best way to display a set of data to reveal its key characteristics?
- How can we use statistical measures to describe and compare different data sets?
- How can a scatter plot and a line of best fit help us identify relationships and make predictions?
- How do outliers and data distribution shape our understanding of a data set?
- What can a two-way frequency table tell us about the relationship between two different variables?

Unit 9: Sequences (~5 Days)

- How can we use mathematical patterns to predict what comes next?
- How is an arithmetic sequence related to a linear function?
- How is a geometric sequence related to an exponential function?
- How can we use rules and formulas to find any term in a sequence without listing all the terms?
- What are the key differences between arithmetic and geometric sequences?

Instructional Resources and Materials

Instructional resources are the information sources teachers utilize to guide their teaching and assessing. Instructional materials are the texts students read or review. The instructional resources and materials may vary in order to meet the learning needs of students.

- Guided Note Outlines
- Google Classroom
- DeltaMath
- Desmos
- Khan Academy
- NJ Standardized Test Prep Resources
- Kuta Software
- **Textbooks and Curricula:** Big Ideas Math- Algebra 1

Assessment Strategies

Assessment measures a student's mastery of a course standard and learning objective. Assessment can be used for both instructional purposes and for evaluative purposes. Teachers may choose one or more of the following ideas to assess learners. They may also modify these ideas to make the assessment more responsive to students' interests and needs.

Formative: Practice Problem Sets, Homework Exercises, Exit Tickets, Graded Check-Ins

Summative: Quizzes & Unit Tests

Benchmark: Midterm and Final Exams

Alternative: Projects

Suggested Strategies for Modification & Differentiation

[Modifications Chart](#)

Multilingual Learners

Please note this curriculum can be modified for Multilingual Learners for the Sheltered Math 7 course