ALGEBRA I

CREDIT   1   GRADE   9   PREREQUISITE   NONE

Students will reinforce basic algebraic concepts and skills used in expressions, equation, graphs, and problem solving and gain a deeper understanding of linear equations, inequalities, and quadratic functions. Students begin study of algebraic concepts and skills used in exponents, radicals, and systems of equations. **NOTE: This course is required for graduation.**

State Standards for Algebra I may be found here:
https://www.tn.gov/education/article/mathematics-standards

First Nine Weeks
- 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.
- Use properties of exponents to transform expressions for exponential functions.
- Create equations and inequalities in one variable and use them to solve problems.
- Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- 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.
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

* Common Assessment #1
* Common Assessment #2

Second Nine Weeks
- 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 equations $y = f(x)$.
- Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- 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 functions is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- 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.
- Calculate and interpret the average rate of change of a function (presented symbolically or a s a table) over a specified interval. Estimate the rate of change from a graph.

- Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
- Create equations in two or more variables to represent relationship between quantities; graph equations on coordinate axes with labels and scales.
- Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
- Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (including reading these from a table).
- 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.
- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- 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.
- Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
- Determine an explicit expression, a recursive process, or steps for calculation from a context.
- Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- 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).
- 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.

* Common Assessment #3
* Common Assessment #4
* Common Assessment #5

Third Nine Weeks
- Use the properties of exponents to transform expressions for exponential functions.
- Create equations in two or more variables to represent relationship between quantities; graph equations on coordinate axes with labels and scales.
- Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
- Determine an explicit expression, a recursive process, or steps for calculation from a context.
- Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
- 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).
- Calculate and interpret the average rate of change of a function (presented symbolically or a s a table) over a specified interval. Estimate the rate of change from a graph.
- Define appropriate quantities for the purpose of descriptive modeling.
- Interpret parts of an expression, such as terms, factors, and coefficients.

- Create equations and inequalities in one variable and use them to solve problems.
- Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
- Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- 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.
- Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
- 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.
- Interpret complicated expressions by viewing one or more of their parts as a single entity.
- Use the structure of an expression to identify ways to rewrite it.
- 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.
- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- 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.
- Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
- Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- Factor a quadratic expression to reveal the zeros of the function it defines.
- Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

* Common Assessment #6
* Common Assessment #7
* Common Assessment #8

Fourth Nine Weeks
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- 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.
- 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 equations $y = f(x)$.

- 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.
- Interpret complicated expressions by viewing one or more of their parts as a single entity.
- Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
- 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.
- Calculate and interpret the average rate of change of a function (presented symbolically or a s a table) over a specified interval. Estimate the rate of change from a graph.
- 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.
- Represent data with plots on the real number line (dot plots, histograms, and box plots).
- 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.
- Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
- Informally assess the fit of a function by plotting and analyzing residuals.
- Fit a linear function for a scatter plot that suggests a linear association.
- Compute (using technology) and interpret the correlation coefficient of a linear fit.
- Recognize 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.

* Common Assessment #9
* Common Assessment #10.

For information regarding instructional objectives and materials, please contact the school principal.

* Common assessments are scheduled within the nine weeks. Each school may adjust the week and/or day of the week to meet the individual school's schedule.

* Common assessments may be rescheduled due to inclement weather.