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<b>STANDARD 4.1 (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.</b>	
By the end of <b>Grade 2</b> , students will:	
<b>4.1.2 A. Number Sense</b>	
1. Use real-life experiences, physical materials, and technology to construct meanings for numbers ( <b>unless otherwise noted, all indicators for grade 2 pertain to these sets of numbers as well</b> ).	
<ul style="list-style-type: none"> <li>• Whole numbers through hundreds</li> </ul>	
<ul style="list-style-type: none"> <li>• Ordinals</li> </ul>	
<ul style="list-style-type: none"> <li>• Proper fractions (denominators of 2, 3, 4, 8, 10)</li> </ul>	
2. Demonstrate an understanding of whole number place value concepts.	
3. Understand that numbers have a variety of uses.	
4. Count and perform simple computations with coins.	
<ul style="list-style-type: none"> <li>• Amounts up to \$1.00 (using cents notation)</li> </ul>	
5. Compare and order whole numbers.	
<b>4.1.2 B. Numerical Operations</b>	
1. Develop the meanings of addition and subtraction by concretely modeling and discussing a large variety of problems.	
<ul style="list-style-type: none"> <li>• Joining, separating, and comparing</li> </ul>	
2. Explore the meanings of multiplication and division by modeling and discussing problems.	

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3.	Develop proficiency with basic addition and subtraction number facts using a variety of fact strategies (such as “counting on” and “near doubles”) and then commit them to memory.	
4.	Construct, use, and explain procedures for performing addition and subtraction calculations with:	
	<ul style="list-style-type: none"> <li>● Pencil-and-paper</li> </ul>	
	<ul style="list-style-type: none"> <li>● Mental math</li> </ul>	
	<ul style="list-style-type: none"> <li>● Calculator</li> </ul>	
5.	Use efficient and accurate pencil-and-paper procedures for computation with whole numbers.	
	<ul style="list-style-type: none"> <li>● Addition of 2-digit numbers</li> </ul>	
	<ul style="list-style-type: none"> <li>● Subtraction of 2-digit numbers</li> </ul>	
6.	Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.	
7.	Check the reasonableness of results of computations.	
8.	Understand and use the inverse relationship between addition and subtraction.	
<b>4.1.2 C.</b>	<b>Estimation</b>	
1.	<b>Judge without counting whether a set of objects has less than, more than, or the same number of objects as a reference set.</b>	
2.	Determine the reasonableness of an answer by estimating the result of computations (e.g., $15 + 16$ is not 211).	
3.	Explore a variety of strategies for estimating both quantities (e.g., the	

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number of marbles in a jar) and results of computation.	
<b>STANDARD 4.2 (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.</b>	
By the end of <b>Grade 2</b> , students will:	
<b>4.2.2 A. Geometric Properties</b>	
1. Identify and describe spatial relationships among objects in space and their relative shapes and sizes.	
<ul style="list-style-type: none"> <li>● Inside/outside, left/right, above/below, between</li> </ul>	
<ul style="list-style-type: none"> <li>● Smaller/larger/same size, wider/narrower, longer/shorter</li> </ul>	
<ul style="list-style-type: none"> <li>● Congruence (i.e., same size and shape)</li> </ul>	
2. Use concrete objects, drawings, and computer graphics to identify, classify, and describe standard three-dimensional and two-dimensional shapes.	
<ul style="list-style-type: none"> <li>● Vertex, edge, face, side</li> </ul>	
<ul style="list-style-type: none"> <li>● 3D figures – cube, rectangular prism, sphere, cone, cylinder, and pyramid</li> </ul>	
<ul style="list-style-type: none"> <li>● 2D figures – square, rectangle, circle, triangle</li> </ul>	
<ul style="list-style-type: none"> <li>● Relationships between three- and two-dimensional shapes (i.e., the face of a 3D shape is a 2D shape)</li> </ul>	
3. Describe, identify and create instances of line symmetry.	
4. Recognize, describe, extend and create designs and patterns with geometric objects of different shapes and colors.	

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<b>4.2.2 B. Transforming Shapes</b>	
1. Use simple shapes to make designs, patterns, and pictures.	
2. Combine and subdivide simple shapes to make other shapes.	
<b>4.2.2 C. Coordinate Geometry</b>	
1. Give and follow directions for getting from one point to another on a map or grid.	
<b>4.2.2 D. Units of Measurement</b>	
1. Directly compare and order objects according to measurable attributes.	
<ul style="list-style-type: none"> <li>● Attributes – length, weight, capacity, time, temperature</li> </ul>	
2. Recognize the need for a uniform unit of measure.	
3. Select and use appropriate standard and non-standard units of measure and standard measurement tools to solve real-life problems.	
<ul style="list-style-type: none"> <li>● Length – inch, foot, yard, centimeter, meter</li> </ul>	
<ul style="list-style-type: none"> <li>● Weight – pound, gram, kilogram</li> </ul>	
<ul style="list-style-type: none"> <li>● Capacity – pint, quart, liter</li> </ul>	
<ul style="list-style-type: none"> <li>● Time – second, minute, hour, day, week, month, year</li> </ul>	
<ul style="list-style-type: none"> <li>● Temperature – degrees Celsius, degrees Fahrenheit</li> </ul>	

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4. Estimate measures.	
<b>4.2.2 E. Measuring Geometric Objects</b>	
1. Directly measure the perimeter of simple two-dimensional shapes.	
2. Directly measure the area of simple two-dimensional shapes by covering them with squares.	
<b>STANDARD 4.3 (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.</b>	
By the end of <b>Grade 2</b> , students will:	
<b>4.3.2 A. Patterns</b>	
1. Recognize, describe, extend, and create patterns.	
<ul style="list-style-type: none"> <li>● Using concrete materials (manipulatives), pictures, rhythms, &amp; whole numbers</li> </ul>	
<ul style="list-style-type: none"> <li>● Descriptions using words and symbols (e.g., “add two” or “+ 2”)</li> </ul>	
<ul style="list-style-type: none"> <li>● Repeating patterns</li> </ul>	
<ul style="list-style-type: none"> <li>● Whole number patterns that grow or shrink as a result of repeatedly adding or subtracting a fixed number (e.g., skip counting forward or backward)</li> </ul>	
<b>4.3.2 B. Functions and Relationships</b>	
1. Use concrete and pictorial models of function machines to explore the basic concept of a function.	
<b>4.3.2 C. Modeling</b>	
1. Recognize and describe changes over time (e.g., temperature, height).	
2. Construct and solve simple open sentences involving addition or subtraction.	

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<ul style="list-style-type: none"> <li>● Result unknown (e.g., <math>6 - 2 = \underline{\quad}</math> or <math>n = 3 + 5</math>)</li> </ul>	
<ul style="list-style-type: none"> <li>● Part unknown (e.g., <math>3 + \square = 8</math>)</li> </ul>	
<b>4.3.2 D. Procedures</b>	
1. Understand and apply (but don't name) the following properties of addition:	
<ul style="list-style-type: none"> <li>● Commutative (e.g., <math>5 + 3 = 3 + 5</math>)</li> </ul>	
<ul style="list-style-type: none"> <li>● Zero as the identity element (e.g., <math>7 + 0 = 7</math>)</li> </ul>	
<ul style="list-style-type: none"> <li>● Associative (e.g., <math>7 + 3 + 2</math> can be found by first adding either <math>7 + 3</math> or <math>3 + 2</math>)</li> </ul>	
<b>STANDARD 4.4 (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INFERENCES FROM DATA.</b>	
<b>4.4.2 A. Data Analysis</b>	
1. Collect, generate, record, and organize data in response to questions, claims, or curiosity.	
<ul style="list-style-type: none"> <li>● Data collected from students' everyday experiences</li> </ul>	
<ul style="list-style-type: none"> <li>● Data generated from chance devices, such as spinners and dice</li> </ul>	
2. Read, interpret, construct, and analyze displays of data.	
<ul style="list-style-type: none"> <li>● Pictures, tally chart, pictograph, bar graph, Venn diagram</li> </ul>	
<ul style="list-style-type: none"> <li>● Smallest to largest, most frequent (mode)</li> </ul>	
<b>4.4.2 B. Probability</b>	

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1. Use chance devices like spinners and dice to explore concepts of probability.	
<ul style="list-style-type: none"> <li>● Certain, impossible</li> </ul>	
<ul style="list-style-type: none"> <li>● More likely, less likely, equally likely</li> </ul>	
2. Provide probability of specific outcomes.	
<ul style="list-style-type: none"> <li>● Probability of getting specific outcome when coin is tossed, when die is rolled, when spinner is spun (e.g., if spinner has five equal sectors, then probability of getting a particular sector is one out of five)</li> </ul>	
<ul style="list-style-type: none"> <li>● When picking a marble from a bag with three red marbles and four blue marbles, the probability of getting a red marble is three out of seven</li> </ul>	
<b>4.4.2 C. Discrete Mathematics—Systematic Listing and Counting</b>	
1. Sort and classify objects according to attributes.	
<ul style="list-style-type: none"> <li>● Venn diagrams</li> </ul>	
2. Generate all possibilities in simple counting situations (e.g., all outfits involving two shirts and three pants).	
<b>4.4.2 D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms</b>	
1. Follow simple sets of directions (e.g., from one location to another, or from a recipe).	
2. Color simple maps with a small number of colors.	
3. Play simple two-person games (e.g., tic-tac-toe) and informally explore the idea of what the outcome should be.	
4. Explore concrete models of vertex-edge graphs (e.g. vertices as “islands” and edges as “bridges”).	

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<ul style="list-style-type: none"> <li>● Paths from one vertex to another</li> </ul>	
<p><b>STANDARD 4.5 (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.</b></p>	
<p>At each grade level, with respect to content appropriate for that grade level, students will:</p>	
<p><b>4.5 A. Problem Solving</b></p>	
<p>1. Learn mathematics through problem solving, inquiry, and discovery.</p>	
<p>2. Solve problems that arise in mathematics and in other contexts.</p>	
<ul style="list-style-type: none"> <li>● Open-ended problems</li> </ul>	
<ul style="list-style-type: none"> <li>● Non-routine problems</li> </ul>	
<ul style="list-style-type: none"> <li>● Problems with multiple solutions</li> </ul>	
<ul style="list-style-type: none"> <li>● Problems that can be solved in several ways</li> </ul>	
<p>3. Select and apply a variety of appropriate problem-solving strategies (e.g., “try a simpler problem” or “make a diagram”) to solve problems.</p>	
<p>4. Pose problems of various types and levels of difficulty.</p>	
<p>5. Monitor their progress and reflect on the process of their problem solving activity.</p>	
<p>6. Distinguish relevant from irrelevant information, and identify missing information.</p>	
<p><b>4.5 B. Communication</b></p>	
<p>1. Use communication to organize and clarify their mathematical thinking.</p>	

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<ul style="list-style-type: none"> <li>● Reading and writing</li> </ul>	
<ul style="list-style-type: none"> <li>● Discussion, listening, and questioning</li> </ul>	
<p>2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.</p>	
<p>3. Analyze and evaluate the mathematical thinking and strategies of others.</p>	
<p>4. Use the language of mathematics to express mathematical ideas precisely.</p>	
<b>4.5 C. Connections</b>	
<p>1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).</p>	
<p>2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).</p>	
<p>3. Recognize that mathematics is used in a variety of contexts outside of mathematics.</p>	
<p>4. Apply mathematics in practical situations and in other disciplines.</p>	
<p>5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).</p>	
<p>6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.</p>	
<b>4.5 D. Reasoning</b>	
<p>1. Recognize that mathematical facts, procedures, and claims must be justified.</p>	
<p>2. Use reasoning to support their mathematical conclusions and problem solutions.</p>	

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3. Select and use various types of reasoning and methods of proof.	
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.	
5. Make and investigate mathematical conjectures.	
<ul style="list-style-type: none"> <li>● Counterexamples as a means of disproving conjectures</li> </ul>	
<ul style="list-style-type: none"> <li>● Verifying conjectures using informal reasoning or proofs.</li> </ul>	
6. Evaluate examples of mathematical reasoning and determine whether they are valid.	
<b>4.5 E. Representations</b>	
1. Create and use representations to organize, record, and communicate mathematical ideas.	
<ul style="list-style-type: none"> <li>● Concrete representations (e.g., base-ten blocks or algebra tiles)</li> </ul>	
<ul style="list-style-type: none"> <li>● Pictorial representations (e.g., diagrams, charts, or tables)</li> </ul>	
<ul style="list-style-type: none"> <li>● Symbolic representations (e.g., a formula)</li> </ul>	
<ul style="list-style-type: none"> <li>● Graphical representations (e.g., a line graph)</li> </ul>	
2. Select, apply, and translate among mathematical representations to solve problems.	
3. Use representations to model and interpret physical, social, and mathematical phenomena.	
<b>4.5 F. Technology</b>	

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1. Use technology to gather, analyze, and communicate mathematical information.	
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.	
3. Use graphing calculators and computer software to investigate properties of functions and their graphs.	
4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).	
5. Use computer software to make and verify conjectures about geometric objects.	
6. Use computer-based laboratory technology for mathematical applications in the sciences (cf. science standards).	

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