Kindergarten Mathematics Standards

Critical Areas for COHERENCE in Mathematics in Kindergarten

In Kindergarten, instructional time should focus on three critical areas:

1. Representing and comparing whole numbers, initially with sets of object. Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals. Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes. Students understand "teen" numbers are ten ones and some more ones.

2. Understanding addition as putting together and adding to, and subtraction as taking apart and taking from. Students begin to model simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 − 2 = 5. (Kindergarten students should see addition and subtraction equations, and students writing of equations in kindergarten is encouraged, but it is not required.). Students apply effective strategies for counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away but are not expected to work above 10.

3. Describing shapes and space. Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Standards for Mathematical Practice in Kindergarten

The 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 Kindergarten students complete.

Practice	Explanation and Example
1) Make sense of problems and persevere in solving them.	Mathematically proficient students in Kindergarten begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of the problem and look for ways to solve it. Students in Kindergarten use concrete objects or pictures to help them conceptualize and solve problems. Kindergarten students also are expected to persevere while solving tasks; that is, if students reach a point in which they are stuck, they don't "give up", they try another strategy. For example, young students might use concrete objects or pictures to show the actions of a problem or seeing a way to begin, they ask questions that will help them get started.
2) Reason abstractly and quantitatively.	Mathematically proficient students in Kindergarten begin to recognize that a number represents a specific quantity. Then, they connect the quantity to objects and written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. For example, Kindergartners use concrete objects to "act out" a context, they represent the problem with mathematical objects or symbols. This is also an example of modeling with mathematics (SMP #4).
3) Construct viable arguments and critique the reasoning of others.	Mathematically proficient students in Kindergarten construct arguments using concrete objects, pictures, drawings, and actions. They begin to develop their mathematical communication skills as they participate in mathematical discussions. Questions like "How did you get that?" and "Why is that true?" encourage them to explain their thinking to others and respond to others' thinking. For example, in order to demonstrate what happens to the sum when the same amount is added to one addend and subtracted from another, students might represent a story about children moving between two classrooms: the number of children in each classroom is an addend; the total number of children in the two classrooms is the sum. When some students move from one classroom to the other, the number of students in each classroom changes by that amount—one addend decreases by some amount and the other addend increases by that same amount—but the total number of students does not change.
4) Model with mathematics.	Mathematically proficient students in Kindergarten can apply the mathematics they know to solve problems that arise in everyday life. For example, when Kindergartners are first studying an operation such as addition, they might arrange counters to solve problems such as: there are seven animals in the yard, some are dogs and some are cats, how many of each could there be? They are using the counters to model the mathematical elements of the contextual problems (they can split the set of 7 into a set of 3 and a set of 4, etc. and the teacher writes their actions with the counters in an equation, 4 + 3 = 7) Kindergartners experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects,

Practice	Explanation and Example
	acting out, making a chart or list, creating equations, etc. Students need many opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed.
5) Use appropriate tools strategically.	Mathematically proficient students in Kindergarten begin to consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, kindergarteners may decide that it might be advantageous to use linking cubes to represent two quantities and then compare the two representations side-by-side. The tools that Kindergartners might use include physical objects (cubes, geometric shapes, place value manipulatives, etc.) drawings or diagrams (number paths, tally marks, tape diagrams, arrays, tables, etc.) paper and pencil, rulers and other measuring tools, scissors, tracing paper, or other available technologies.
6) Attend to precision.	Mathematically proficient students in Kindergarten start by using everyday language to express their mathematical ideas and begin to develop their communication skills. They try to use clear and precise language in their discussions with others and in their own reasoning. For example, students can "show" and "explain" that the number 8 (whole) can be decomposed into 4 (part) and 4 (part) or 5 (part) and 3 (part), and so on. They "show" and can explain this relationship using concrete objects and/or number bond graphic organizer.
7) Look for and make use of structure.	Mathematically proficient students in Kindergarten look for patterns and structures in numbers, place value, properties of operations, etc. They USE structure to solve problems. Examples: The less you subtract, the greater the difference. Recognizing that adding 1 results in the next counting number. When Kindergartners recognize that adding 1 results in the next counting number, they are identifying the basic structure of whole numbers. Students use the "part-part-whole" relationship or structure to solve problems. They also recognize the pattern that exists in the teen numbers; every teen number Is written with a 1 (representing one ten) and ends with the digit that is first stated. (Example: 13 = One ten and three ones or "one ten, three)
8) Look for and express regularity in repeated reasoning.	Mathematically proficient students in Kindergarten notice repetitive actions in counting and computation, etc. and find shortcuts. For example, they may notice that the next number in a counting sequence is "one more". When counting by tens, the next number in the sequence is "ten more" (or one more group of ten) or they notice that when tossing two-colored 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, and 2 yellow and when tossing 4 counters, they get 1 red, 3 yellow and 3 red, 1 yellow.* Or on a Ten Frame, with 8 counters, they notice there are 2 spaces, or with 4 counters on the Ten Frame, there are 6 spaces. As they look for and explain their reasoning they continually ask themselves, "Does this make sense"?

Mathematics Content Standards in Grade K

Counting and Cardinality K.CC

(Counting and Cardinality and Operations and Algebraic Thinking Progression K-5 Pg. 1-5)

Know number names and the count sequence.

(Counting and Cardinality and Operations and Algebraic Thinking Progression K-5 Pg. 4-5)

- K.CC.1 Count to 100 by ones and by tens and identify as a growth pattern.
- K.CC.2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
- K.CC.3 Read and write **numerals** from 0 to 20.

Count to tell the number of objects.

(Counting and Cardinality and Operations and Algebraic Thinking Progression K-5 Pg. 4-5)

- K.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality.
  - K.CC.4a. When counting objects, say each number's name in sequential order, pairing each object with one and only one number name and each number name with one and only one object (Click here for a video showing this concept).
  - K.CC.4b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
  - K.CC.4c. Understand that each successive number name refers to a quantity that is one larger.
  - K.CC.4d. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).
- K.CC.5 Count to answer "how many?" up to20 concrete or pictorial objects arranged in a line, a rectangular array, or a circle, or as many as 10 objects in a scattered configuration **(subitizingError! Bookmark not defined.**); given a number from 1 to 20, count out that many objects.

Compare numbers.

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

- K.CC.6 Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, *(e.g. by using matching and counting strategies.)* Include groups with up to ten objects.
- K.CC.7 Compare two numbers between 1 and 10 presented as written **numerals**.

Operations and Algebraic Thinking K.OA

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

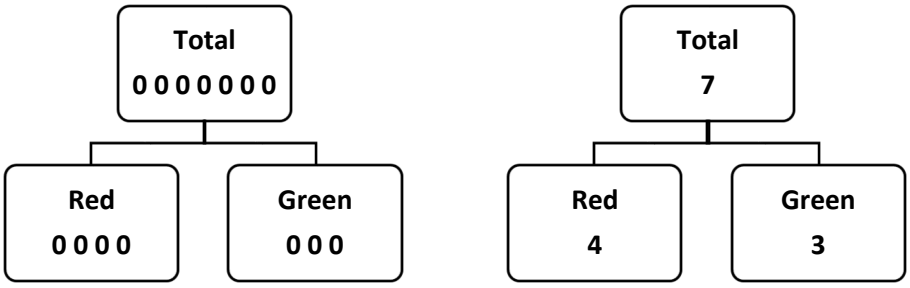
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

- K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (*e.g. claps*), acting out situations, verbal explanations, expressions, or

equations.

K.OA.2. Solve addition and subtraction word problems, and add and subtract within 10, (*e.g. by using objects or drawings to represent the problem.)* Refer to shaded section of Table 1 for specific situation types.

K.OA.3. **Decompose** numbers less than or equal to 10 into pairs in more than one way, (*e.g. by using objects or drawings, and record each decomposition by a drawing or equation* (*e.g.* $5 = 2 + 3$ *and* $5 = 4 + 1$)).



K.OA.4. For any number from 1 to 9, find the number that makes 10 when added to the given number, *(e.g. by using objects or drawings, and record the answer with a drawing or equation.).*

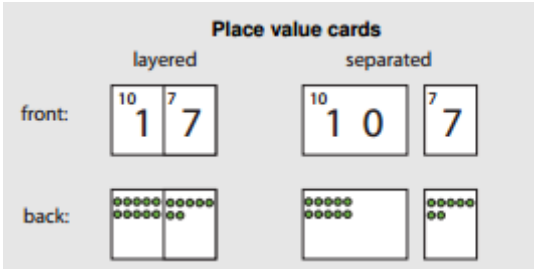
K.OA.5. Fluently (efficiently, accurately, and flexibly) add and subtract within 5.

Number and Operations in Base Ten K.NBT

(Numbers & Operations Base 10 Progression K-5 Pg. 5)

Work with numbers 11–19 to gain foundations for place value.

K.NBT.1. Compose and **decompose** numbers from 11 to 19 into ten ones and some further ones, *(e.g. by using objects or drawings, and record each composition or decomposition by a drawing or equation*



(e.g. $10 + 8 = 18$ *and* $19 = 10 + 9$*);)*; understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Measurement and Data K.MD

Describe and compare measurable attributes.

(Measurement & Data progression – measurement part K-5 Pg. 6-7)

K.MD.1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.2. Directly compare two objects, with a measureable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

Classify objects and count the number of objects in each category.

(Measurement & Data Progression – data part K-5 Pg. 5)

K.MD.2. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count (*Limit category counts to be less than or equal to 10*).

Geometry K.G

(Geometry Progression K-6 Pgs. 6-7)

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above, below, beside, in front of, behind, and next to*.

K.G.2. Correctly gives most precise name of shapes regardless of their orientations (position and direction in space) or overall size.

K.G.3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

Analyze, compare, create, and compose shapes.

K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations (position and direction in space), using informal language to describe their similarities, differences, parts *(e.g. number of sides and vertices/"corners"*) and other attributes *(e.g. having sides of equal length)*.

K.G.5. Model shapes in the world by building shapes from components (*e.g. sticks and clay balls*) and drawing shapes.

K.G.6. Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*