Grade 1 Mathematics

Maryland College and Career Ready Curriculum Framework

Introduction

The Code of Maryland Regulations (COMAR) 13A.04.12.01, Mathematics Instructional Programs for Grades Prekindergarten – 12 states that, "each local education agency shall provide in public schools an instructional program in mathematics each year for all students in grades prekindergarten – 8; Offer in public schools a mathematics program in grades 9—12. Beginning with students entering grade 9 in the 2014—2015 school year, each student shall enroll in a mathematics course in each year of high school that the student attends, up to a maximum of 4 years of attendance, unless in the 5th or 6th year a mathematics course is needed to meet a graduation requirement."

State Frameworks are developed by the Maryland State Department of Education (MSDE) to support local education agencies in providing high-quality instructional programs in mathematics. State Frameworks are defined as supporting documents and provide guidance for implementing the Maryland College and Career Ready Standards for Mathematics which are reviewed and adopted by the Maryland State Board of Education every eight years. State Frameworks also provide consistency in learning expectations for students in mathematics programs across the twenty-four local education agencies as local curriculum is developed and adopted using these documents as a foundation.

MSDE shall update the State Frameworks in Mathematics in the manner and time the State Superintendent of Schools determines is necessary to ensure alignment with best-in-class, research-based practices. Tenure and stability of State Frameworks affords local education agencies the necessary time to procure supporting instructional materials, provide professional development, and to measure student growth within the program. Educators, practitioners, and experts who participate in writing workgroups for State Frameworks represent the diversity of stakeholders across Maryland. State Frameworks in Elementary mathematics grades Prekindergarten – 5 were developed, reviewed, and revised by teams of Maryland educators and practitioners, including local education agency content curriculum specialists, classroom teachers, accessibility staff, and academic researchers and experts in close collaboration with MSDE.

The Grade 1 Mathematics Framework was released in June 2011.

HOW TO READ THE MARYLAND COLLEGE AND CAREER READY CURRICULUM FRAMEWORK

The Maryland College and Career Ready Standards for Mathematics (MCCRSM) at the first-grade level specify the mathematics that all students should study as they prepare to be college and career ready by graduation. The first-grade standards are listed by domains. For further clarification of the standards, reference the appropriate domain in the set of Progression Documents for the Common Core State Standards for Mathematics.

This framework document provides an overview of the Standards that are grouped together to form the domains for grade one. The Standards within each domain are grouped by topic and are in the same order as they appear in the Common Core State Standards for Mathematics. This document is not intended to convey the exact order in which the Standards will be taught, nor the length of time to devote to the study of the different standards.

The framework contains the following:

- **Domains** are intended to convey coherent groupings of content.
- **Clusters** are groups of related standards.
- **Standards** define what students should understand and be able to do.
- **Essential Skills and Knowledge** statements provide language to help teachers develop common understandings and valuable insights into what a student must know and be able to do to demonstrate proficiency with each standard. Maryland mathematics educators thoroughly reviewed the standards and, as needed, provided statements to help teachers comprehend the full intent of each standard.
- **Framework Vocabulary Words** provide definitions of key mathematics vocabulary words found in the document.

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

1. MAKE SENSE OF PROBLEMS AND PERSEVERE IN SOLVING THEM.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. REASON ABSTRACTLY AND QUANTITATIVELY.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. CONSTRUCT VIABLE ARGUMENTS AND CRITIQUE THE REASONING OF OTHERS.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify to improve the arguments.

4. MODEL WITH MATHEMATICS.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. USE APPROPRIATE TOOLS STRATEGICALLY.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. ATTEND TO PRECISION.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. LOOK FOR AND MAKE USE OF STRUCTURE.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well-remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. LOOK FOR AND EXPRESS REGULARITY IN REPEATED REASONING.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1)$ equals 3. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x-1)(x^2 + x + 1)$ and $(x-1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

CONNECTING THE STANDARDS FOR MATHEMATICAL PRACTICE TO THE MARYLAND COLLEGE AND CAREER READY STANDARDS

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction. The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices. In this respect, those content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

1.OA Operations and Algebraic Thinking

1.OA.A REPRESENT AND SOLVE PROBLEMS INVOLVING ADDITION AND SUBTRACTION.

1.OA.A.1

Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

Essential Skills and Knowledge

- Ability to solve a variety of addition and subtraction word problems situations (Table 1).
- Ability to use mental math strategies to compute the solutions to addition and subtraction word problems.
- Ability to use an empty square or question mark to represent an unknown in an equation.
- Ability to represent the problem in multiple ways including drawings and or objects/manipulatives (e.g., counters, connecting cubes, number lines, and part-part- whole mats).
- Demonstrates conservation of numbers to 10 (Understands the cardinality of numbers).
- Ability to demonstrate numbers 11-19 as ten and some more.
- Ability to compose and decompose numbers in a wide variety of ways.

1.OA.A.2

Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

Essential Skills and Knowledge

- Ability to add numbers in any order and be able to identify the most efficient way to solve the problem.
- Ability to solve a variety of addition and subtraction word problems (Table 1).
- Note Essential Skills and Knowledge listed in 1.OA.A.1.

1.OA.B UNDERSTAND AND APPLY PROPERTIES OF OPERATIONS AND THE RELATIONSHIP BETWEEN ADDITION AND SUBTRACTION.

1.OA.B.3

Apply properties of operations as strategies to add and subtract. Examples: If $8 + 3 = 11$ is known, then $3 + 8 = 11$ is also known. (Commutative property of addition) To add $2 + 6 + 4$, the second two numbers can be added to make a ten, so $2 + 6 + 4 = 2 + 10$, which equals 12. (Associative property of addition.) *Students need not use formal terms for these properties.

Essential Skills and Knowledge

- Reference the list of properties of operations (Table 2).
- Demonstrates an understanding of the commutative property for addition.
- Uses the commutative for addition as a strategy to recall addition and subtraction facts.
- Demonstrates an understanding of the associative property for addition.
- Uses the associative property for addition as a strategy to recall addition and subtraction facts.

1.OA.B.4

Understand subtraction as an unknown addend problem. For example, subtract $10 - 8$ by finding the number that makes 10 when added to 8.

Essential Skills and Knowledge

- Ability to connect addition to subtraction (inverse operations).
- Ability to apply the strategy to think addition rather than take away.
- Rather than find 9- 6 equals ?, ask how many would you add to six to equal nine?
- Ability to use concrete models with manipulatives to find the unknown.
- Ability to use the open number line to find the unknown.

1.OA.C ADD AND SUBTRACT WITHIN 20.

1.OA.C.5

Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).

Essential Skills and Knowledge

- Knowledge of and ability to use addition counting strategies (e.g., Counting All, Counting On, Counting On from the Larger Number) to solve addition problems.
- Knowledge of and ability to use subtraction counting strategies (Counting Up To, Counting Back From) to solve problems.
- Ability to use skip counting to add, understanding when skip counting they are adding groups of, such as when counting by 2s to add 2 understand that a counting by 2’s is counting groups of 2.

1.OA.C.6

Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on, making ten (e.g. $8 + 6 = 8 + 2 + 4$, which leads to $10 + 4 = 14$); decomposing a number leading to a ten (e.g., $13 - 4 = 13 - 3 - 1$, which leads to $10 - 1 = 9$); using the relationship between addition and subtraction (e.g., knowing that $8 + 4 = 12$, one knows $12 - 8 = 4$); and creating equivalent but easier or known sums (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1$, which equals 13).

Essential Skills and Knowledge

- Ability to use mental math strategies such as counting on, making ten, decomposing a number leading to ten, the relationship between addition and subtraction, and creating equivalent but easier or know sums to add and subtract within 20, first using visual models and then moving to mental math.
- Ability to demonstrate fluency for addition and subtraction within 10, building first on accurate recall of the facts using games, (including technology) and purposeful practice. (Tasks which are timed should not be used unless students have demonstrated accurate recall of the facts).

1.OA.D WORK WITH ADDITION AND SUBTRACTION EQUATIONS.

1.OA.D.7

Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? $6 = 6, 7 = 8 - 1, 5 + 2 = 2 + 5,\ 4 + 1 = 5 + 2$.

Essential Skills and Knowledge

- Knowledge that an equal sign represents the relationship between two equal quantities.
- Knowledge that the quantities on both side of the equation are equal in value.
- Understand the equal sign means 'is the same as'.

1.OA.D.8

Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the question true in each of the equations $8 + ? = 11, 5 = ? - 3, 6 + 6 = ?$.

Essential Skills and Knowledge

- Ability to represent the problem in multiple ways including drawings and or objects/manipulatives (e.g., counters, connecting cubes, Digi-Blocks, number lines).
- Ability to take apart and combine numbers in a wide variety of ways.
- Ability to make sense of quantity and be able to compare numbers.
- Ability to use flexible thinking strategies to develop the understanding of the traditional algorithms and their processes.
- Ability to solve a variety of addition and subtraction word problems (Table 1).

1.NBT Number and Operations in Base Ten

1.NBT.A EXTEND THE COUNTING SEQUENCE.

1.NBT.A.1

Count to 120 starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

Essential Skills and Knowledge

- Ability to produce the standard list of counting words in order.
- Ability to represent one-to-one correspondence/match with concrete materials.
- Ability to explore visual representations of numerals, matching a visual representation of a set to a numeral.
- Ability to read a written numeral.
- Ability to represent numerals in a variety of ways, including tracing numbers, repeatedly writing numbers, tactile experiences with numbers (e.g., making numbers out of clay, tracing them in the sand, and writing on the white board or in the air).

1.NBT.B UNDERSTAND PLACE VALUE.

1.NBT.B.2

Understand that the two digits of a two-digit number represent amounts of tens and ones.

Essential Skills and Knowledge

- Ability to use base ten manipulatives (e.g., base ten blocks, Digi- Blocks, connecting cubes, ten frames, interlocking base ten blocks) to represent two-digit numbers.
- Knowledge of the connection between numerals, words, and quantities.
- Knowledge that two-digit numbers are composed of bundles of tens and leftover ones.
- Ability to count by tens and ones.

1.NBT.B.2a

Understand the following as a special case: 10 can be thought of as a bundle of ten ones -- called a “ten.”

Essential Skills and Knowledge

- Ability to use base ten manipulatives (e.g., base ten blocks, Digi- Blocks, connecting cubes, ten frames, interlocking base ten blocks) to build and compare ten ones and ten.

1.NBT.B.2b

Understand the following as a special case: The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.

Essential Skills and Knowledge

- Ability to use base ten manipulatives (e.g., base ten blocks, Digi-Blocks, connecting cubes, ten frames, interlocking base ten blocks) to build and compare 11 to 19.
- Ability to match the concrete representations of 11 through 19 with the numerical representations.
- Ability to understand that numbers 11-19 represent one ten and some more ones.

1.NBT.B.2c

Understand the following as a special case: The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

Essential Skills and Knowledge

- Ability to use base ten manipulatives (e.g., base ten blocks, Digi- Blocks, Unifix Cubes, ten frames, interlocking base ten blocks) to build and model counting by tens.
- Ability to skip count by 10s to 100 understanding that each ten counted represents that number of groups of ten.

1.NBT.B.3

Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

Essential Skills and Knowledge

- Ability to apply their understanding of the value of tens and ones in order to compare the magnitude of two numbers.
- Ability to use base ten manipulatives to represent the numbers and model the comparison of their values.
- Ability to represent their reasoning about the comparison of two two-digit numbers using pictures, numbers, and words.
- Ability to use cardinality to compare the quantity of the numbers with models.
- Ability to use ordinality to compare the placement of the numbers on the number line or 100s chart.
- Knowledge of the symbols >, =, < and their meaning

1.NBT.C USE PLACE VALUE UNDERSTANDING AND PROPERTIES TO ADD AND SUBTRACT.

1.NBT.C.4

Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones, and sometimes it is necessary to compose a ten.

Essential Skills and Knowledge

- Knowledge of the relationship between operations of addition and subtraction.
- Ability to model addition and subtraction using base ten manipulatives (e.g., base ten blocks, Digi-Blocks, Unifix cubes) and explain the process.
- Knowledge of place value.
- Ability to use a variety of methods that could involve invented, flexible or standard algorithmic thinking (e.g., expanded form, partial sums, a traditional algorithm).

1.NBT.C.5

Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

Essential Skills and Knowledge

- Ability to use base ten manipulatives, number lines or hundreds charts to count on10 more/10 less of any two-digit number and explain their reasoning.
- Ability to model addition of 10 more or 10 less of a given number using base ten manipulatives (e.g., base ten blocks, Digi-Blocks, connecting cubes) and explain the process.
- Knowledge of place value and skip counting by forward and backward to and from 10.

1.NBT.C.6

Subtract multiples of 10 in the range of 10-90 from multiples of 10 in the range of 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Essential Skills and Knowledge

- Ability to use base ten manipulatives, number lines or hundreds charts to model finding 10 less and explain reasoning.
- Knowledge of addition and subtraction fact families.
- Ability to model subtraction using base ten manipulatives (e.g., base ten blocks, Digi-Blocks, Unifix cubes) and explain the process.
- Knowledge of place value and skip counting by 10.

1.MD Measurement and Data

1.MD.A MEASURE LENGTHS INDIRECTLY AND BY ITERATING LENGTH UNITS.

1.MD.A.1
Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Essential Skills and Knowledge

- Knowledge of the concept of transitivity (e.g. the understanding that if the length of object A is longer than the length of object B and the length of object B is longer than the length of object C, than the length of object A is longer than the length of object C).

1.MD.A.2
Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

Essential Skills and Knowledge

- Knowledge that length is the distance between the two endpoints of an object.
- Ability to identify a unit of measure.
- Knowledge of nonstandard (e.g., paper clips, eraser length, toothpicks) as well as standard units of measurement.
- Ability to subdivide the object by the unit (placing the unit end to end with no gaps or overlaps next to the object (iterating).

1.MD.B TELL AND WRITE TIME.

1.MD.B.3
Tell and write time in hours and half-hours using analog and digital clocks.

Essential Skills and Knowledge

- Ability to apply knowledge of fractional wholes and halves to telling time.
- Ability to equate a number line to 12 with the face of a clock.
- Ability to match time on a digital clock with that on an analog clock.

1.MD.C REPRESENT AND INTERPRET DATA.

1.MD.C.4

Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Essential Skills and Knowledge

- Ability to sort data into separate categories.
- Ability to display data in appropriate graph, such as a picture graph.
- Ability to answer questions about the data such as "Which category has more?" "Which category has less?" "What is the favorite snack of our class?"

1.G Geometry

1.G.A REASON WITH SHAPES AND THEIR ATTRIBUTES

1.G.A.1

Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

Essential Skills and Knowledge

- Ability to sort shapes (e.g., attribute blocks, polygon figures) by shape, number of sides, size, or number of angles.
- Ability to use geoboards, toothpicks, straws, paper and pencil, computer games to build shapes that possess the defining attributes.
- Ability to explain how two shapes are alike or how they are different from each other.

1.G.A.2

Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

Essential Skills and Knowledge

- Ability to use concrete manipulatives (e.g., pattern blocks, attribute blocks, cubes, rectangular prisms, cones, cylinders, geoboards, paper & pencil,) to create composite shapes from 2 or 3 dimensional shapes.

1.G.A.3

Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

Essential Skills and Knowledge

- Knowledge that the whole or unit has been partitioned into equal– sized portions or fair shares.
- Ability to apply the concept of sharing equally with friends lays the foundation for fractional understanding.
- Ability to model halves and fourths with concrete materials.

Grade 1 MD College and Career-Ready Vocabulary

INVERSE OPERATIONS

Is when two operations undo each other. Addition and subtraction are inverse operations. Multiplication and division are inverse operations. Examples: 4 + 5 equals 9; 9 – 5 equals 4 and 6 x 5 equals 30; 30 ÷ 5 equals 6

COUNTING ALL

Means the very first addition counting strategy that a student uses to count objects, pictures, or items in a problem to determine the total number of objects. This is the least efficient counting strategy to use and should lead to the more efficient Counting On strategies. Example: Bobby has two counters and Susie has three. How many do they have all together? Bobby used manipulatives to represent the objects in the problem. He counted out a set of two counters and a set of three counters. He then used one to one correspondence to count all the objects. Bobby counts each object one at a time and counts in sequence, 1,2,3,4,5

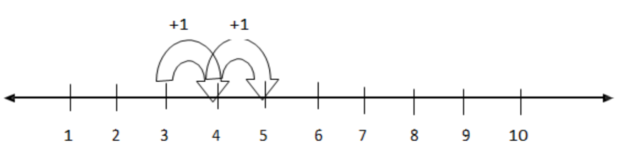
COUNTING ON

Is another counting strategy that students use to solve addition problems. A student solves the problem by counting, but instead of counting all the objects they start with one set of objects that they recognize without counting. The student holds that number of objects in their head and starts counting on from that number until all the objects are counted. For example: Bobby has two counters and Susie has three. How many do they have all together? Susie recognizes, without counting (subitizes) , the set of two counters. She holds that number in her head and counts on from 2. She counts the rest of the counters, 3, 4, 5 to find the total. Susie counts by seeing 2 and holding 2 in her head and counts 3,4,5 as she touches and counts three more counters.

COUNTING ON FROM THE LARGER NUMBER

Is another counting strategy that is used to solve addition problems. After students have had many experiences counting on, they start to realize they should start counting with the set with the largest amount of objects. Example: Bobby has two counters and Susie has three. How many do they have all together? Bobby subitized the three (the larger of the two sets of objects). He held the number 3 in his head and count on to 4,5 to find the total. Booby knows 3 is greater than 2 so he holds 3 in his head and counts on 4, 5 as he touches the two counters left.

USING THE ‘COUNTING ON’ STRATEGY ON AN OPEN NUMBER LINE



Count started at 3, then count on from three to five. How many jumps?

COUNTING UP

Is a subtraction counting strategy in which a student counts up from one part to the whole in order to find the missing part. Example: 9 – 6 equals ? The student would count starting at 6, saying "7, 8, 9" determining that, by counting up three numbers, the missing part of the number sentence is „3". Using a number line students would move to the number 6 and move up the number line counting each tick mark 7,8,9.

COUNTING BACK

Is a subtraction counting strategy in which a student counts back from the total in order to find the missing part. Example: 9 – 6 equals ? The student would count starting at 9, saying "8, 7, 6" determining that, by counting back three numbers, the missing part of the number sentence is,3". On a number line students would find the tick mark labeled 9 and then 'jump back' as they count back to 6, so 8,7,6. 9-6 equals.

VISUAL REPRESENTATIONS OF NUMERALS

Are concrete materials or pictures that represent specific number concepts. Some examples are base ten blocks, fraction bars, pattern blocks, two color counters.

SPECIAL CASE

This is the first introduction to place value where students build numbers composed of one ten and one, two, three, four, five, six, seven, eight, or nine. It is also the only set of numbers greater than 9 in which the „ten" comes at the end of the word (eight<u>een</u>) rather than at the beginning (<u>thirty</u>-six). Also, eleven and twelve follow neither rule.

CARDINALITY

This is the understanding that when counting a set, the last number counted represents the total number of objects in the set. Cardinality gives the numerical symbols their value.

ORDINALITY

Are numbers used to tell order. Examples: first, sixth, eighteenth.

PLACE VALUE

the value of a digit as determined by its position in a number. For example: in the number "101" the one is worth either 100 or 1, depending upon its position.

BASE TEN NUMERALS

a base of a numeration system is the number that is raised to various powers to generate the place values of that system. In the base ten numeration system the base is ten. The first place is 10^0 or 1 (the units place), the second is 10^1 or 10 (the tens place), the third is 10^2 or 100 (the hundreds place), etc. This determines the place value of the different positions in a number.

HALVES

A division of a whole or a set into two equal parts.

FOURTHS/QUARTERS

A division of a whole or a set into four equal part.

Table 1: Common addition and subtraction situations.

	Results Unknown	Change Unknown	Start Unknown
Add to	Two birds sat on a ledge. Three more birds flew to the ledge. How many birds are now on the ledge? $2 + 3 = ?$	Two birds sat on a ledge. Some more birds flew to the ledge. Then there were five birds on the ledge. How many birds flew over to the first two? $2 + ? = 5$	Some birds sat on a ledge. Three more birds flew to the ledge. Then there were five birds on the ledge. How many birds were on the ledge before? $? + 3 = 5$
Take From	Three oranges were on the table. I ate one orange. How many oranges are on the table now? $3 - 1 = ?$	Three oranges were on the table. I ate some oranges. Then there were two oranges. How many oranges did I eat? $3 - ? = 2$	Some oranges were on the table. I ate one orange. Then there were two oranges. How many oranges were on the table before? $? - 3 = 2$

	Total Unknown	Addend Unknown	Both Addends Unknown
Put Together/ Take Apart	Five red marbles and two green marbles are on the table. How many marbles are on the table? $5 + 2 = ?$	Ten marbles are on the table. Five are red and the rest are green. How many marbles are green? $5 + ? = 10$ or $? + 5 = 10$	Max has five marbles. How many can she put in her left hand and how many in her right hand? $5 = 0 + 5$ $5 = 5 + 0$ $5 = 1 + 4$ $5 = 4 + 1$ $5 = 2 + 3$ $5 = 3 + 2$

	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare "more"	**"How many more?" version:** Macy has two cats. Marcus has five cats. How many more cats does Marcus have than Macy? $2 + ? = 5$	**Version with "more":** Marcus has three more cats than Macy. Macy has two cats. How many cats does Marcus have? $2 + 3 = ?$	**Version with "more":** Marcus has three more cats than Macy. Marcus has five cats. How many cats does Macy have? $5 - 3 = ?$
Compare "fewer"	**"How many fewer?" version:** Macy has two cats. Marcus has five cats. How many fewer cats does Macy have than Marcus? $5 - 2 = ?$	**Version with "fewer":** Macy has three fewer cats than Marcus. Macy has two cats. How many cats does Marcus have? $3 + 2 = ?$	**Version with "fewer":** Macy has three fewer cats than Marcus. Marcus has five cats. How many cats does Macy have? $? + 3 = 5$

Darker shading indicates the four Kindergarten problem subtypes. Grade 1 and 2 students work with all subtypes and variants. Unshaded (white) problems are the four difficult subtypes that students should work on in grade 1 but need not master until grade 2.

Adapted from CCSS, p.88, which is based on Mathematics Learning in Early Childhood: Paths Towards Excellence and Equity, National Research Council, 2009, pp. 32-22 and the CCSS Progression document pp. 9.

Table 2: The properties of operations. Here a, b and c stand for arbitrary numbers in a given number system. The properties of operations apply to the rational number system, the real number system, and the complex number.

Associative property of addition	$(a + b) + c = a + (b + c)$
Commutative property of addition	$a + b = b + a$
Additive identity property of 0	$a + 0 = 0 + a = a$
Existence of additive inverses	For every *a* there exists -*a* so that $a + (-a) = (-a) + a = 0$
Associative property of multiplication	$(a \times b) \times c = a \times (b \times c)$
Commutative property of multiplication	$a \times b = b \times a$
Multiplicative identity property 1	$a \times 1 = 1 \times a = a$
Existence of multiplicative inverses	For every $a \neq 0$ there exists $1/a$ so that $a \times 1/a = 1/a \times a = 1$
Distributive property of multiplication over additions	$a \times (b + c) = a \times b + a \times c$

Adapted from CCSS, p.90.