MATHEMATICS

Fourth Grade – Areas of Focus:

<u>Operations and Algebraic Thinking</u>
- Use the four operations with whole numbers to solve problems. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: multiplication/multiply, division/divide, addition/add, subtraction/subtract, equations, unknown, remainders, reasonableness, mental computation, estimation, rounding.
- Gain familiarity with factors and multiples. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: multiplication/multiply, division/divide, factor pairs, factor, multiple, prime, composite.
- Generate and analyze patterns. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: pattern (number or shape), pattern rule.

<u>Number and Operations in Base 10</u>
- Generalize place value understanding for multi-digit whole numbers. Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.
- Use place value understanding and properties of operations to perform multi-digit arithmetic. Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products.

<u>Number and Operations - Fractions</u>
- Extend understanding of fraction equivalence and ordering. Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions.
- Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.
- Understand decimal notation for fractions, and compare decimal fractions. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: fraction, numerator, denominator, equivalent, reasoning, decimals, tenths, hundredths, multiplication, comparisons/compare, ‹, ›, =

Measurement and Data
- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: measure, metric, customary, convert/conversion, relative size, liquid volume, mass, length, distance, kilometer (km), meter (m), centimeter (cm), millimeter (mm), kilogram (kg), gram (g), liter (L), milliliter (mL), inch (in), foot (ft), yard (yd), mile (mi), ounce (oz), pound (lb), cup (c), pint (pt), quart (qt), gallon (gal), time, hour, minute, second, equivalent, operations, add, subtract, multiply, divide, fractions, decimals, area, perimeter.
- Represent and interpret data. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: data, line plot, length, fractions.
- Geometric measurement: understand concepts of angle and measure angles. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: measure, point, end point, geometric shapes, ray, angle, circle, fraction, intersect, one-degree angle, protractor, decomposed, addition, subtraction, unknown.

Geometry
- Draw and identify lines and angles, and classify shapes by properties of their lines and angles. Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Fluency by the end of Fourth Grade
- Add and subtract within 1,000,000.

Fifth Grade – Areas of Focus:

Operations and Algebraic Thinking
- Write and interpret numerical expressions. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: parentheses, brackets, braces, numerical expressions.
- Analyze patterns and relationships. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: numerical patterns, rules, ordered pairs, coordinate plane.

Number and Operations in Base 10
- Understand the place value system. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: place value, decimal, decimal point, patterns, multiply, divide, tenths, thousands, greater than, less than, equal to, ‹, ›, =, compare/comparison, round.

- Perform operations with multi-digit whole numbers and with decimals to hundredths. Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

Number and Operations - Fractions
- Use equivalent fractions as a strategy to add and subtract fractions. Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them.
- Apply and extend previous understandings of multiplication and division to multiply and divide fractions. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense.

Measurement and Data
- Convert like measurement units within a given measurement system. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: conversion/convert, metric and customary measurement From previous grades: relative size, liquid volume, mass, length, kilometer (km), meter (m), centimeter (cm), kilogram (kg), gram (g), liter (L), milliliter (mL), inch (in), foot (ft), yard (yd), mile (mi), ounce (oz), pound (lb), cup (c), pint (pt), quart (qt), gallon (gal), hour, minute, second.
- Represent and interpret data. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: line plot, length, mass, liquid volume.
- Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems.

Geometry
- Graph points on the coordinate plane to solve real-world and mathematical problems. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: coordinate system, coordinate plane, first quadrant, points, lines, axis/axes, x-axis, y-axis, horizontal, vertical, intersection of lines, origin, ordered pairs, coordinates, x-coordinate, y-coordinate
- Classify two-dimensional figures into categories based on their properties. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: attribute, category, subcategory, hierarchy, (properties)-rules about how numbers work, two dimensional From previous grades: polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, cube, trapezoid, half/quarter circle, circle, kite.

Fluency by the end of Fifth Grade
- Multi digit multiplication.

Sixth Grade – Areas of Focus:

Ratios and Proportional Reasoning
- Understand ratio concepts and use ratio reasoning to solve problems. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: ratio, equivalent ratios, tape diagram, unit rate, part-to-part, part-to-whole, percent.

The Number System
- Apply and extend previous understandings of multiplication and division to divide fractions by fractions. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: reciprocal, multiplicative inverses, visual fraction model.
- Compute fluently with multi-digit numbers and find common factors and multiples. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: greatest common factor, least common multiple, prime numbers, composite numbers, relatively prime, factors, multiples, distributive property, prime factorization.
- Apply and extend previous understandings of numbers to the system of rational numbers. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: rational numbers, opposites, absolute value, greater than, >, less than, <, greater than or equal to, ≥, less than or equal to, ≤, origin, quadrants, coordinate plane, ordered pairs, x-axis, y-axis, coordinates.

Expressions and Equations
- Apply and extend previous understandings of arithmetic to algebraic expressions. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: exponents, base, numerical expressions, algebraic expressions, evaluate, sum, term, product, factor, quantity, quotient, coefficient, constant, like terms, equivalent expressions, variables.
- Reason about and solve one-variable equations and inequalities. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: inequalities, equations, greater than, >, less than, <, greater than or equal to, ≥, less than or equal to, ≤, profit, exceed.
- Represent and analyze quantitative relationships between dependent and independent variables. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: dependent variables, independent variables, discrete data, continuous data.

Geometry
- Solve real-world and mathematical problems involving area, surface area, and volume. Mathematically proficient students communicate precisely by engaging in discussion about their

reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: area, surface area, volume, decomposing, edges, dimensions, net, vertices, face, base, height, trapezoid, isosceles, right triangle, quadrilateral, rectangles, squares, parallelograms, trapezoids, rhombi, kites, right rectangular prism.

<u>Statistics and Probability</u>
- Develop understanding of statistical variability. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: statistics, data, variability, distribution, dot plot, histograms, box plots, median, mean.
- Summarize and describe distributions. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: box plots, dot plots, histograms, frequency tables, cluster, peak, gap, mean, median, interquartile range, measures of center, measures of variability, data, Mean Absolute Deviation (M.A.D.), quartiles, lower quartile (1st quartile or Q1), upper quartile (3rd quartile or Q3), symmetrical, skewed, summary statistics, outlier.

<u>Fluency by the end of Sixth Grade</u>
- Multi digit division.
- Multi digit decimal operations.

Seventh Grade – Areas of Focus:
<u>Ratios and Proportional Reasoning</u>
- Analyze proportional relationships and use them to solve real-world and mathematical problems. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: proportion, ratio, proportional relationships, percent, simple interest, rate, principal, tax, discount, markup, markdown, gratuity, commissions, fees, percent of error.

<u>The Number System</u>
- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: rational numbers, integers, additive inverse.

<u>Expressions and Equations</u>
- Use properties of operations to generate equivalent expressions. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: coefficients, like terms, distributive property, factor.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should

learn to use with increasing precision with this cluster are: numeric expressions, algebraic expressions, maximum, minimum.

Geometry
- Draw, construct and describe geometrical figures and describe the relationships between them. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: scale drawing, dimensions, scale factor, plane sections, right rectangular prism, right rectangular pyramids, parallel, perpendicular.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: inscribed, circumference, radius, diameter, pi, supplementary, vertical, adjacent, complementary, pyramids, face, base.

Statistics and Probability
- Use random sampling to draw inferences about a population. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: random sampling, population, representative sample, inferences.
- Draw informal comparative inferences about two populations. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: variation/variability, distribution, measures of center, measures of variability.
- Investigate chance processes and develop, use, and evaluate probability models. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: sample spaces.

Eighth Grade – Areas of Focus:

<u>The Number System</u>
- Know that there are numbers that are not rational, and approximate them by rational numbers. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: Real Numbers, Irrational numbers, Rational numbers, Integers, Whole numbers, Natural numbers, radical, radicand, square roots, perfect squares, cube roots, terminating decimals, repeating decimals, truncate.

<u>Expressions and Equations</u>
- Work with radicals and integer exponents. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: laws of exponents, power, perfect squares, perfect cubes, root, square root, cube root, scientific notation, standard form of a number. Students should also be able to read and use the symbol: ±.
- Understand the connections between proportional relationships, lines, and linear equations. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: unit rate, proportional relationships, slope, vertical, horizontal, similar triangles, y-intercept.
- Analyze and solve linear equations and pairs of simultaneous linear equations. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: intersecting, parallel lines, coefficient, distributive property, like terms, substitution, system of linear equations.

<u>Functions</u>
- Define, evaluate, and compare functions. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: functions, y-value, x-value, vertical line test, input, output, rate of change, linear function, non-linear function.
  - Use functions to model relationships between quantities. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: linear relationship, rate of change, slope, initial value, y-intercept.

<u>Geometry</u>
- Understand congruence and similarity using physical models, transparencies, or geometry software. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: translations, rotations, reflections, line of reflection, center of rotation, clockwise, counterclockwise, parallel lines, betweenness, congruence, ≅, reading A' as "A prime", similarity, dilations, pre-image, image, rigid transformations, exterior angles, interior angles, alternate interior angles, angle-angle criterion, deductive reasoning, vertical angles, adjacent, supplementary, complementary, corresponding, scale factor, transversal, parallel.

- Understand and apply the Pythagorean Theorem. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: right triangle, hypotenuse, legs, Pythagorean Theorem, Pythagorean triple.
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: cones, cylinders, spheres, radius, volume, height, Pi.

Statistics and Probability
- Investigate patterns of association in bivariate data. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: bivariate data, scatter plot, linear model, clustering, linear association, non-linear association, outliers, positive association, negative association, categorical data, two-way table, relative frequency.