PRE-ALGEBRA EIGHTH GRADE

PURPOSE:

Students will demonstrate number sense by identifying and explaining subsets of the real number system and by performing computational procedures with rational numbers. They will recognize and model patterns in the real world by generating, simplifying, and solving algebraic expressions and equations and translates between numerical, tabular, graphical, and symbolic representations of linear relationships. Students will use geometric properties and formulas, recognize and apply transformations on geometric figures and analyze slopes of a line on a coordinate plane. The students will organize, display and explain numerical data sets and apply the concepts of probability to draw conclusions and make predictions .

BENCHMARKS AND INDICATORS:

Number Sense

1.1 Demonstrates number sense for real numbers and simple algebraic expressions

- 8P11K2 states, explains and uses equivalent representations for rational numbers and simple algebraic expressions, including integers, fractions, decimals, percents, and ratios
- 8P11K4 recognize and describes irrational numbers
- ***8P11K5a-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 by tested**)**
- 8P11K6 explains and determines the absolute value of real numbers

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

- ***8P12K2 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)**
- ***8P12A1a-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**

1.3 Uses computational estimation with real numbers

- 8P13K2 uses various estimation strategies and explains how they were used to estimate real number quantities and simple algebraic expressions
- 8P13K3 state and explains why a decimal representation of *pi* is an approximate value
- 8P13K4 identify and explain between which two consecutive integers and irrational number lies

1.4 Models, performs, and explains computation with rational numbers, the irrational number *pi*, and algebraic expressions

- **N*8P14K2a-b performs and explains these computational procedures with rational numbers (a) addition, subtraction, multiplication, and division of integers, (b) orders of operations**

- 8P14K2d 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
- 8P14K2e-f (e) addition of polynomials, (f) simplifies algebraic expressions in one variable by combining like terms or by using the distributive property
- 8P14K3 list factors and common factors of simple monomial expressions
- ***8P14A1a-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)**

Algebra

2.1 Recognizes, describes, extends, develops, and explains the general rule of a pattern

- 8P21K1a-b identifies, states, and continues a pattern presented in various formats including numeric, algebraic, visual, verbal, kinesthetic, and written using these attributes; (a) counting numbers including perfect squares, cubes, and factors, (b) rational numbers including arithmetic and geometric sequences
- 8P21K4 states the rule to find the nth term of a pattern using explicit symbolic notation

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

- ***8P22K3a solves one- and two-step linear equations in one variable with rational number coefficients and constants intuitively and/or analytically**
- 8P22K3b-c solves (b) one-step linear inequalities in one variable with rational number coefficients and constants intuitively, analytically and graphically. (c) systems of given linear equations with whole number coefficients and constants graphically
- 8P22K4 states and describes the mathematical relationship between ratios, proportions, and percents and how to solve for a missing monomial term in a proportion.
- ***8P22A1a represent real-world problems using variables, symbols, expressions, one- and two-step equations with rational number coefficients and constants**
- 8P22A3a generates real-world problems that represent one- and two-step linear equations

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

- 8P23K3 explains the concepts of slope and x- and y-intercepts of a line
- 8P23K5 identifies ordered pairs from a graph, and /or plots ordered pairs using a variety of scales for the x- and y-axis
- ***8P23A3 translates between the numerical, tabular, graphical, and symbolic representations of linear relationships with integer coefficients and constants**

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

- 8P24K1d, e, g, k, states, explains and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Models include: (d) factor trees to model LCM, GCF, and prime factorization, (e) equations and inequalities to model numerical relationships, (g) coordinate planes to model relationships between ordered pairs and linear equations and inequalities, (k) frequency tables, bar graphs, circle graphs, Venn diagrams, charts, tables, single and double stem-and-leaf plots, scatter plots, box-and-whisker plots to organize and display data

- ***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

- 8P31K2a,d,f,g discusses properties of triangles and quadrilaterals related to: (a) sum of the interior angles of any triangle is 180 degrees, (d) rectangles have angles of 90 degrees, sides may or may not be equal, (f) squares have angles of 90 degrees, all sides congruent, (g) trapezoids have one pair of opposite sides parallel and the other pair of opposite sides are not parallel
- ***8P31K6a-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**
- ***8P31A1a 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

- 8P32K3 converts within the customary system and within the metric system.
- 8P32K5a-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
- 8P32K6 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

- 8P33K1 identifies, describes, and performs single and multiple transformations [reflection, rotation, translation, reduction (contraction/shrinking), enlargement (magnification/growing) on a two-dimensional figure]

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

- ***8P34K1a-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**

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

- ***8P41K3 finds the probability of a compound event composed of two independent events in an experiment, simulation, or situation**
- 8P41K5 finds the odds of a desired outcome in an experiment or simulation and expresses the answer of a ratio
- ***8P41A4a makes predictions based on the theoretical probability of (a) a simple event in an experiment or simulation**

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

- ***8P42K3 determines and explains the measures of central tendency (mode, median, mean, range) for a rational number data set**
- 8P42K4 determines and explains the range, quartiles, and interquartile range for a rational number data set
- 8P42K5 explains the effects of outliers on the median, mean, and range of a set of data