SIXTH GRADE

Mathematics Standards for the Archdiocese of Detroit

Ratios & Proportional Relationships	
Understand ratio concepts and use ratio reasoning to solve problems	
6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes the ratio A to C is 1:3 or 1/3."
6.RP.A.2	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.(75/15=5/1)".
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams (fraction bars), double number line diagrams, or equations.
6.RP.A.3a	Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
6.RP.A.3b	Find equivalent ratios by scaling up or scaling down.
6.RP.A.3c	Solve unit rate problems including those involving unit pricing, and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?
6.RP.A.3d	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
6.RP.A.3e	Calculate part of a number given the percentage and the number (e.g., 20% of $5 is what part of $5?).
6.RP.A.3f	Solve contextual problems involving percentages such as sales taxes and tips.
6.RP.A.3g	For applied situations, estimate the answers to calculations involving operations with rational numbers (e.g. 1/2 of 55 is about 25).
6.RP.A.3h	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities (e.g. ½ yard is equivalent to 18 inches).
6.RP.A.3i	Convert between basic units of measurement within a single measurement system (square inches to square feet).
The Number System	
Apply and extend previous understandings of multiplication and division.	

6.NS.A.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi? Compute fluently with multi-digit numbers and find common factors and multiples*.
6.NS.A.2	Understand division of fractions and whole numbers as the inverse of multiplication (e.g., 4/2=4 x 1/2).
6.NS.A.3	Solve for the unknown value in equations such as 1/4 ÷ n = 1/8.
6.NS.A.4	Multiply and divide any two fractions, including mixed numbers, fluently.
Compute fluently with multi-digit numbers and find common factors and multiples.	
6.NS.B.5	Fluently divide multi-digit numbers using the standard algorithm.
6.NS.B.6	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
6.NS.B.7	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12.
6.NS.B.8	Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4(9+ 2). Apply and extend previous understandings of numbers to the system of rational numbers*.
6.NS.B.9	Find the greatest common factor and least common multiple for two or more whole numbers using prime factorization.
Apply and extend previous understandings of numbers to the system of rational numbers.	
6.NS.C.10	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
6.NS.C.11	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinate.
6.NS.C.11a	Recognize opposite signs of numbers as indicating locations on opposite

	sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. Understand that 0 is an integer that is neither negative nor positive.
6.NS.C.11b	Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
6.NS.C.11c	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
6.NS.C.12	Understand that rational numbers are quotients of integers (non- zero denominators); a rational number is either a fraction or a negative fraction.
6.NS.C.13	Understand that a fraction or a negative fraction is a quotient of two integers (-8/3 is -8÷3).
6.NS.C.13a	Represent rational numbers as fractions or decimals (terminating or repeating) when possible, and translate between the representations.
6.NS.C.14	Add, subtract, multiply, and divide positive rational numbers fluently.
6.NS.C.15	Understand integer subtraction as the inverse of integer addition.
6.NS.C.16	Understand integer division as the inverse of integer multiplication.
6.NS.C.17	Add and multiply integers between -10 and 10; subtract and divide integers using the related facts. Use the number line and chip models for addition and subtraction.
6.NS.C.18	Understand and use positive exponents with integers.
6.NS.C.18a	Express numbers in scientific notation.
6.NS.C.19	Understand the concept of square root and cube root.
6.NS.C.20	Understand ordering and absolute value of rational numbers.
6.NS.C.20a	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right*.
6.NS.C.20b	Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 ^{o}C > –7 ^{o}C to express the fact that –3 ^{o}C is warmer than –7 ^{o}C.*
6.NS.C.20c	Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars*.
6.NS.C.20d	Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars*.

6.NS.C.21	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
Expressions & Equations	
Apply and extend previous understandings of arithmetic to algebraic expressions.	
6.EE.A.1	Write and evaluate numerical expressions involving whole-number exponents.
6.EE.A.2	Write, read, and evaluate expressions in which letters stand for numbers (variables).
6.EE.A.2a	Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y, or 8 is less than y as y - 8.*
6.EE.A.2b	Identify parts of an expression using mathematical terms (sum, difference, product, quotient, term, factor, coefficient, variable, constant); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms*.
6.EE.A.2c	Evaluate expressions. Include expressions that arise from formulas used in real-world problems. *For example, use the formulas $V = s^3$ and $A = 6\ s^2$ to find the volume and surface area of a cube with sides of length s = 1/2*. (Order of Operations).
6.EE.A.3	Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*
6.EE.A.4	Identify and explain when two expressions are equivalent. *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*
Reason about and solve one-variable equations and inequalities.	
6.EE.B.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
6.EE.B.7	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

6.EE.B.8	Distinguish between an algebraic expression and an equation.
6.EE.B.9	Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same solution.
6.EE.B.10	Understand that multiplying or dividing both sides of an equation by the same non-zero number creates a new equation that has the same solutions.
6.EE.B.11	Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x <$ c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
Represent and analyze quantitative relationships between dependent and independent variables.	
6.EE.C.12	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*
Represent Linear Functions Using Tables, Equations, and Graphs	
6.EE.D.13	Understand that relationships between quantities can be represented by graphs and tables.
6.EE.D.14	Solve simple problems involving linear functions whose input values are integers; write the equation; graph the resulting ordered pairs of integers.
6.EE.D.15	Represent simple relationships between quantities using verbal descriptions, formulas or equations, tables, and graphs.
Geometry	
Solve real-world and mathematical problems involving area, surface area, and volume.	
6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
6.G.A.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
6.G.A.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in

	the context of solving real-world and mathematical problems.
6.G.A.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
6.G.A.5	Understand and apply basic properties of lines, and angles.
6.G.A.5a	Understand congruence of corresponding and alternate interior angles when parallel lines are cut by transversal, and that such congruencies imply parallel lines.
6.G.A.5b	Locate interior and exterior angles of any triangle, and use the property that an exterior angle of a triangle is equal to the sum of the remote (opposite) interior angles.
6.G.A.6	Understand and apply basic properties of triangles, including: triangle inequality relationships of vertical angles, complementary angles, supplementary angles.
6.G.A.7	Understand that for polygons, congruence means corresponding sides and angles have equal measures.
6.G.A.7a	know that the sum of the exterior angles of a convex polygon is 360º.
6.G.A.8	Understand the basic rigid motions (transformations) in the plane (reflections, rotations, translations).
6.G.A.8a	Understand and use simple compositions of basic rigid transformations (a translation followed by reflection).
Statistics & Probability	
Develop understanding of statistical variability.	
6.SP.A.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages*.
6.SP.A.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
6.SP.A.3	Recognize that a measure of center (median and/or mean) for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
Summarize and describe distributions.	
6.SP.B.4	Display numerical data in plots on a number line, including dot plots, circle graphs, stem and leaf plots, histograms, box and whisker plots, and select appropriate representation to address questions.
6.SP.B.5	Summarize numerical data sets in relation to their context.
6.SP.B.5a	Reporting the number of observations.
6.SP.B.5b	Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
6.SP.B.5c	Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking.

6.SP.B.5d	Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.