

# ALGEBRA I EIGHTH GRADE

## PURPOSE:

Students will demonstrate number sense by performing computational procedures on algebraic expressions. They will solve and generate equations and inequalities of the following types: systems, quadratic, radical, and absolute value. Students will be able to recognize and identify characteristics of functions. Students will apply properties of geometric shapes and measurement formulas to solve real world problems, manipulate and analyze all aspects of linear equations, and predict outcomes of transformations on 2-d and 3-d objects.

## BENCHMARKS AND INDICATORS:

### Number Sense

#### 1.1 Demonstrates number sense for real numbers and simple algebraic expressions

- 8A11K2 states, explains and uses equivalent representations for real numbers and algebraic expressions, including integers, fractions, decimals, percents, ratios, rational number bases with integer exponents, scientific notation and absolute value
- **\*8A11K5a-c states and explains what happens to the product or quotient when positive number is multiplied and divided by a rational number greater than zero and (a) less than one, (b) greater than one, and (c) zero (division by zero will not be tested)**

#### 1.2 Demonstrates an understanding of the real number system; recognizes, applies, and explains their properties to algebraic expressions

- **\*8A12K2 identifies all the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] to which a given number belongs. (irrational numbers will not be tested)**
- **\*8A12A1a-b generates and solves real-world problems with rational numbers using the concepts of these properties (a) commutative, associative, distributive, and substitution, (b) identity and inverse properties of addition and multiplication, symmetric property of equality, and zero product property**

#### 1.3 Uses computational estimation with real numbers

- #8A13A1 adjusts original rational number estimate of a real-world problem based on additional information (a frame of reference)e.g. estimate how long it takes to walk from here to there; time how long it takes to take five steps and adjust your estimate. Must be able to set up a proportion to solve.

#### 1.1 Computation-the student models, performs and explains computation with real numbers and polynomials

- **N\*8A14K2a-c performs and explains these computational procedures with rational numbers (a) addition, subtraction, multiplication, and division of integers, (b) orders of operations, (c) multiplication of radicals**
- 8A14K2d multiplication and division to find (a) percent of a number, (b) percent of increase and decrease (c) percent one number is of another number (d) a number when a percent of a number is given

- 8A14K2e-f (e) addition, subtraction and multiplication of polynomials, (f) simplifies algebraic monomial expressions using the properties of exponents using integer exponents
- **\*8A14A1a-c generates and solves one- and two-step real world problems using computational procedures and mathematical concepts with (a) rational numbers, (b) the irrational number  $\pi$  as an approximation, (c) applications of percents e.g., sales tax and discounts. ( percents greater than or equal to 100 will not be tested)**
- #8A14K2 simplifying radicals to an exact answer including rationalizing the denominator

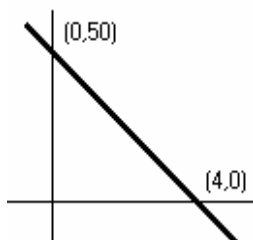
## Algebra

### 2.1 Uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities

- **\*8A22K3a solves one- and two-step linear equations and inequalities in one variable with rational number coefficients and constants intuitively and/or analytically**
- #8A22K3a-f solves equations in the following formats (a) linear equations and inequalities, (b) quadratic equations using factoring (using the box) and by taking the square root of both sides (c) systems of linear equations with two unknowns using integer coefficients and constants, and how the solution relates to the graph (d) radical equations, and (e) rational equations with binomials within the fraction, (f) absolute value equations and inequalities
- **\*8A22A1a represent real-world problems using variables, symbols, expressions, one- and two-step equations with rational number coefficients and constants**
- #8A22A3a generates real-world problems that represent one- and two-step linear equations e.g. tickets for a school play are \$5 for adults and \$3 for students. You need to sell at least \$65 in tickets. Give an inequality and a graph that represents this situation and three possible solutions

### 2.3 Recognizes, describes, and analyzes constant, linear, and nonlinear relationships

- 8A23K3 explains the concepts of slope and x- and y-intercepts of a line, also recognizes how changes in the constant and/or slope within a linear function changes the appearance of the graph
- **\*8A23A3 translates between the numerical, tabular, graphical, and symbolic representations of linear relationships with integer coefficients and constants**
- #8A23A2 interprets the meaning of the x- and y- intercepts, slope, and/or points on and off the line on a graph in the context of a real-world situation (2.4.A1e) (\$), e.g., the graph below represents a tank full of water being emptied. What does the y-intercept represent? What does the x-intercept represent? What is the rate at which it is emptying? What does the point (2, 25) represent in this situation? What does the point (2,30) represent in this situation?
- The Water Tank      x axis=hours    y axis=gallons



- #8A23K2 matches equations to graphs, and names of the linear, quadratic, absolute value and square root functions
- #8A23K2 determine if a relation (given in a variety of formats) is a function
- #8A23K5 Identify the domain and range for a relation ( given in a variety of formats)

- #8A23K7 Uses function notation

2.4 Generates and uses mathematical models to represent and justify mathematical relationships found

- **\*8P24A2 determines if a given graphical, algebraic, or geometric model is an accurate representation of a given real-world situation**

## Geometry

3.1 Recognizes geometric figures and compares their properties

- **\*8A31K6a-b uses the pythagorean theorem to (a) determine if a triangle is a right triangle, (b) find a missing side of a right triangle where the lengths of all three sides are whole numbers**
- **\*8A31A1a solves real world problems by (a) using the properties of corresponding parts of similar and congruent figures e.g. scale drawings, map reading, proportions, or indirect measurements**

3.2 Estimates, measures and uses geometric formulas.

- 8A32K3 converts within the customary system and within the metric system
- 8A32K5a-c uses given measurement formulas to find: (a) area of parallelograms, circles, triangles, and trapezoids, (b) surface area of rectangular prisms, triangular prisms, and cylinders, (c) volume of rectangular prisms, triangular prisms, and cylinders
- 8A32K6 recognizes how ratios and proportions can be used to measure inaccessible objects. e.g. flagpoles and shadow

3.3 Recognizes and applies transformations on geometric figures

- 8A33K1 identifies, describes, and performs single and multiple transformations [reflection, rotation, translation, reduction (contraction/shrinking), enlargement ( magnification/growing) on a two-dimensional figure], and analyzes the impact of transformations on the perimeter and area of circles, rectangles, and triangles and volume of rectangular prisms and cylinders
- #8A33K1 describe and draw multiple transformations on a function

3.4 Uses an algebraic perspective to examine the geometry of two-dimensional figures

- **\*8A34K1a-d uses the coordinate plane to (a) list several ordered pairs on the graph of a line and find the slope of the line, (b) recognize that ordered pairs that lie on the graph of an equation are solutions to the equation, (c) recognize that points that do not lie on the graph of an equation are not solutions to that equation, (d) determine the length of a side of a figure drawn on a coordinate plane with vertices having the same x- and y-coordinates**
- #8A34K4 finds and explains the relationship between the slopes of parallel and perpendicular lines (2.4.K1f), e.g., the equation of a line  $2x + 3y = 12$ . The slope of this line is  $-2/3$ . What is the slope of a line perpendicular to this line?
- #8A34K6 recognizes the equation of a line and transforms the equation from point-slope and standard form into slope-intercept form in order to identify the slope and y-intercept and uses this information to graph the line
- #8A34K5 Uses Pythagorean Theorem to find the distance between two points
- #8A34K7 identifies characteristics of various functions such as open up or down, vertex, axis of symmetry, compression or stretch, sketch the graph, etc.

## Data

4.1 Applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects

- **\*8A41K3 finds the probability of a compound event composed of two independent events in an experiment, simulation, or situation**
- 8A41K5 finds the odds of a desired outcome in an experiment or simulation and expresses the answer of a ratio
- **\*8A41A4a makes predictions based on the theoretical probability of (a) a simple event in an experiment or simulation**
- #8A41K3 explains the relationship between probability and odds and computes one given the other

4.2 Collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data

- **\*8A42K3 determines and explains the measures of central tendency (mode, median, mean, range) for a rational number data set**
- 8A42K4 determines and explains the range, quartiles, and interquartile range for a rational number data set.
- 8A42K5 explains the effects of outliers on the median, mean, and range of a set of data
- #8A42K5 approximates a line of best fit given a scatter plot and makes predictions using the graph or the equation of that line
- #8A42A1a-h uses data analysis (mean, median, mode, range, quartile, interquartile range) in real-world problems with rational number data sets to compare and contrast two sets of data, to make accurate inferences and predictions, to analyze decisions, and to develop convincing arguments from these **data displays**
  - a. frequency tables and line plots;
  - b. bar, line, and circle graphs;
  - c. Venn diagrams or other pictorial displays;
  - d. charts and tables;
  - e. stem-and-leaf plots (single and double);
  - a.** scatter plots
  - b.** box-and-whiskers plots;
  - h. histograms.