

**Bermudian Springs Pennsylvania Core Standards  
Math Framework  
First Grade**



## Introduction

Bermudian Springs School District, in partnership with all stakeholders, recognizes the importance of our students being able to use mathematics in everyday life and in the workplace. New knowledge, tools, and ways of solving math problems will significantly enhance opportunities for shaping our students future. Math competencies open doors to productive futures. All students should have the opportunity and support necessary to learn significant math with depth and understanding. Common Core has provided critical areas designed to bring focus to the standards at each grade by describing key concepts in order to guide instruction. The critical areas for instructional focus for first grade math outlined by the *Common Core* include the following four areas:

- 1. Developing understanding of addition, subtraction, and strategies for addition and subtraction within 20.** Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., “making tens”) to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.
- 2. Developing understanding of whole number relationships and place value, including grouping in tens and ones.** Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.
- 3. Developing understanding of linear measurement and measuring lengths as iterating length units.** Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.
- 4. Reasoning about attributes of, and composing and decomposing geometric shapes.** Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, and determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

*Common Core, pg. 27.*

**Adapted from: commoncore.org, 2013; parconline.org, 2013; pdesas.org, 2013**

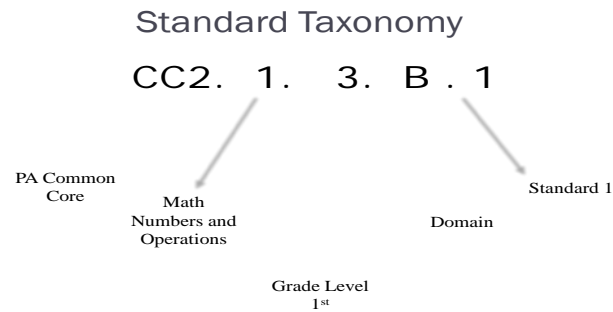
## Standards for Mathematical Practices for First Grade

Bermudian Springs School District incorporated the following Mathematical Practices which are expected to be integrated into every mathematics lesson for all students as outlined in the Pennsylvania Core Standards. Below are a few examples of how these mathematical practices may be integrated into some tasks that Bermudian students will apply in first grade.

|   |   |
|---|---|
| <p><b>1. Make Sense and Persevere in Solving Problems.</b></p>                    | <p>Mathematically proficient students in First Grade continue to develop the ability to focus attention, test hypotheses, take reasonable risks, remain flexible, try alternatives, exhibit self-regulation, and persevere (Copley, 2010). As the teacher uses thoughtful questioning and provides opportunities for students to share thinking, First Grade students become conscious of what they know and how they solve problems. They make sense of task-type problems, find an entry point or a way to begin the task, and are willing to try other approaches when solving the task. They ask themselves, “Does this make sense?” First Grade students’ conceptual understanding builds from their experiences in Kindergarten as they continue to rely on concrete manipulatives and pictorial representations to solve a problem, eventually becoming fluent and flexible with mental math as a result of these experiences.</p> |
| <p><b>2. Reason abstractly and quantitatively.</b></p>                            | <p>Mathematically proficient students in First Grade recognize that a number represents a specific quantity. They use numbers and symbols to represent a problem, explain thinking, and justify a response. For example, when solving the problem: “<i>There are 60 children on the playground. Some children line up. There are 20 children still on the playground. How many children lined up?</i>” first grade students may write <math>20 + 40 = 60</math> to indicate a Think-Addition strategy. Other students may illustrate a counting-on by tens strategy by writing <math>20 + 10 + 10 + 10 + 10 = 60</math>. The numbers and equations written illustrate the students’ thinking and the strategies used, rather than how to simply compute, and how the story is decontextualized as it is represented abstractly with symbols.</p>  |
| <p><b>3. Construct viable arguments and critique the reasoning of others.</b></p> | <p>Mathematically proficient students in First Grade continue to develop their ability to clearly express, explain, organize and consolidate their math thinking using both verbal and written representations. Their understanding of grade appropriate vocabulary helps them to construct viable arguments about mathematics. For example, when justifying why a particular shape isn’t a square, a first grade student may hold up a picture of a rectangle, pointing to the various parts, and reason, “It can’t be a square because, even though it has 4 sides and 4 angles, the sides aren’t all the same size.” In a classroom where risk-taking and varying perspectives are encouraged, mathematically proficient students are willing and eager to share their ideas with others, consider other ideas proposed by classmates, and question ideas that don’t seem to make sense.</p>   |
| <p><b>4. Model with mathematics.</b></p>  | <p>Mathematically proficient students in First Grade model real-life mathematical situations with a number sentence or an equation, and check to make sure that their equation accurately matches the problem context. They also use tools, such as tables, to help collect information, analyze results, make conclusions, and review their conclusions to see if the results make sense and revising as needed.</p>   |
| <p><b>5. Use appropriate tools strategically.</b></p>                             | <p>Mathematically proficient students in First Grade have access to a variety of concrete (e.g. 3-dimensional solids, ten frames, number balances, number lines) and technological tools (e.g., virtual manipulatives, calculators, interactive websites) and use them to</p>   |

|   |   |
|---|---|
|   | <p>investigate mathematical concepts. They select tools that help them solve and/or illustrate solutions to a problem. They recognize that multiple tools can be used for the same problem- depending on the strategy used. For example, a child who is in the counting stage may choose connecting cubes to solve a problem. While, a student who understands parts of number, may solve the same problem using ten-frames to decompose numbers rather than using individual connecting cubes. As the teacher provides numerous opportunities for students to use educational materials, first grade students' conceptual understanding and higher-order thinking skills are developed.</p>  |
| <p><b>6. Attend to precision.</b></p>                                   | <p>Mathematically proficient students in First Grade attend to precision in their communication, calculations, and measurements. They are able to describe their actions and strategies clearly, using grade-level appropriate vocabulary accurately. Their explanations and reasoning regarding their process of finding a solution becomes more precise. In varying types of mathematical tasks, first grade students pay attention to details as they work. For example, as students' ability to attend to position and direction develops, they begin to notice reversals of numerals and self-correct when appropriate. When measuring an object, students check to make sure that there are not any gaps or overlaps as they carefully place each unit end to end to measure the object (iterating length units). Mathematically proficient first grade students understand the symbols they use (<math>=</math>, <math>&gt;</math>, <math>&lt;</math>) and use clear explanations in discussions with others. For example, for the sentence <math>4 &gt; 3</math>, a proficient student who is able to attend to precision states, "Four is more than 3" rather than "The alligator eats the four. It's bigger."</p> |
| <p><b>7. Look for and make use of structure.</b></p>                    | <p>Mathematically proficient students in First Grade carefully look for patterns and structures in the number system and other areas of mathematics. For example, while solving addition problems using a number balance, students recognize that regardless whether you put the 7 on a peg first and then the 4, or the 4 on first and then the 7, they both equal 11 (commutative property). When decomposing two-digit numbers, students realize that the number of tens they have constructed 'happens' to coincide with the digit in the tens place. When exploring geometric properties, first graders recognize that certain attributes are critical (number of sides, angles), while other properties are not (size, color, orientation).</p>   |
| <p><b>8. Look for and express regularity in repeated reasoning.</b></p> | <p>Mathematically proficient students in First Grade begin to look for regularity in problem structures when solving mathematical tasks. For example, when adding three one-digit numbers and by making tens or using doubles, students engage in future tasks looking for opportunities to employ those same strategies. Thus, when solving <math>8+7+2</math>, a student may say, "I know that 8 and 2 equal 10 and then I add 7 more. That makes 17. It helps to see if I can make a 10 out of 2 numbers when I start." Further, students use repeated reasoning while solving a task with multiple correct answers. For example, in the task "There are 12 crayons in the box. Some are red and some are blue. How many of each could there be?" First Grade students realize that the 12 crayons could include 6 of each color (<math>6+6 = 12</math>), 7 of one color and 5 of another (<math>7+5 = 12</math>), etc. In essence, students repeatedly find numbers that add up to 12.</p>  |

| Mathematical Standards: Development and Progression |                                       |                                       |   |                                       |   |   |   |                                |   |                         |    |  |
|---|---------------------------------------|---------------------------------------|---|---------------------------------------|---|---|---|--------------------------------|---|-------------------------|----|--|
|   | Pre K                                 | K                                     | 1 | 2                                     | 3 | 4 | 5   | 6                              | 7 | 8                       | HS |  |
| 2.1<br>Numbers and Operations                       | (A) Counting & Cardinality            |                                       |   |                                       |   |   |   |                                |   |                         |    |  |
|   |                                       | (B) Number and Operations in Base Ten |   |                                       |   |   | (D) Ratios and Proportional Relationships |                                |   | (F) Number and Quantity |    |  |
|   |                                       |                                       |   | (C) Number and Operations - Fractions |   |   | (E) The Number System                     |                                |   |                         |    |  |
| 2.2<br>Algebraic Concepts                           | (A) Operations and Algebraic Thinking |                                       |   |                                       |   |   | (B) Expressions and Equations             |                                |   | (D) Algebra             |    |  |
|   |                                       |                                       |   |                                       |   |   |   |                                |   | (C) Functions           |    |  |
| 2.3<br>Geometry                                     | (A) Geometry                          |                                       |   |                                       |   |   |   |                                |   |                         |    |  |
| 2.4<br>Measurement, Data and Probability            | (A) Measurement and Data              |                                       |   |                                       |   |   |   | (B) Statistics and Probability |   |                         |    |  |



|  |   |
|--|---|
| <b>2.1 Number and Operations</b>   |   |
| <b>Domain:</b> (B) Numbers and Operations in Base Ten  |   |
| <b>Standard:</b> CC.2.1.1.B.1 Extend the counting sequence to read and write numerals to represent objects.  |   |
| <b>Key Concepts</b>  | <b>Key Vocabulary</b>   |
| Numeration, counting, skip counting, extend counting sequence  | less, more, fewer, before, after, number line, number grid, even, odd, scroll |
| <b>Competencies</b>  |   |
| <i>Describe what students should be able to do (key skills) as a result of this instruction</i>  |   |
| <ul style="list-style-type: none"> <li>• Write numbers</li> <li>• Represent numbers in 10s frames</li> <li>• Associate a number with a number of objects (1-to-1 correspondence)</li> <li>• Counting: count by 1s, count by 2s, count by 5s, count by 10s, count by 25s</li> <li>• Count orally or in writing count by 1s to 100, 2s to 50, 5s to 100, 10s to 100</li> </ul> |   |

|  |   |
|--|---|
| <b>2.1 Number and Operations</b>   |   |
| <b>Domain:</b> (B) Numbers and Operations in Base Ten  |   |
| <b>Standard:</b> CC.2.1.1.B.2 Use place value concepts to represent amounts of tens and ones and to compare two digit numbers.   |   |
| <b>Key Concepts</b>  | <b>Key Vocabulary</b>   |
| Base-10 Blocks with Place Value  | cubes, longs, flats, ones place, tens place, hundreds place, digit, greater than, less than |
| <b>Competencies</b>  |   |
| <i>Describe what students should be able to do (key skills) as a result of this instruction</i>  |   |
| <ul style="list-style-type: none"> <li>• Adding 10s and 1s</li> <li>• Use a place value mat to create numbers and make exchanges between tens and ones</li> <li>• Understand bundles of 10</li> <li>• Exchange 1s for 10</li> <li>• Construct and deconstruct a number using 10s and 1s</li> <li>• Compare two 2-digit numbers based on meanings of 10s and 1s</li> <li>• Formulate two numbers with 10 more and/or 10 less</li> <li>• Record the results of comparisons using less than and greater than symbols &lt; &gt;</li> </ul> |   |

**2.1 Number and Operations**

|  |  |
|--|--|
| <b>Domain:</b> (B) Numbers and Operations in Base Ten  |  |
| <b>Standard:</b> CC.2.1.1.B.3 Use place value concepts and properties of operations to add and subtract within 100.  |  |
| <b>Key Concepts</b>  | <b>Key Vocabulary</b>  |
| Operations, place value  | number grid, number line, add, subtract, sum, equals, number story, number model, solve, ones place, tens place, hundreds place, digit |
| <b>Competencies</b>  |  |
| <i>Describe what students should be able to do (key skills) as a result of this instruction</i>  |  |
| <ul style="list-style-type: none"> <li>• Adding and Subtracting one- and two-digit numbers</li> <li>• Adding and subtracting-replacing and/or carrying over ones and tens place</li> <li>• Solve number stories</li> </ul> |  |

|  |   |
|--|---|
| 2.2 Algebraic Concepts   |   |
| <b>Domain:</b> (A) Operations and Algebraic Thinking   |   |
| <b>Standard:</b> CC.2.2.1.A.1 Represent and solve problems involving addition and subtraction within 20.   |   |
| <b>Key Concepts</b>  | <b>Key Vocabulary</b>   |
| Addition and subtraction to 20, represent numbers in number models to solve a number story   | add, subtract, sum, difference, solve, equals, number model, number story, function machine, doubles facts, turn-around facts, fact triangle, fact family |
| <b>Competencies</b>  |   |
| <i>Describe what students should be able to do (key skills) as a result of this instruction</i>  |   |
| <ul style="list-style-type: none"> <li>• Adding and subtracting one- and two-digit numbers</li> <li>• Find the rules and complete algebraic concepts in function machines (pre-algebra preparation)</li> <li>• Solve real-world and mathematical addition and subtraction stories using drawings, manipulatives, etc.</li> </ul> |   |

|  |  |
|--|--|
| 2.2 Algebraic Concepts   |  |
| <b>Domain:</b> (A) Operations and Algebraic Thinking   |  |
| <b>Standard:</b> CC.2.2.1.A.2 Understand and apply properties of operations and the relationship between addition and subtraction. |  |
| <b>Key Concepts</b>  | <b>Key Vocabulary</b>  |
| Apply strategies to add and subtract   | function machine, fact family, fact triangle, turn-around facts, number model, frames-and-arrows |
| <b>Competencies</b>  |  |
| <i>Describe what students should be able to do (key skills) as a result of this instruction</i>                                    |  |

- Identify relationships between numbers within fact families
- Pre-algebra preparation: solving equations to find unknown numbers
- Apply an appropriate strategy to solve facts
- Identify relationships within numbers that are used to create similar operations (i.e. fact families)

### 2.3 Geometry

**Domain:** (A) Geometry

**Standard:** CC.2.3.1.A.1 Compose and distinguish between two- and three- dimensional shapes based on their attributes.

#### Key Concepts

Identify two-dimensional shapes, identify three-dimensional shapes, identify attributes of shapes

#### Key Vocabulary

pattern block template, polygon, quadrilateral, attributes, face, surface, sides, corners, Two-Dimensional Shapes: hexagon, circle, triangle, rhombus, trapezoid, square, rectangle, parallelogram, Three-Dimensional Shapes: sphere, cylinder, rectangular prism, cube, pyramid, cone

#### Competencies

*Describe what students should be able to do (key skills) as a result of this instruction*

- Identify shapes and objects in real life
- Draw two-dimensional shapes
- Identify two- and three-dimensional shapes

### 2.3 Geometry

**Domain:** (A) Geometry

**Standard:** CC.2.3.1.A.2 Identify and describe two- and three- dimensional shapes.

#### Key Concepts

Divide shapes into fractional parts, understand whole and fractional parts of a given shape, identify and complete symmetrical figures

#### Key Vocabulary

Symmetry, symmetrical, whole, half, halves, fourths, quarters, equal parts

#### Competencies

*Describe what students should be able to do (key skills) as a result of this instruction*

- Dividing real objects into equal parts (foods: cutting a pie/pizza)
- Using fractions in cooking/recipes
- Separate objects into equal parts
- Identify fractional parts of a whole



|   |  |
|---|--|
| 2.4 Measurement, Data and Probability   |  |
| <b>Domain:</b> (B) Measurement and Data   |  |
| <b>Standard:</b> CC.2.4.1.A.1 Order lengths and measure them both indirectly and by repeating length units.   |  |
| <b>Key Concepts</b>   | <b>Key Vocabulary</b>                          |
| Measure objects using nonlinear measurements  | Length, non-standard ordering, longer, shorter |
| <b>Competencies</b><br><i>Describe what students should be able to do (key skills) as a result of this instruction</i>  |  |
| <ul style="list-style-type: none"> <li>• Measurement in the real world: length/height of objects in life (i.e. building/construction)</li> <li>• Measure objects using nonstandard forms of measurement</li> <li>• Order objects in length</li> <li>• Compare lengths (longer/shorter)</li> <li>• Draw a conclusion about indirect measurement for an unknown length</li> </ul> |  |

|  |   |
|--|---|
| 2.4 Measurement, Data and Probability  |   |
| <b>Domain:</b> (B) Measurement and Data  |   |
| <b>Standard:</b> CC.2.4.1.A.2 Tell and write time to the nearest half hour using both analog and digital clocks.   |   |
| <b>Key Concepts</b>  | <b>Key Vocabulary</b>   |
| Identify and demonstrate the understanding of telling time to the hour and half-hour   | analog clock, digital clock, clockwise, face, hour hand, minute hand, hours, minutes, seconds, hour, half hour, half-past, midnight, noon, AM, PM |
| <b>Competencies</b><br><i>Describe what students should be able to do (key skills) as a result of this instruction</i>   |   |
| <ul style="list-style-type: none"> <li>• Telling time: read a given time on an analog and/or digital clock</li> <li>• Telling time: keeping track of important times throughout the day (waking up/going to bed/recess/lunch/going home)</li> <li>• Using a clock to demonstrate time</li> <li>• Telling time to the nearest increment (hour/half-hour)</li> </ul> |   |

|   |   |
|---|---|
| 2.4 Measurement, Data and Probability   |   |
| <b>Domain:</b> (B) Measurement and Data   |   |
| <b>Standard:</b> CC.2.4.1.A.4 Represent and interpret data using tables/charts. |   |
| <b>Key Concepts</b>   | <b>Key Vocabulary</b>   |
| Create and interpret data using bar graphs and line plots                       | bar graph, line plot, pattern, column, row, most common, least common |

**Competencies**

*Describe what students should be able to do (key skills) as a result of this instruction*

- Record and Analyze data over a given time
- Analyze any chart with information
- Create a bar graph and line plot
- Identify the most common and least common in a set of data
- Ask and answer questions about data points