Pre K-Kindergarten Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

PLEASE NOTE: *These learner outcomes are presented and/or reinforced over a two-year period in Pre K (if applicable) and Kindergarten. It is expected that students (by the end of Kindergarten) will be able to do the following:*

Number Sense and Operations
1) Count by ones to at least 20.
2) Match quantities up to at least 10 with numerals and words.
3) Identify positions of objects in sequences (e.g., first, second) up to fifth.
4) Compare sets of up to at least 10 concrete objects using appropriate language (e.g., none, more than, fewer than, same number of, one more than), and order numbers.
5) Understand the concepts of whole and half.
6) Identify U.S. coins by name.
7) Use objects and drawings to model and solve related addition and subtraction problems to ten.
8) Estimate the number of objects in a group and verify results.

Patterns, Relations, and Algebra
1) Identify the attributes of objects as foundation for sorting and classifying (e.g., a red truck, a red block, and a red ball share the attribute of being red).
2) Sort and classify objects by color, shape, size, number, and other properties.
3) Identify, reproduce, describe, extend, and create color, rhythmic, shape, number, and letter repeating patterns with simple attributes (e.g., ABABAB…).
4) Count by fives and tens at least up to 50.

Geometry
1) Name, describe, sort, and draw simple two-dimensional shapes.
2) Describe attributes of two-dimensional shapes (e.g., number of sides, number of corners).
3) Name and compare three-dimensional shapes.
4) Identify positions of objects in space, and use appropriate language (e.g., beside, inside, next to, close to, above, below, apart) to describe and compare their relative positions.

Measurement
1) Recognize and compare the attributes of length, volume/capacity, weight, area, and time using appropriate language (e.g., longer, taller, shorter, same length; heavier, lighter, same weight; holds more, holds less, holds the same amount).
2) Make and use estimates of measurements from everyday experiences..
3) Use nonstandard units to measure length, area, weight, and capacity.

Data Analysis, Statistics, and Probability
1) Collect, sort, organize, and draw conclusions about data using concrete objects, pictures, numbers and graphs.

Grades 1-2 Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

PLEASE NOTE: *These learner outcomes are presented and/or reinforced over a two-year period in grades 1 and 2. It is expected that students (by the end of grade 2) will be able to do the following:*

Number Sense and Operations	
1)	Name and write (in numerals) whole numbers to 1000, identify the place values of the digits, and order the numbers.
2)	Identify and distinguish among multiple uses of numbers, including cardinal (to tell how many) and ordinal (to tell which one in an ordered list), and numbers as labels and as measurements.
3)	Identify and represent common fractions (1/2, 1/3, ¼) as parts of wholes, parts of groups, and numbers on the number line.
4)	Compare whole numbers using terms and symbols (e.g., less than, equal to, greater than, <, =, >).
5)	Identify odd and even numbers and determine whether a set of objects has an odd or even number of elements.
6)	Identify the value of all U.S. coins, and $1, $5, $10, and $20 bills. Find the value of a collection of coins and dollar bills and different ways to represent an amount of money up to $5. Use appropriate notation (e.g., 69¢, $1.35).
7)	Demonstrate an understanding of various meanings of addition and subtraction (e.g., addition as combination—plus, combined with, more; subtraction as comparison—how much less, how much more; equalizing—how many more are needed to make these equal; separation—how much remaining).
8)	Understand and use the inverse relationship between addition and subtraction (e.g., 8+6=14 is equivalent to 14-6=8 and is also equivalent to 14-8=6) to solve problems and check solutions.
9)	Know addition facts (addends to ten) and related subtraction facts, and use them to solve problems.
10)	Demonstrate the ability to add and subtract three-digit numbers accurately and efficiently.
11)	Demonstrate in the classroom an understanding of and the ability to use the conventional algorithms for addition (two 3-digit numbers and three 2-digit numbers) and subtraction (two 3-digit numbers).
12)	Estimate, calculate, and solve problems involving addition and subtraction of two-digit numbers. Describe differences between estimates and actual calculations.

Patterns, Relations, and Algebra	
1)	Identify, reproduce, describe, extend, and create simple rhythmic, shape, size, number, color, and letter repeating patterns.
2)	Identify different patterns on the hundreds chart.
3)	Describe and create addition and subtraction number patterns (e.g., 1, 4, 7, 10…; or 25, 23, 21…).
4)	Skip count by twos, fives, and tens up to at least 50, starting at any number.
5)	Construct and solve open sentences that have variables (e.g. □ +7=10).
6)	Write number sentences using +, -, <, =, and/or > to represent mathematical relationships in everyday situations.
7)	Describe functions related to trading, including coin trades and measurement trades (e.g. five pennies make one nickel, four cups make one quart, 11 nickels are worth more than 5 dimes).

Geometry	
1)	Describe attributes and parts of two-and three-dimensional shapes (e.g., length of sides, and number of corners, edges, faces, and sides).
2)	Identify, describe, draw, and compare two-dimensional shapes, including both polygonal (up to six sides) and curved figures such as circles.
3)	Recognize congruent shapes.
4)	Identify shapes that have been rotated (turned), reflected (flipped), translated (slid), and enlarged. Describe direction of translations (e.g., left, right, up, down).
5)	Identify symmetry in two-dimensional shapes.
6)	Predict the results of putting shapes together and taking them apart.
7)	Relate geometric ideas to numbers (e.g., seeing rows in an array as a model of repeated addition).

Grades 1-2 Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

Measurement
1)   Identify parts of the day (e.g., morning, afternoon, evening), week, month, and calendar.
2)   Tell time at quarter-hour intervals on analog and digital clocks using a.m. and p.m.
3)   Compare the length, weight, area, and volume of two or more objects by using direct comparison.
4)   Measure and compare common objects using metric and English units of length measurement (e.g. centimeter, inch).
5)   Select and correctly use the appropriate measurement tools (e.g., ruler, balance scale, thermometer).
6)   Make and use estimates of measurement, including time, volume, weight, and area.

Data Analysis, Statistics, and Probability
1)   Use interviews, surveys, and observations to gather data about themselves and their surroundings
2)   Organize, classify, represent, and interpret data using tallies, charts, tables, bar graphs, pictographs, and Venn diagrams; interpret the representations.
3)   Formulate inferences (draw conclusions) and make educated guesses (conjectures) about a situation based on information gained from data.
4)   Decide which outcomes of experiments are most likely.

Grades 3-4 Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

PLEASE NOTE: *These learner outcomes are presented and/or reinforced over a two-year period in grades 3 and 4. It is expected that students (by the end of grade 4) will be able to do the following:*

Number Sense and Operations

1)	Exhibit an understanding of the base ten number system by reading, modeling, writing, and interpreting whole numbers to at least 100,000; demonstrating an understanding of the values of the digits; and comparing and ordering the numbers.
2)	Represent, order, and compare large numbers (to at least 100,000) using various forms, including expanded notation (e.g., 853=8 x 100 + 5 x 10 + 3).
3)	Demonstrate an understanding of fractions as parts of unit wholes, as parts of a collection, and as locations on the number line.
4)	Select, use, and explain models to relate common fractions and mixed numbers (1/2, 1/3, 1/4, 1/5, 1/6, 1/8, 1/10, 1/12, and 1½), find equivalent fractions, mixed numbers, and decimals, and order fractions.
5)	Identify and generate equivalent forms of common decimals and fractions less than one whole (halves, quarters, fifths and tenths).
6)	Exhibit an understanding of the base ten number system by reading, naming, and writing decimals between 0 and 1 up to the hundredths.
7)	Recognize classes (in particular, odds, evens; factors or multiples of a given number; and squares) to which a number may belong, and identify the numbers in those classes. Use these in the solution of problems.
8)	Select, use, and explain various meanings and models of multiplication and division of whole numbers. Understand and use the inverse relationship between the two operations.
9)	Select, use, and explain the commutative, associative, and identity properties of operations on whole numbers in problem situations (e.g., 37 x 46 = 46 x 37, (5 x 7) x 2 = 5 x (7 x 2)).
10)	Select and use appropriate operations (addition, subtraction, multiplication, division) to solve problems, including those involving money.
11)	Know multiplication facts through 12 x 12 and related division facts. Use these facts to solve related multiplication problems and compute related problems (e.g., 3 x 5 is related to 30 x 50, 300 x 5, and 30 x 500).
12)	Add and subtract (up to five-digit numbers) and multiply (up to three digits by two digits) accurately and efficiently.
13)	Divide up to a three-digit whole number with a single-digit divisor (with or without remainders) accurately and efficiently.
14)	Demonstrate in the classroom an understanding of and the ability to use the conventional algorithms for addition and subtraction (up to five-digit numbers), and multiplication (up to three digits by two digits).
15)	Demonstrate in the classroom an understanding of and the ability to use the conventional algorithm for division of up to a three-digit whole number with a single-digit divisor (with or without remainders).
16)	Round whole numbers through 100,000 to the nearest 10, 100, 1000. 10,000, and 100,000.
17)	Select and use a variety of strategies (e.g., front-end, rounding, and regrouping) to estimate quantities, measures, and the results of whole-number computations up to three-digit whole numbers and amounts of money to $1000, and to judge the reasonableness of the answer.
18)	Use concrete objects and visual models to add and subtract common fractions.

Patterns, Relations, and Algebra

1)	Create, describe, extend and explain symbolic (geometric) and numeric patterns, including multiplication patterns like 3, 30,300,3000…
2)	Use symbol and letter variables (e.g. Δ. X) to represent unknowns or quantities that vary in expressions and in equations or inequalities (mathematical sentences that use =, <,>).
3)	Determine values of variables in simple equations (e.g. 4106 – Δ =37, 5 = µ + 3).
4)	Use pictures, models, tables, charts, graphs, words, number sentences, and mathematical notations to interpret mathematical relationships.
5)	Solve problems involving proportional relationships, including unit pricing (e.g., four apples cost 80¢, so one apple costs 20¢) and map interpretation (e.g. one inch represents five miles, so two inches represent ten miles).
6)	Determine how change in one variable relates to a change in a second variable (e.g., input-output tables).

Grades 3-4 Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

Geometry

1)	Compare and analyze attributes and other features (e.g., number of sides, faces, corners, right angles, diagonals, and symmetry) of two- and three-dimensional geometric shapes.
2)	Describe, model, draw, compare, and classify two-and three-dimensional shapes (e.g., circles, polygons—especially triangles and quadrilaterals—cubes, spheres, and pyramids).
3)	Recognize similar figures.
4)	Identify angles as acute, right, or obtuse.
5)	Describe and draw intersecting, parallel, and perpendicular lines.
6)	Using ordered pairs of numbers and/or letters, graph, locate, identify points, and describe paths (first quadrant).
7)	Describe and apply techniques such as reflections (flips), rotations (turns), and translations (slides) for determining if two shapes are congruent.
8)	Identify and describe line symmetry in two-dimensional shapes.
9)	Predict and validate the results of partitioning, folding, and combining two- and three-dimensional shapes.

Measurement

1)	Demonstrate an understanding of such attributes as length, area, weight, and volume, and select the appropriate type of unit for measuring each attribute.
2)	Carry out simple unit conversions within a system of measurement (e.g., hours to minutes, cents to dollars, yards to feet or inches, etc.).
3)	Identify time to the minute on analog and digital clocks using a.m. and p.m. Compute elapsed time using a clock (e.g., hours and minutes since…) and using a calendar (e.g., days since…).
4)	Estimate and find area and perimeter of a rectangle, triangle, or irregular shape using diagrams, models, and grids or by measuring.
5)	Identify and use appropriate metric and English units and tools (e.g., ruler, angle ruler, graduated cylinder, thermometer) to estimate, measure, and solve problems involving length, area, volume, weight, time, angle size, and temperature.

Data Analysis, Statistics, and Probability

1)	Collect and organize data using observations, measurements, surveys, or experiments, and identify appropriate ways to display the data.
2)	Match representations of a data set such as lists, tables, or graphs (including circle graphs) with the actual set of data
3)	Construct, draw conclusions, and make predictions of data sets, including tables, bar graphs, pictographs, line graphs, line plots, and tallies.
4)	Represent the possible outcomes for a simple probability situation (e.g., the probability of drawing a red marble from a bag containing three red marbles and four green marbles).
5)	List and count the number of possible combinations of objects from three sets (e.g., how many different outfits can one make from a set of three shirts, a set of two skirts, and a set of two hats?).
6)	Classify outcomes as certain, likely, unlikely, or impossible by designing and conducting experiments using concrete objects such as counters, number cubes, spinners or coins.

Grades 5-6 Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

PLEASE NOTE: *These learner outcomes are presented and/or reinforced over a two-year period in grades 5 and 6. It is expected that students (by the end of grade 6) will be able to do the following:*

Number Sense and Operations

1)	Demonstrate an understanding of positive integer exponents, in particular, when used in powers of ten (e.g., 10^2, 10^3).
2)	Demonstrate an understanding of place value to billions and thousandths.
3)	Represent and compare very large (billions) and very small (thousandths) positive numbers in various forms such as expanded notation without exponents (e.g., 9724 = 9 x 1000 + 7 x 100 + 2 x 10 + 4).
4)	Demonstrate an understanding of fractions as a ratio of whole numbers, as parts of unit wholes, as parts of a collection, and as locations on the number line.
5)	Identify and determine common equivalent fractions, mixed numbers, decimals, and percents.
6)	Find and position integers, fractions, mixed numbers, and decimals (both positive and negative), on the number line.
7)	Compare and order integers (including negative integers), and positive fractions, mixed numbers, decimals, and percents.
8)	Apply number theory concepts-including prime and composite numbers, prime factorization, greatest common factor, least common multiple, and divisibility rules for 2, 3, 4, 5, 6, 9,and 10-to the solution of problems.
9)	Select and use appropriate operations to solve problems involving addition, subtraction, multiplication, division, and positive integer exponents with whole numbers, and with positive fractions, mixed numbers, decimals, and percents.
10)	Use the number line to model addition and subtraction of integers, with the exception of subtracting negative integers.
11)	Apply the Order of Operations for expressions involving addition, subtraction, multiplication, and division with grouping symbols (+, -, X, ÷).
12)	Demonstrate an understanding of the inverse relationships of addition and subtraction, and use that understanding to simplify computation and solve problems.
13)	Accurately and efficiently add, subtract, multiply, and divide (with double-digit divisors) whole numbers and positive decimals.
14)	Accurately and efficiently add, subtract, multiply, and divide positive fractions and mixed numbers. Simplify fractions.
15)	Add and subtract integers, with the exception of subtracting negative integers.
16)	Estimate results of computations with whole numbers, and with positive fractions, mixed numbers, decimals, and percents. Describe reasonableness of estimates.

Patterns, Relations, and Algebra

1)	Analyze and determine the rules for extending symbolic, arithmetic, and geometric patterns and progressions (e.g., ABBCCC; 1,5, 9, 13…; 3, 9, 27…).
2)	Replace variables with given values and evaluate/simplify (e.g., 2μ + 3 when μ =4).
3)	Use the property of equality to solve problems (e.g., if □ + 7 = 13, then □ = 13-7, therefore □ = 6; if 3 x □ = 15, then 1/3 x 3 x □= 1/3 x 15, therefore □=5).
4)	Represent real situations and mathematical relationships with concrete models, tables, graphs, and rules in words and with symbols (e.g., input-output tables).
5)	Solve linear equations using concrete models, tables, graphs, and paper-pencil methods.
6)	Produce and interpret graphs that represent the relationship between two variables in everyday situations.
7)	Identify and describe relationships between two variables with a constant rate of change. Contrast these with relationships where the rate of change is not constant.

Grades 5-6 Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

Geometry

1) Identify polygons based on their properties, including types of interior angles, perpendicular or parallel sides, and congruence of sides (e.g., squares, rectangles, rhombuses, parallelograms, trapezoids, and isosceles, equilateral, and right triangles).
2) Identify three-dimensional shapes (e.g., cubes, prisms, spheres, cones, and pyramids) based on their properties such as edges and faces.
3) Identify relationships among points, lines, and planes (e.g., intersecting, parallel, perpendicular).
4) Graph points and identify coordinates of points on the Cartesian coordinate plane (all four quadrants).
5) Find the distance between two points on horizontal or vertical number lines.
6) Predict, describe and perform transformations on two-dimensional shapes (e.g. translations, rotations, and reflections).
7) Identify types of symmetry, including line and rotational.
8) Determine if two shapes are congruent by measuring sides or a combination of sides and angles, as necessary; or by motions or series of motions (e.g., translations, rotations, and reflections).
9) Match three-dimensional objects and their two-dimensional representations (e.g. nets, projections, and perspective drawings).

Measurement

1) Apply the concepts of perimeter and area to the solution of problems. Apply formulas where appropriate.
2) Identify, measure, describe, classify, and construct various angles, triangles, and quadrilaterals.
3) Solve problems involving proportional relationships and units of measurement (e.g., same system unit conversions, scale models, maps, and speed).
4) Find areas of triangles and parallelograms. Recognize that shapes with the same number of sides but different appearances can have the same area. Develop strategies to find the area of more complex shapes.
5) Identify, measure, and describe circles and the relationships of the radius, diameter, circumference, and area (e.g., $d=2r$, $\pi=C/d$), and use the concepts to solve problems.
6) Find volumes and surface areas of rectangular prisms.
7) Find the sum of the angles in simple polygons (up to eight sides) with and without measuring the angles.

Data Analysis, Statistics, and Probability

1) Describe and compare data sets using the concepts of median, mean, mode, maximum and minimum, and range.
2) Construct and interpret stem-and-leaf plots, line plots, and circle graphs.
3) Use tree diagrams and other models (e.g., lists and tables) to represent possible or actual outcomes of trials.
4) Predict the probability of outcomes of simple experiments (e.g., tossing a coin, rolling a die) and test the predictions. Use appropriate ratios between 0 and 1 to represent the probability of the outcome and associate the probability with the likelihood of the event.

PLEASE NOTE: *These learner outcomes are presented and/or reinforced over a two-year period in grades 7 and 8. It is expected that students (by the end of grade 8) will be able to do the following:*

Number Sense and Operations	
1)	Compare, order, estimate, and translate among integers, fractions and mixed numbers (e.g., rational numbers), decimals, and percents.
2)	Define, compare, order, and apply frequently used irrational numbers such as $\sqrt{2}$ and π.
3)	Use ratios and proportions in the solution of problems, in particular, problems involving unit rates, scale factors, and rate of change.
4)	Represent numbers in scientific notation, and use them in calculations and problem situations.
5)	Apply number theory concepts, including prime factorization and relatively prime numbers, to the solution of problems.
6)	Demonstrate an understanding of absolute value (e.g., $|-3| = |3| = 3$).
7)	Apply the rules of powers and roots to the solution of problems. Extend the Order of Operations to include positive integer exponents and square roots.
8)	Demonstrate an understanding of the properties of arithmetic operations on rational numbers. Use the associative, commutative, and distributive properties: properties of the identity and inverse elements (e.g., $-7 + 7 + 0$; $\frac{3}{4} \times 4/3 - 1$); and the notion of closure of a subset of the rational numbers under an operation (e.g., the set of odd integers is closed under multiplication but not under addition).
9)	Use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems (e.g., multiplying by ½ or 0.5 is the same as dividing by 2).
10)	Estimate and compute with fractions (including simplification of fractions), integers, decimals, and percents (including those greater than 100 and less than 1).
11)	Determine when an estimate rather than an exact answer is appropriate and apply in problem situations.
12)	Select and use appropriate operations—addition, subtraction, multiplication, division, and positive integer exponents—to solve problems with rational numbers (including negatives).

Patterns, Relations, and Algebra	
1)	Extend, represent, analyze, and generalize a variety of patterns with tables, graphs, words, and when possible, symbolic expressions. Include arithmetic and geometric progressions (e.g., compounding).
2)	Evaluate simple algebraic expressions for given variable values (e.g., $3a^2 - b$ for $a = 3$ and $b = 7$).
3)	Demonstrate an understanding of the identity $(-x)(-y)$. Use this identity to simplify algebraic expressions, (e.g., $(-2)(-x+2) = 2x - 4$).
4)	Create and use symbolic expressions and relate them to verbal, tabular, and graphical representations.
5)	Identify the slope of a line as a measure of its steepness and as a constant rate of change from its table of values, equation, or graph. Apply the concept of slope to the solution of problems.
6)	Identify the roles of variables within an equation (e.g., $y = mx + b$, expressing y as a function of x with parameters m and b).
7)	Set up and solve linear equations and inequalities with one or two variables, using algebraic methods, models, and/or graphs.
8)	Explain and analyze—both quantitatively and qualitatively, using pictures, graphs, charts, or equations—how a change in one variable results in a change in another variable in functional relationships (e.g., $C = \pi d$, $A = \pi r^2$ (A as a function of r), $A_{rectangle} = lw$ ($A_{rectangle}$ as a function of l and w).
9)	Use linear equations to model and analyze problems involving proportional relationships. Use technology as appropriate.
10)	Use tables and graphs to represent and compare linear growth patterns. In particular, compare rates of change and x- and y-intercepts of different linear patterns.

Grades 7-8 Math Curriculum Overview - Adapted from Fall River Diocesan Curriculum Guidelines

Geometry

1) Analyze, apply, and explain the relationship between the number of sides and the sums of the interior and exterior angle measures of polygons.
2) Classify figures in terms of congruence and similarity, and apply these relationships to the solution of problems.
3) Demonstrate an understanding of the relationships of angles formed by intersecting lines, including parallel lines cut by a transversal.
4) Demonstrate an understanding of the Pythagorean theorem. Apply the theorem to the solution of problems.
5) Use a straightedge, compass, or other tools to formulate and test conjectures, and to draw geometric figures.
6) Predict the results of transformations on unmarked or coordinate planes and draw the transformed figure (e.g., predict how tessellations transform under translations, reflections, and rotations).
7) Identify three-dimensional figures (e.g., prisms, pyramids) by their physical appearance, distinguishing attributes, and spatial relationships such as parallel faces.
8) Recognize and draw two-dimensional representations of three-dimensional objects (e.g., nets, projections, and perspective drawings).

Measurement

1) Select, convert (within the same system of measurement), and use appropriate units of measurement or scale.
2) Given the formulas, convert from one system of measurement to another. Use technology as appropriate.
3) Demonstrate an understanding of the concepts and apply formulas and procedures for determining measures, including those of area and perimeter/circumference of parallelograms, trapezoids, and circles. Given the formulas, determine the surface area and volume of rectangular prisms, cylinders, and spheres. Use technology as appropriate.
4) Use ratio and proportion (including scale factors) in the solution of problems, including problems involving similar plane figures, and indirect measurement.
5) Use models, graphs, and formulas to solve simple problems involving rates (e.g., velocity and density).

Data Analysis, Statistics, and Probability

1) Describe the characteristics and limitations of a data sample. Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling).
2) Select, create, interpret, and utilize various tabular and graphical representations of data (e.g., circle graphs, Venn diagrams, scatterplots, stem-and –leaf plots, box-and-whisker plots, histograms, tables, and charts). Differentiate between continuous and discrete data and ways to represent them.
3) Find, describe, and interpret appropriate measures of central tendency (mean, median,and mode) and spread (range) that represent a set of data. Use these notions to compare different sets of data.
4) Use tree diagrams, tables, organized lists, basic combinatorics ("fundamental counting principle") and area models to compute probabilities for simple compound events (e.g., multiple coin tosses or rolls of dice).