# Alabama State Course of Study
# Math-Algebra (Planned Curriculum)

| Standards | Resources |
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| NUMBER AND QUANTITY | |
| The Real Number System | |
| • 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-RN1] (ALG I: B)<br>• Rewrite expressions involving radicals and rational exponents using the properties of exponents. [N-RN2] (ALG I: B)<br>• 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. [N-RN3] (ALG I: A/B) | Lesson Activities<br>Title: Make Your City Great Again<br>Description: Make your city great again by teaming up with a local organization to enhance the community This project requires students to generate unique answers to the problems and needs of their community. Students will together in a class discussion decide what the project will be based on (feeding the homeless, helping people involved in a disaster, clean up a mile in the community).<br>Students will team up on the classroom to come up with a set of questions to ask the community organizations<br>-what are ways we can help-what do you suggest we do<br>How can your organization assist us?<br>How can we assist your organizations?<br>What will we display on out poster? |
| Quantities* | |
| • Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. [N-Q1] (ALG I: A)<br>• Define appropriate quantities for the purpose of descriptive modeling. [N-Q2] (ALG I: A)<br>• Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. [N-Q3] (ALG I: A) | Learning Activities<br>**Subject:** Science (9 - 12), Digital Literacy and Computer Science (9 - 12), Literacy Standards (6-12) (9 - 10), Mathematics (9 - 12)<br>**Title:** Historical Climate Analysis Activity<br>**Description:**<br>The object of this activity is to demonstrate the concept of climate change. Historical climate data has been used to show a local area in central England to represent an entire time frame. This learning activity incorporates temperature conversions, graphing, graphical analysis and extensions into the Medieval Warm Period.<br><br>Subject: Science (9 - 12), Mathematics (9 - 12), Literacy Standards (6-12) (9 - 10)<br>Title: Hurricane Tracking Activity<br>Description:<br>This activity utilizes maps and other visualizations to analyze past NOAA hurricane data. It incorporates graphing wind speed and pressure to note the correlation between the two. Finally, it will show the relationship between hurricane category and damage. |

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| ALGEBRA | |
| Seeing Structure in Expressions | |
| • Interpret expressions that represent a quantity in terms of its context.* [A-SSE1] (ALG I: A/B)<br>• Use the structure of an expression to identify ways to rewrite it. [A-SSE2] (ALG I: A/B)<br>• Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* [A-SSE3] (ALG I: B) | Title: Express Yourself!<br>Description:<br>This learning activity will be used during a lesson on Algebraic Expressions. Students will work in pairs to translate between words, tables, symbols, and area representation of algebraic expressions.<br><br>Title: Mondrian Factoring Models<br>Description:<br>Piet Mondrian is an artist famous for creating his masterpieces out of line art that utilized clean lines through rectangles. This activity will help us to create our own "Mondrian" by using our knowledge of factoring Quadratic trinomials through the use of Algebra tiles and area models.<br><br>This activity was created as a result of the ALEX Resource Development Summit.<br><br>Title: Express Yourself!<br>Description:<br>This learning activity will be used during a lesson on Algebraic Expressions. Students will work in pairs to translate between words, tables, symbols, and area representation of algebraic expressions.<br><br>This learning activity results from the ALEX Resource Development Summit. |
| Arithmetic With Polynomials and Rational Expressions | |
| • 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-APR1] (ALG I: B)<br>• (+) 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. [A-APR7] (ALG I: B) | Learning Activities<br>Title: Adding and Subtracting Polynomials: The Thinking Tree<br>Description:<br>After a lesson on adding and subtracting polynomials, the students will complete an exit ticket by picking three questions from The Thinking Tree to answer.<br><br>Title: Dice, Dice Baby!<br>Description: |

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| | Students will work in pairs and roll various colored dice in order to create polynomial expressions for addition and/or subtraction.<br><br>Title: Interactive Multiplication of Binomials<br>Description:<br>This activity allows the student to reinforce a lesson for multiplying binomials. The students will be visualizing the multiplication of binomials by manipulating tiles on a digital diagram. |
| | Classroom Resources |
| | Title: KutaSoftware: Algebra 1 - Adding And Subtracting Polynomials Part 3<br>URL:<br>https://www.youtube.com/watch?v=y0iyfz4vZpc&list=PLD7NSlqW6HTGDhLkT5T71rw1e5m9xgFxq&index=93<br>Description:<br>This YouTube video will help explain how to teach adding and subtracting polynomials using a worksheet from Kuta Software. Kuta Software is free software for math teachers that creates worksheets in a matter of minutes. There are a series of three videos available to fully teach this concept. The videos are labeled Adding And Subtracting Polynomials Part 1, Adding And Subtracting Polynomials Part 2, and Adding And Subtracting Polynomials Part 3. This video can be played as a continuation of a lesson on adding and subtracting polynomials.<br><br>Title: Multiplying Polynomials Part 1<br>URL:<br>https://www.youtube.com/watch?v=8pECyJg-WEw&list=PLD7NSlqW6HTGDhLkT5T71rw1e5m9xgFxq&index=94<br>Description:<br>This YouTube video will help explain how to teach multiplying polynomials using a worksheet from Kuta Software. Kuta Software is free software for math teachers that creates worksheets in a matter of minutes. There are a series of three videos available to fully teach this concept. The videos are labeled Multiplying Polynomials Part 1, Multiplying Polynomials Part 2, and Multiplying Polynomials Part 3. This video can be played to introduce a lesson on multiplying polynomials.<br><br>Subject: Mathematics (9 - 12)<br>Title: Multiplying Polynomials Part 2 |

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| | URL:<br>https://www.youtube.com/watch?v=7Fs9O-hnR0E&list=PLD7NSlqW6HTGDhLkT5T71rw1e5m9xgFxq&index=95<br>Description:<br>This YouTube video will help explain how to teach multiplying polynomials using a worksheet from Kuta Software. Kuta Software is free software for math teachers that creates worksheets in a matter of minutes. There are a series of three videos available to fully teach this concept. The videos are labeled Multiplying Polynomials Part 1, Multiplying Polynomials Part 2, and Multiplying Polynomials Part 3. This video can be played as a continuation of a lesson on multiplying polynomials.<br><br>Title: Multiplying Polynomials Part 3<br>URL:<br>https://www.youtube.com/watch?v=OFdS4fQdraY&list=PLD7NSlqW6HTGDhLkT5T71rw1e5m9xgFxq&index=96<br>Description:<br>This YouTube video will help explain how to teach multiplying polynomials using a worksheet from Kuta Software. Kuta Software is free software for math teachers that creates worksheets in a matter of minutes. There are a series of three videos available to fully teach this concept. The videos are labeled Multiplying Polynomials Part 1, Multiplying Polynomials Part 2, and Multiplying Polynomials Part 3. This video can be played as a continuation of a lesson on multiplying polynomials. |
| Creating Equations* | |
| ● 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. [A-CED1] (ALG I: A/B)<br>● Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. [A-CED2] (ALG I: A/B)<br>● Represent constraints by equations or inequalities, and by systems of equations and/or inequalities and interpret solutions as viable or non-viable options in a modeling context. [A-CED3] (ALG I: A) | Lesson Plans<br>Title: Can You Solve the Mystery of the Variable?<br>Description:<br>This lesson will help students master Algebra I standard 15: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations [A-CED4]. The lesson will make the connection between isolating a guilty person in a “who-dun-it” with isolating a given variable in an equation. In addition, this lesson will involve students creating a list of procedures to use when solving for a given variable. At this time, it is not necessary for students to know the formal names for the properties. It is important for students to understand the concepts and take part in creating a set of procedures for isolating a variable and solving equations.<br><br>Title: Solving Formulas for the Given Variable<br>Description: |

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| • Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. [A-CED4] (ALG I: A) | This lesson will use the process of inverse operations to solve formulas for a given variable. Some formulas will not be recognized by the student. The actual formula is not important, but the variables are. |
| Reasoning With Equations and Inequalities | |
| • 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-REI1] (ALG I: A/B)<br>• Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. [A-REI3] (ALG I: A)<br>• Solve quadratic equations in one variable. [A-REI4] (ALG I: B)<br>• 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-REI5] (ALG I: A)<br>• Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. [A-REI6] (ALG I: A)<br>• Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. [A-REI7] (ALG I: B)<br>• 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-REI10] (ALG I: A)<br>• 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, | Learning Activities<br>Title: Kahooting Equations<br>Description:<br>Students will use the Kahoot! response system to solve one-step equations and inequalities with one variable.<br><br>The teacher will be able to monitor the use of Kahoots as a type of formative assessment - through quizzing, collaboration, and presentation of content. Kahoot! initiates peer-led discussions, with students left on the edge of their seats.<br>Title: Mondrian Factoring Models<br>Description:<br>Piet Mondrian is an artist famous for creating his masterpieces out of line art that utilized clean lines through rectangles. This activity will help us to create our own “Mondrian” by using our knowledge of factoring Quadratic trinomials through the use of Algebra tiles and area models.<br><br>Title: Finding the Zeros by Graphing<br>Description:<br>This activity will help students solve quadratic equations in one variable. While instruction is delivered, the teacher will use the website, Desmos, to show where the graph crosses the x-axis.<br>Classroom Resources |

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| rational, absolute value, exponential, and logarithmic functions.* [A-REI11] (ALG I: A/B) | Subject: Mathematics (9 - 12)<br>Title: Compound Inequalities Review<br>URL:<br>https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:solve-equations-inequalities/x2f8bb11595b61c86:compound-inequalities/a/compound-inequalities-review<br>Description:<br>In this activity from Khan Academy, students will review how to graph and solve compound inequalities. This activity has embedded videos, practice problems with immediate checks for the correctness of answers, an explanation option, and more practice choice at the end of the lesson. This review can be assigned to Google Classroom.<br><br>Title: Multi-Step Inequalities Assessment<br>URL: https://quizizz.com/admin/quiz/5f29ff7b8fcd74001c3aa869<br>Description:<br>Students will use the Quizizz response system to complete a Multi-Step Inequalities Assessment. Quizizz allows the teacher to conduct student-paced formative assessments through quizzing, collaboration, peer-led discussions, and presentation of content in a fun and engaging way for students of all ages.<br><br>Title: Inequalities on the Number Line<br>URL:<br>https://teacher.desmos.com/activitybuilder/custom/57d9fdc6ebf48f73093807b2<br>Description:<br>In this Desmos activity, students explore linear inequalities and make connections among multiple representations (including algebraic expressions, verbal statements, number line graphs, and solution sets). There are a series of 3 videos available to fully teach this concept. The videos are labeled "Inequalities on the Number Line," "Compound Inequalities on the Number Line," and "Absolute Value Inequalities on the Number Line." This activity should be used to help teach a lesson on solving linear inequalities. This Desmos activity offers sample student responses and a teacher guide.<br><br>Title: Multi-Step Equations Part 2<br>URL: https://www.youtube.com/watch?v=TAWLYlBql4g<br>Description: |

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| | This YouTube video will help explain how to teach multi-step equations using a worksheet from Kuta Software. Kuta Software is free software for math teachers that creates worksheets in a matter of minutes. There are a series of three videos to fully teach this concept. The videos are labeled Multi-Step Equations Part 1, Multi-Step Equations Part 2, and Multi-Step Equations Part 3. This video can be played as a continuation of a lesson on solving multi-step equations. |

| FUNCTIONS | |
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| Interpreting Functions | |
| • 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 ranGEO. 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-IF1] (ALG I: A)<br>• Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. [F-IF2] (ALG I: A)<br>• Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. [F-IF3] (ALG I: B)<br>• 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-IF4] (ALG I: A/B)<br>• Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.* [F-IF5] (ALG I: A/B)<br>• 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-IF6] (ALG I: A/B)<br>• Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* [F-IF7] (ALG I: A/B) | Learning Activities<br>Title: What the f of x? (Function Notation)<br>Description:<br>The learning activity What the "f of x"? will be used during the lesson on function notation to evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context |

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| • Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. [F-IF8] (ALG I: A/B)<br>• Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). [F-IF9] (ALG I: A/B) Example: Given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. | |
| Building Functions | |
| • Write a function that describes a relationship between two quantities.* [F-BF1] (ALG I: A/B)<br>• Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.* [F-BF2] (ALG I: A/B)<br>• 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-BF3] (ALG I: A/B) | Lesson Plans |
| | Title: It's All in the Family<br>Description:<br>Students will be motivated to learn how to build new linear functions from existing linear functions. Students will bring pictures of themselves and their parents from home to personally involve them in the lesson. Students will learn to use the patterns inherent in functions to quickly and accurately graph linear functions. This lesson will only deal with vertical shifts and the steepness of the line. Horizontal shifts will be dealt with in future lessons. In addtion, in future lessons students will transfer this knowledge to also graph exponential, quadratic, and absolute value functions.<br><br>This is a College- and Career-Ready Standards showcase lesson plan. |
| | Learning Activities |
| | Title: Let's Experiment With Graphs of Functions Using Technology!<br>Description:<br>This learning activity Let's Experiment With Graphs of Functions Using Technology! will be used during a lesson on identifying 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 using technology, finding the value of k given the graphs, and recognizing even and odd functions from their graphs and algebraic expressions for them.<br><br>This activity results from the ALEX Resource Development Summit. |

| Linear, Quadratic, and Exponential Models* | |
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| • Distinguish between situations that can be modeled with linear functions and with exponential functions. [F-LE1] (ALG I: B)<br>• 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-LE2] (ALG I: A/B)<br>• 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-LE3] (ALG I: B)<br>• Interpret the parameters in a linear or exponential function in terms of a context. [F-LE5] (ALG I: A/B) | Learning Activities<br>Title: The Spread of a Virus: Are All Viruses Virulent?<br>Description:<br>In this activity, students will watch a short video clip that displays how quickly past viruses have spread and how deadly they are. This will activate students' prior knowledge about rates of growth and provide the context for the simulation activity they will engage in during the next activity.<br><br>Title: The Spread of a Virus: Does Social Distancing Matter?<br>Description:<br>This exploration provides students the opportunity to actively engage in creating their own knowledge about exponential models. They are given the support to conduct their own simulation and record the information, make predictions using the data that they have collected, and compare their predictions to the technology generated models. Additionally, the technology element is necessary to make sense of the data in a more efficient manner as compared to hand calculations of procedures. The emphasis is to produce a deep conceptual understanding of rates of change of exponential functions in multiple representations and use that information to build up procedural fluency.<br><br>Title: The Spread of a Virus: Which Virus Is More Virulent?<br>Description:<br>This activity allows teachers to formatively assess students' understanding of multiplicative rates of change from different representations. The activity presents four different viruses of different spread rates, and students are to determine which virus is the most virulent and justify their responses. |
| STATISTICS AND PROBABILITY | |
| Interpreting Categorical and Quantitative Data | |
| • Represent data with plots on the real number line (dot plots, histograms, and box plots). [S-ID1] (ALG I: B)<br>• 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-ID2] (ALG I: B) | Learning Activities<br>Title: Slope! Tilting the Learning Curve With Video<br>Description:<br>The YouTube video "Slope Music Video" is a video that introduces the concept of slope and slope-intercept form of a linear equation. |

| | Classroom Resources |
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| | Title: Land the Plane<br>URL:<br>https://teacher.desmos.com/activitybuilder/custom/582b81f4bf3030840aacf265<br>Description:<br>In this Desmos activity, students practice finding equations of lines in order to land a plane on a runway. Most of the challenges are well-suited to slope-intercept form, but they are easily adapted to other forms of linear equations depending on the goals of an individual class or a student. This activity should be used to help teach a lesson on slope-intercept. This Desmos activity offers sample student responses and a teacher guide.<br><br>Title: Hit the Runway<br>URL:<br>https://teacher.desmos.com/activitybuilder/custom/56274598fc26d37312cf969b<br>Description:<br>In this Desmos activity, students practice finding equations of lines in order to hit the runway. Students will practice writing equations of lines, introducing the concepts of slope-intercept lines. This activity should be used to help teach a lesson on slope-intercept. This Desmos activity offers sample student responses and a teacher guide.<br><br>Title: Graphing Lines<br>URL: https://phet.colorado.edu/en/simulation/graphing-lines<br>Description:<br>In this PhET activity, students will explore the world of lines and investigate the relationships between linear equations, slope, and graphs of lines. The learning goals for this activity will be to explain how the slope of a graphed line can be computed, graph a line given an equation in either slope-intercept or point-slope form, write an equation in slope-intercept or point-slope form given a graphed line, and predict how changing variables in a linear equation will affect the graphed line. This activity should be used to help teach a lesson on graphing linear equations. This PhET activity can be downloaded and assigned to Google Classroom. |

| Conditional Probability and the Rules of Probability | |
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| • 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. [S-CP2] (ALG I: B) | Learning Activities |
| | Title: Taking the Shortcut to Multihybrid Genetic Probability Problems<br>Description:<br>In this lesson, students will use the concept of finding the probability of an offspring having more than one genetic trait simultaneously. They will use a shortcut method to find the probability and they will use a Punnett square calculator to check their answers. This lesson can be used to teach genetics in a science classroom or a practical "real world" application of probability calculations in a math classroom. |