Grade 1 Mathematics Standards

Critical Areas for COHERENCE in Mathematics in Grade 1

In Grade 1, instructional time should focus on four critical 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 from Kindergarten 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 (e.g., Commutative Property and Associative Property) to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., "making tens" and "doubles +1") 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 (students are expected to use more than just the traditional algorithms) 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. (Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.)

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.

Standards for Mathematical Practice in Grade 1

The State Standards for Mathematical Practice are practices expected to be integrated into every mathematics lesson for all students Grades K-12. Below are a few examples of how these Practices may be integrated into tasks that Grade 1 students complete.

Practice	Explanation and Example.
1) Make sense of problems and persevere in solving them.	Mathematically proficient students in Grade 1 examine problems (tasks), can make sense of the meaning of the task and find an entry point or a way to start the task. Grade 1 students also develop a foundation for problem solving strategies and become independently proficient on using those strategies to solve new tasks. In Grade 1, students' work still relies on concrete manipulatives and pictorial representations as students solve tasks unless the KCCRS refers to the word *fluently*, which denotes mental mathematics. Grade 1 students also are expected to persevere while solving tasks; that is, if students reach a point in which they are stuck, they can reexamine the task in a different way, or use a different strategy and continue to solve the task. For example, to solve a problem involving multi-digit numbers, they might first consider similar problems that involve multiples of ten. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. They often check their answers to problems using a different method or approach and lastly, mathematically proficient students complete a task by asking themselves the question, "Does my answer make sense?"
2) Reason abstractly and quantitatively.	Mathematically proficient students in Grade 1 make sense of quantities and the relationships while solving tasks. This involves two processes- *decontextualizing* and *contextualizing*. In Grade 1, students represent situations by *decontextualizing* tasks into numbers and symbols and *contextualizing* numbers and symbols. For *contextualizing* example, when a student sees the expression 40 − 26, she might visualize this problem by thinking, if I have 26 marbles and Melisa has 40, how many more do I need to have as many as Melisa? Then, in that context, she thinks, 4 more will get me to a total of 30, and then 10 more will get me to 40, so the answer is 14. In this example, the student uses a context to think through a strategy for solving the problem, using the relationship between addition and subtraction and decomposing and recomposing the quantities. She then uses what she did in the context to identify the solution of the original abstract problem. A *decontextualizing* example: Melisa has 15 pieces of candy and gives 7 away to her friend, Deb. Students may think about the number they have to add to 7 to get to 15 and write: 15 − 7 = 8
3) Construct viable arguments and critique the reasoning of others.	Mathematically proficient students in Grade 1 accurately use definitions and previously established solutions to construct viable arguments about mathematics. In Grade 1 during discussions about problem solving strategies, students constructively critique the strategies and reasoning of their classmates. Examples: 1)while solving 74 − 18 , students may use a variety of strategies, and after working on the task, can discuss and critique each other's reasoning and strategies, citing similarities and differences between strategies. Students in Grade 1 present their arguments in the

Practice	Explanation and Example.
	form of representations, actions on those representations, and explanations in words (oral or written).
4) Model with mathematics.	Mathematically proficient students in Grade 1 model real-life mathematical situations with an equation (number sentence) and check to make sure that their equation accurately matches the problem context. At this level it might be as simple as writing an addition equation to describe a situation. Grade 1 students still rely on concrete manipulatives and pictorial representations while solving problems, but the expectation is that they will also write an equation to model problem situations. Likewise, Grade 1 students are expected to create an appropriate problem situation from an equation. For example, students are expected to create a story problem for the equation 24 + 17 − 13 = ? *See Table 1 in Appendix for Addition/Subtraction "Situations".*
5) Use appropriate tools strategically.	Mathematically proficient students in Grade 1 have access to and use tools appropriately. These tools might include physical objects (cubes, geometric shapes, place value manipulatives, fractions bars, etc.) drawings or diagrams (number lines, tally marks, tape diagrams, arrays, tables, graphs, etc.), paper & pencil, rulers, and other measuring tools, scissors, tracing paper, grid paper, virtual manipulatives or other available technologies that support conceptual understanding and higher-order thinking skills. Example: while solving 28 + 17, students can explain why place value blocks are more appropriate than counters.
6) Attend to precision.	Mathematically proficient students in Grade 1 are precise in their communication, calculations, and measurements. They start by using everyday language to express their mathematical ideas, realizing that they need to select words with clarity and specificity rather than saying "it works" without explaining what "it" means. Once Grade 1 students become familiar with a mathematical idea or object, they are ready to learn more precise mathematical terms to describe it. In all mathematical tasks, it is expected that Grade 1 students communicate clearly, using grade-level appropriate vocabulary accurately as well as giving precise explanations and reasoning regarding their process of finding solutions. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. Example: the equivalence of 8 & 5 can be written both as 5 + 3 = 8 and 8 = 5 + 3. They understand the equal sign means "same value as".
7) Look for and make use of structure.	Mathematically proficient students in Grade 1 carefully look for patterns and structures in the number system and other areas of mathematics. At this level, students USE structure such as place value, the properties of operations, other generalizations about the behavior of the operations (for example, the less you subtract, the greater the difference). Or, while solving addition and subtraction problems students can apply the patterns of the number system to skip count by 10s off the decade. For example, Grade 1 students are expected to mentally reason that 33 + 21 is 33 plus 2 tens, which equals 53 and then an addition one which equals 54. While working in the Numbers in Base Ten domain, students work with the idea that 10 ones equal a ten, and 10 tens equals 1 hundred. Further, Grade 1 students also make use of structure when they work with subtraction as missing addend problems,

Practice	Explanation and Example.
	such as 50 − 33 = ? can be written as 33+ ? = 50 and can be thought of as how much more do I need to add to 33 to get to 50?
8) Look for and express regularity in repeated reasoning.	Mathematically proficient students in Grade 1 begin to look for regularity in problem structures when solving mathematical tasks. For example, first graders might notice that when tossing 2-color counters to find combinations of a given number, they always get what they call “opposites”----when tossing 6 counters, they get 2 red, 4 yellow and 4 red, 2 yellow and when tossing 10 counters, they get 1 red, 9 yellow and 1 yellow and 9 reds and are able to formulate conjectures about what they noticed. Also, students begin to look for strategies to be more efficient in computations, including doubles strategies and making a ten. Lastly, while solving all tasks, Grade 1 students accurately check for the reasonableness of their solutions during and after completing the task.

Mathematics Content Standards in Grade 1

Operations and Algebraic Thinking 1.OA

(Counting and Cardinality and Operations and Algebraic Thinking Progression K-5 Pg. 12)

Represent and solve problems involving addition and subtraction.

(Refer to shaded section of Table 1 for specific situation types.)

1.OA.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 situation equations and/or solution equations with a symbol for the unknown number to represent the problem.)*

> For Example:
> *A clown had 20 balloons. He sold some and has 12 left. How many did he sell?*
> Situation Equation: 20 – ? = 12
> Solution Equation: 20 -12 = ?

1.OA.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.)*

Understand and apply properties of operations and the relationship between addition and subtraction.

1.OA.3. Apply (not necessary to name) properties of operations as strategies to add and subtract. *Examples:* $8 + 3 = 11$ *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* $2 + 6 + 4 = 2 + 10 = 12$*. (Associative property of addition.) To add 0 to any number, the answer is that number* $7 + 0 = 7$ *(Additive identity property of 0).* Students need not use formal terms for these properties.

1.OA.4. Understand subtraction as an unknown-addend problem. *For example, subtract* $10 - 8$ *by finding the number that makes 10 when added to 8.*

Add and subtract within 20.

1.OA.5. Relate counting to addition and subtraction (*e.g. by counting on 2 to add 2, counting back 1 to subtract 1*).

1.OA.6. Add and subtract within 20, demonstrating fluency (efficiently, accurately, and flexibly) for addition and subtraction within 10. Use mental strategies such as counting on; making *ten (e.g.* $8 + 6 = 8 + 2 + 4 = 10 + 4 = 14$*)*; decomposing a number leading to a ten
(e.g. $13 - 4 = 13 - 3 - 1 = 10 - 1 = 9$*);* 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*
$6 + 6 + 1 = 12 + 1 = 13$*).*

Work with addition and subtraction equations.

1.OA.7. Understand the meaning of the equal sign (the value is the same on both sides 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?* $6 = 6;\ \ 7 = 8 - 1;\ \ 5 + 2 = 2 + 5;\ \ 4 + 1 = 3 + 2;\ \ 7 - 1 = 4;\ \ 5 + 4 = 7 - 2$

1.OA.8. Using related equations, Determine the unknown whole number in an addition or subtraction equation. *For example, determine the unknown number that makes the equation true in each of the equations* $\blacksquare - 3 = 7;\ \ 7 + 3 = \blacksquare$.

Number and Operations in Base Ten 1.NBT

(Numbers & Operations Base 10 Progression K-5 Pgs. 6-7)

Extend the counting sequence.

1.NBT.1. Count to 120 (recognizing growth and repeating patterns), starting at any number less than 120. In this range, read and write **numerals** and represent a number of objects with a written numeral.

Understand place value.

1.NBT.2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

- 1.NBT.2a. 10 can be thought of as a grouping of ten ones—called a "ten."
- 1.NBT.2b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
- 1.NBT.2c. 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).
- 1.NBT.2d. Show flexibility in composing and decomposing tens and ones *(e.g. 20 can be composed from 2 tens or 1 ten and 10 ones, or 20 ones.)*

1.NBT.3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the relational symbols >, <, =, and ≠.

Use place value understanding and properties of operations to add and subtract.

1.NBT.4. Add within 100 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 including:

- 1.NBT.4a. Adding a two-digit number and a one-digit number
- 1.NBT.4b. Adding a two-digit number and a multiple of 10
- 1.NBT.4c. Understanding that when adding two-digit numbers, combine like base-ten units such as tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

1.NBT.5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

1.NBT.6. Subtract multiples of 10 in the range 10 to 90 from multiples of 10 in the range 10 to 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.

Measurement and Data 1.MD

Measure lengths indirectly and by iterating length units.

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

(Measurement and Data (measurement part) Progression K–5 Pg. 8 Paragraph 1.)

1.MD.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.*
(Measurement and Data (measurement part) Progression K–5 Pg. 8, 3rd Section.)

Tell and write time.

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

Represent and interpret data.

1.MD.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.
(Measurement and Data (data part) Progression K–5 Pg. 5).

Geometry 1.G

(Geometry Progression K-6 Pgs. 8-9)

Reason with shapes and their attributes.

1.G.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 that possess defining attributes.

1.G.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. Students do not need to learn formal names such as "right rectangular prism."

1.G.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*. Note: fraction notation ($\frac{1}{2}, \frac{1}{4}$) is not expected at this grade level.
Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.