**Grade 5 - Algebra I Progression - Patterns, Functions, and Algebra**

|  | **PATTERNS/PROPORTIONAL and ADDITIVE RELATIONSHIPS/LINEAR FUNCTIONS** | | | | | |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **5** | **6** | | **7** | | **8** | | **Algebra I** |
| **5.18 The student will identify, describe, create, express, and extend number patterns found in objects, pictures, numbers, and tables.**   * Identify, create, describe, and extend patterns using concrete materials, number lines, tables, or pictures. * Describe and express the relationship found in patterns, using words, tables, and symbols. * Solve practical problems that involve identifying, describing, and extending single-operation input and output rules (limited to addition, subtraction and multiplication of whole numbers; addition and subtraction of fractions, with denominators of 12 or less; and addition and subtraction of decimals expressed in tenths or hundredths). * Identify the rule in a single-operation numerical pattern found in a list or table (limited to addition, subtraction and multiplication of whole numbers; addition and subtraction of fractions, with denominators of 12 or less; and addition and subtraction of decimals expressed in tenths or hundredths). | **6.12 The student will**   1. **represent a proportional relationship between two quantities, including those arising from practical situations;** 2. **determine the unit rate of a proportional relationship and use it to find a missing value in a ratio table;** 3. **determine whether a proportional relationship exists between two quantities; and** 4. **make connections between and among representations of a proportional relationship between two quantities using verbal descriptions, ratio tables, and graphs.**  * Make a table of equivalent ratios to represent a proportional relationship between two quantities, given a ratio. (a) * Make a table of equivalent ratios to represent a proportional relationship between two quantities, when given a practical situation. (a) * Identify the unit rate of a proportional relationship represented by a table of values or a verbal description, including those represented in a practical situation. Unit rates are limited to positive values. (b) * Determine a missing value in a ratio table that represents a proportional relationship between two quantities using a unit rate. Unit rates are limited to positive values. (b) * Determine whether a proportional relationship exists between two quantities when given a table of values or a verbal description, including those represented in a practical situation. Unit rates are limited to positive values. (c) * Determine whether a proportional relationship exists between two quantities given a graph of ordered pairs. Unit rates are limited to positive values. (c) * Make connections between and among multiple representations of the same proportional relationship using verbal descriptions, ratio tables, and graphs. Unit rates are limited to positive values. (d) | **7.10 The student will.**   1. **determine the slope, *m*, as rate of change in a proportional relationship between two quantities and write an equation in the form *y* = *mx* to represent the relationship;** 2. **graph a line representing a proportional relationship between two quantities given the slope and an ordered pair, or given the equation in *y******= mx* form where *m* represents the slope as rate of change.** 3. **determine the *y-*intercept, *b,* in an additive relationship between two quantities andwrite an equation in the form *y* = *x* + *b* to represent the relationship;** 4. **graph a line representing an additive relationship between two quantities given the *y*-intercept and an ordered pair, or given the equation in the form *y* = *x* + *b*, where *b* represents the *y-*intercept; and** 5. **make connections between and among representations of a proportional or additive relationship between two quantities using verbal descriptions, tables, equations, and graphs.**  * Determine the slope, *m*, as rate of change in a proportional relationship between two quantities given a table of values or a verbal description, including those represented in a practical situation, and write an equation in the form *y* = *mx* to represent the relationship. Slope will be limited to positive values. (a) * Graph a line representing a proportional relationship, between two quantities given an ordered pair on the line and the slope, *m*, as rate of change. Slope will be limited to positive values. (b) * Graph a line representing a proportional relationship between two quantities given the equation of the line in the form *y* = *mx*, where *m* represents the slope as rate of change. Slope will be limited to positive values. (b) * Determine the *y-*intercept, *b*, in an additive relationship between two quantities given a table of values or a verbal description, including those represented in a practical situation, and write an equation in the form *y* = *x* + *b*, *b* ≠ 0, to represent the relationship. (c) * Graph a line representing an additive relationship (*y* = *x* + *b, b* ≠ 0) between two quantities, given an ordered pair on the line and the *y*-intercept (*b*). The *y*-intercept (*b*) is limited to integer values and slope is limited to 1. (d) * Graph a line representing an additive relationship between two quantities, given the equation in the form y= *x* + *b, b* ≠ 0. The *y*-intercept (*b*) is limited to integer values and slope is limited to 1. (d) * Make connections between and among representations of a proportional or additive relationship between two quantities using verbal descriptions, tables, equations, and graphs. (e) | | **8.15 The student will**   1. **determine whether a given relation is a function; and** 2. **determine the domain and range of a function.**  * Determine whether a relation, represented by a set of ordered pairs, a table, or a graph of discrete points is a function. Sets are limited to no more than 10 ordered pairs. (a) * Identify the domain and range of a function represented as a set of ordered pairs, a table, or a graph of discrete points. (b)   **8.16 The student will**   1. **recognize and describe the graph of a linear function with a slope that is positive, negative, or zero;** 2. **identify the slope and *y*-intercept of a linear function given a table of values, a graph, or an equation in *y* = *mx* + *b* form;** 3. **determine the independent and dependent variable, given a practical situation modeled by a linear function;** 4. **graph a linear function given the equation in  *y* = *mx* + *b* form; and** 5. **make connections between and among representations of a linear function using verbal descriptions, tables, equations, and graphs.**  * Recognize and describe a line with a slope that is positive, negative, or zero (0). (a) * Given a table of values for a linear function, identify the slope and *y*-intercept. The table will include the coordinate of the *y*-intercept. (b) * Given a linear function in the form *y* = *mx* + *b*, identify the slope and *y*-intercept. (b) * Given the graph of a linear function, identify the slope and *y*-intercept. The value of the *y*-intercept will be limited to integers. The coordinates of the ordered pairs shown in the graph will be limited to integers. (b) * Identify the dependent and independent variable, given a practical situation modeled by a linear function. (c) * Given the equation of a linear function in the form *y* = *mx* + *b*, graph the function. The value of the *y*-intercept will be limited to integers. (d) * Write the equation of a linear function in the form *y* = *mx* + *b* given values for the slope, *m,* and the *y*-intercept or given a practical situation in which the slope, *m*, and *y*-intercept are described verbally.(e) * Make connections between and among representations of a linear function using verbal descriptions, tables, equations, and graphs. (e). | | **A.6 The student will**  **a) determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line;**  **b) write the equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line; and**  **c) graph linear equations in two variables.**   * Determine the slope of the line, given the equation of a linear function. (a) * Determine the slope of a line, given the coordinates of two points on the line. (a) * Determine the slope of a line, given the graph of a line. (a) * Recognize and describe a line with a slope or rate of change that is positive, negative, zero, or undefined. (a) * Write the equation of a line when given the graph of a line. (b) * Write the equation of a line when given two points on the line whose coordinates are integers. (b) * Write the equation of a line when given the slope and a point on the line whose coordinates are integers. (b) * Write the equation of a vertical line as *x* = *a*. (b) * Write the equation of a horizontal line as *y* = *c*. (b) * Write the equation of a line parallel or perpendicular to a given line through a given point. (b) * Graph a linear equation in two variables, including those that arise from a variety of practical situations. (c) * Use the parent function *y* = *x* and describe transformations defined by changes in the slope or *y*-intercept. (c)   **A.7 The student will investigate and analyze linear and quadratic function families and their characteristics both algebraically and graphically, including**  **a) determining whether a relation is a function;**  **b) domain and range;**  **c) zeros;**  **d) intercepts;**  **e) values of a function for elements in its domain; and**  **f) connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs.**   * Determine whether a relation, represented by a set of ordered pairs, a table, a mapping, or a graph is a function. (a) * Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. (b, c, d) * Use the x-intercepts from the graphical representation of a quadratic function to determine and confirm its factors. (c, d) * For any value, x, in the domain of f, determine f(x). (e) * Represent relations and functions using verbal descriptions, tables, equations, and graph. Given one representation, represent the relation in another form. (f) * Investigate and analyze characteristics and multiple representations of functions with a graphing utility.  (a, b, c, d, e, f) | |

|  | | **SOLVING EQUATIONS** | | | | | |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **5** | | **6** | | **7** | | **8** | | **Algebra I** |
| **5.19 The student will**   1. **investigate and describe the concept of variable;** 2. **write an equation to represent a given mathematical relationship, using a variable;** 3. **use an expression with a variable to represent a given verbal expression involving one operation; and** 4. **create a problem situation based on a given equation, using a single variable and one operation.**  * Describe the concept of a variable (presented as boxes, letters, or other symbols) as a representation of an unknown quantity. (a) * Write an equation with addition, subtraction, multiplication, or division, using a variable to represent an unknown quantity. (b) * Use an expression with a variable to represent a given verbal expression involving one operation (e.g., “5 more than a number” can be represented by y + 5). (c) * Create and write a word problem to match a given equation with a single variable and one operation. (d) | **6.13 The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable.**   * Identify examples of the following algebraic vocabulary: equation, variable, expression, term, and coefficient. * Represent and solve one-step linear equations in one variable, using a variety of concrete materials such as colored chips, algebra tiles, or weights on a balance scale. * Apply properties of real numbers and properties of equality to solve a one-step equation in one variable. Coefficients are limited to integers and unit fractions. Numeric terms are limited to integers. * Confirm solutions to one-step linear equations in one variable. * Write verbal expressions and sentences as algebraic expressions and equations. * Write algebraic expressions and equations as verbal expressions and sentences. * Represent and solve a practical problem with a one-step linear equation in one variable. | | **7.12 The student will solve two-step linear equations in one variable, including practical problems that require the solution of a two-step linear equation in one variable.**   * Represent and solve two-step linear equations in one variable using a variety of concrete materials and pictorial representations. * Apply properties of real numbers and properties of equality to solve two-step linear equations in one variable. Coefficients and numeric terms will be rational. * Confirm algebraic solutions to linear equations in one variable. * Write verbal expressions and sentences as algebraic expressions and equations. * Write algebraic expressions and equations as verbal expressions and sentences. * Solve practical problems that require the solution of a two-step linear equation. | | **8.17 The student will solve multistep linear equations in one variable with the variable on one or both sides of the equation, including practical problems that require the solution of a multistep linear equation in one variable.**   * Represent and solve multistep linear equations in one variable with variable on one or both sides of the equation (up to four steps) using a variety of concrete materials and pictorial representations. Apply properties of real numbers and properties of equality to solve multistep linear equations in one variable (up to four steps). Coefficients and numeric terms will be rational. Equations may contain expressions that need to be expanded (using the distributive property) or require collecting like terms to solve. * Write verbal expressions and sentences as algebraic expressions and equations. * Write algebraic expressions and equations as verbal expressions and sentences. * Solve practical problems that require the solution of a multistep linear equation. * Confirm algebraic solutions to linear equations in one variable. | | **A.4 The student will solve**  **a) multistep linear equations in one variable algebraically;**  **b) quadratic equations in one variable algebraically;**  **c) literal equations for a specified variable;**  **d) systems of two linear equations in two variables algebraically and graphically; and**  **e) practical problems involving equations and systems of equations.**   * Determine whether a linear equation in one variable has one, an infinite number, or no solutions. (a) * Apply the properties of real numbers and properties of equality to simplify expressions and solve equations. (a, b) * Solve multistep linear equations in one variable algebraically. (a) * Solve quadratic equations in one variable algebraically. Solutions may be rational or irrational. (b) * Solve a literal equation for a specified variable. (c) * Given a system of two linear equations in two variables that has a unique solution, solve the system by substitution or elimination to identify the ordered pair which satisfies both equations. (d) * Given a system of two linear equations in two variables that has a unique solution, solve the system graphically by identifying the point of intersection. (d) * Solve and confirm algebraic solutions to a system of two linear equations using a graphing utility. (d) * Determine whether a system of two linear equations has one, an infinite number, or no solutions. (d) * Write a system of two linear equations that models a practical situation. (e) * Interpret and determine the reasonableness of the algebraic or graphical solution of a system of two linear equations that models a practical situation. (e) * Solve practical problems involving equations and systems of equations. (e) | |

| **SOLVING INEQUALITIES** | | | | |
| --- | --- | --- | --- | --- |
| **5** | **6** | **7** | **8** | **Algebra I** |
|  | **6.14 The student will**   1. **represent a practical situation with a linear inequality in one variable; and**   **b) solve one-step linear inequalities in one variable, involving addition and subtraction, and graph the solution on a number line.**   * Given a verbal description, represent a practical situation with a one-variable linear inequality. (a) * Apply properties of real numbers and the addition or subtraction property of inequality to solve a one-step linear inequality in one variable, and graph the solution on a number line. Numeric terms being added or subtracted from the variable are limited to integers. (b) * Given the graph of a linear inequality with integers, represent the inequality two different ways (e.g., *x* < -5 or -5 > *x*) using symbols. (b) * Identify a numerical value(s) that is part of the solution set of a given inequality. (a, b) | 7.13 The student will solve one- and two-step linear inequalities in one variable, including practical problems, involving addition, subtraction, multiplication, and division, and graph the solution on a number line.   * Apply properties of real numbers and the multiplication and division properties of inequality to solve one-step inequalities in one variable, and the addition, subtraction, multiplication, and division properties of inequality to solve two-step inequalities in one variable. Coefficients and numeric terms will be rational. * Represent solutions to inequalities algebraically and graphically using a number line. * Write verbal expressions and sentences as algebraic expressions and inequalities. * Write algebraic expressions and inequalities as verbal expressions and sentences. * Solve practical problems that require the solution of a one- or two-step inequality. * Identify a numerical value(s) that is part of the solution set of a given inequality. | **8.18 The student will solve multistep linear inequalities in one variable with the variable on one or both sides of the inequality symbol, including practical problems, and graph the results on a number line.**   * Apply properties of real numbers and properties of inequality to solve multistep linear inequalities (up to four steps) in one variable with the variable on one or both sides of the inequality. Coefficients and numeric terms will be rational. Inequalities may contain expressions that need to be expanded (using the distributive property) or require collecting like terms to solve. * Graph solutions to multistep linear inequalities on a number line. * Write verbal expressions and sentences as algebraic expressions and inequalities. * Write algebraic expressions and inequalities as verbal expressions and sentences. * Solve practical problems that require the solution of a multistep linear inequality in one variable. * Identify a numerical value(s) that is part of the solution set of a given inequality. | **A.5 The student will**  **a) solve multistep linear inequalities in one variable algebraically and represent the solution graphically;**  **b) represent the solution of linear inequalities in two variables graphically;**  **c) solve practical problems involving inequalities; and**  **d) represent the solution to a system of inequalities graphically.**   * Solve multistep linear inequalities in one variable algebraically and represent the solution graphically. (a) * Apply the properties of real numbers and properties of inequality to solve multistep linear inequalities in one variable algebraically. (a) * Represent the solution of a linear inequality in two variables graphically. (b) * Solve practical problems involving linear inequalities. (c) * Determine whether a coordinate pair is a solution of a linear inequality or a system of linear inequalities. (c) * Represent the solution of a system of two linear inequalities graphically. (d) * Determine and verify algebraic solutions using a graphing utility.  (a, b, c, d) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ALGEBRAIC EXPRESSIONS**  **(ORDER OF OPERATIONS)** | | | | |
| **5** | **6** | **7** | **8** | **Algebra I** |
|  |  | **7.11 The student will evaluate algebraic expressions for given replacement values of the variables.**   * Represent algebraic expressions using concrete materials and pictorial representations. Concrete materials may include colored chips or algebra tiles. * Use the order of operations and apply the properties of real numbers to evaluate expressions for given replacement values of the variables. Exponents are limited to 1, 2, 3, or 4 and bases are limited to positive integers. Expressions should not include braces { } but may include brackets [ ] and absolute value  | |. Square roots are limited to perfect squares. Limit the number of replacements to no more than three per expression. | **8.14 The student will**   1. **evaluate an algebraic expression for**   **given replacement values of the variables; and**   1. **simplify expressions in one variable.**  * Use the order of operations and apply the properties of real numbers to evaluate algebraic expressions for the given replacement values of the variables. Exponents are limited to whole numbers and bases are limited to integers. Square roots are limited to perfect squares. Limit the number of replacements to no more than three per expression. (a) * Represent algebraic expressions using concrete materials and pictorial representations. Concrete materials may include colored chips or algebra tiles. (a) * Simplify algebraic expressions in one variable. Expressions may need to be expanded (using the distributive property) or require combining like terms to simplify. Expressions will include only linear and numeric terms. Coefficients and numeric terms may be rational. (b) | **A.1 The student will**   1. **represent verbal quantitative situations algebraically; and** 2. **evaluate algebraic expressions for given replacement values of the variables.**  * Translate between verbal quantitative situations and algebraic expressions and equations. (a) * Represent practical situations with algebraic expressions in a variety of representations (e.g., concrete, pictorial, symbolic, verbal). (a) * Evaluate algebraic expressions, using the order of operations, which include absolute value, square roots, and cube roots for given replacement values to include rational numbers, without rationalizing the denominator. (b) |