Mathematics | Grade K

The descriptions below provide an overview of the mathematical concepts and skills that students explore throughout Kindergarten.

Counting and Cardinality
Students use numbers, including written numerals and counting, to develop concepts about quantity. Students use numbers to solve contextual problems and represent quantities, such as counting objects in a set, counting out a given number of objects, and comparing sets or numerals. Students use effective strategies for counting and answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects and learning about counting sequences.

Operations and Algebraic Thinking
Students develop an understanding of addition and subtraction and determine when to add or subtract in a given context. Students should solve a variety of problem types in order to make connections among contexts, equations, and strategies (See Table 1 - Addition and Subtraction Situations). Students choose from multiple representations (including using objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions, or equations) when solving addition and subtraction problems within 10. Students compose and decompose quantities within 10 in various ways, and use mental strategies flexibly to develop fluency in addition and subtraction within 10.

Number and Operations in Base Ten
Students understand that numbers from 11 to 19 represent ten ones and some more ones by using objects or drawings, and record each composition or decomposition by a drawing and/or write an equation to represent this relationship.

Measurement and Data
Students describe and sort objects in many different ways. This includes length, weight, and coins. They classify objects in categories and compare measurable attributes. Students begin to learn to graph and analyze collections of objects. Students learn to identify the penny, nickel, dime, and quarter and know the value of each.

Geometry
Students describe their physical world using geometric ideas, vocabulary, and positional words. Regardless of orientation, students name two-dimensional shapes and three-dimensional solids, compare shapes/solids, and combine shapes/solids to create new shapes/solids. Students will recognize, describe, extend, and create patterns and explain patterning rules and the structure of patterns.

Standards for Mathematical Practice

Being successful in mathematics requires the development of approaches, practices, and habits of mind that need to be in place as one strives to develop mathematical fluency, procedural skills, and conceptual understanding. The Standards for Mathematical Practice are meant to address these areas of expertise that teachers should seek to develop in their students. These approaches, practices, and habits of mind can be summarized as "processes and proficiencies" that successful mathematicians have as a part of their work in mathematics. Additional explanations are included in the main introduction of these standards.

Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Literacy Standards for Mathematics

Communication in mathematics employs literacy skills in reading, vocabulary, speaking and listening, and writing. Mathematically proficient students communicate using precise terminology and multiple representations including graphs, tables, charts, and diagrams. By describing and contextualizing mathematics, students create arguments and support conclusions. They evaluate and critique the reasoning of others, analyze, and reflect on their own thought processes. Mathematically proficient students have the capacity to engage fully with mathematics in context by posing questions, choosing appropriate problem-solving approaches, and justifying solutions. Further explanations are included in the main introduction.

Literacy Skills for Mathematical Proficiency
1. Use multiple reading strategies. 2. Understand and use correct mathematical vocabulary. 3. Discuss and articulate mathematical ideas. 4. Write mathematical arguments.

Counting and Cardinality (CC)

Cluster Headings	Content Standards
A. Know number names and the counting sequence.	**K.CC.A.1** Count to 100 by ones, fives, and tens. Count backward from 10. **K.CC.A.2** Count forward by ones beginning from any given number within the known sequence (instead of having to begin at 1). **K.CC.A.3** Write numbers from 0 to 20. Represent a quantity of objects with a written number 0-20. **K.CC.A.4** Recognize, describe, extend, and create patterns and explain a simple rule for a pattern using concrete materials. Analyze the structure of the repeating pattern by identifying the unit (core) of the pattern.
B. Count to tell the number of objects.	**K.CC.B.5** Understand the relationship between numbers and quantities; connect counting to cardinality. **a.** When counting objects 1-20, say the number names in the standard order, using one-to-one correspondence. **b.** Recognize 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. **c.** Recognize that each successive number name refers to a quantity that is one greater and each previous number is one less. **K.CC.B.6** Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, a circle, or as many as 10 things in a scattered configuration. Given a number from 1-20, count out that many objects.
C. Compare numbers.	**K.CC.C.7** Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group. **K.CC.C.8** Compare two given numbers up to 10, when written as numerals, using the terms *greater than, less than*, or *equal to.* (Students need not use comparison symbols here.)

Operations and Algebraic Thinking (OA)

Cluster Headings	Content Standards
A. Represent and solve problems involving addition and subtraction. (See Table 1 - Addition and Subtraction Situations)	**K.OA.A.1** Represent addition and subtraction with objects, fingers, drawings, acting out situations, verbal explanations, expressions, or equations. **K.OA.A.2** Add and subtract within 10 to solve contextual problems with result/total unknown involving situations of add to, take from, and put together/take apart. Use objects, drawings, or equations to represent the problem. **K.OA.A.3** Decompose numbers less than or equal to 10 into addend pairs in more than one way (*e.g., 5 = 2 + 3 and 5 = 4 + 1*) by using objects or drawings. Record each decomposition using a drawing or writing an equation. **K.OA.A.4** Find the number that makes 10, when added to any given number, from 1 to 9 using objects or drawings. Record the answer using a drawing or writing an equation. **K.OA.A.5** Use mental strategies flexibly to develop fluency in addition and subtraction within 10.

Number and Operations in Base Ten (NBT)

Cluster Headings	Content Standards
A. Work with numbers 11– 19 to gain foundations for place value.	**K.NBT.A.1** Compose and decompose numbers from 11 to 19 into a group of ten ones and some more ones by using objects or drawings (*e.g., 18 equals 10 + 8*). Record the composition or decomposition using a drawing or by writing an equation.

Measurement and Data (MD)

Cluster Headings	Content Standards
A. Describe and compare measurable attributes.	**K.MD.A.1** Describe the measurable attributes of an object, such as length (long/short), height (tall/short), or weight (heavy/light). **K.MD.A.2** Directly compare two objects with a measurable attribute in common, to describe which object has more of/less of the attribute. For example, directly compare the heights of two children and describe one child as taller/shorter.
B. Work with money.	**K.MD.B.3** Identify the penny, nickel, dime, and quarter based on their attributes (size and color) and recognize the value of each.
C. Classify objects and count the number of objects in each category.	**K.MD.C.4** Sort a collection of objects into a given category, with 10 or fewer in each category. Compare the categories by group size.

Geometry (G)

Cluster Headings	Content Standards
A. Identify and describe shapes and solids.	**K.G.A.1** Describe objects in the environment using names of shapes and solids (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). Describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, between, and next to. **K.G.A.2** Correctly name shapes and solids (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres) regardless of their orientations or overall size. **K.G.A.3** Identify shapes (squares, circles, triangles, rectangles, and hexagons) as two-dimensional and solids (cubes, cones, cylinders, and spheres) as three-dimensional.

B. Analyze, compare, create, and compose shapes.	**K.G.B.4** Describe similarities and differences between two- and three-dimensional shapes/solids, in different sizes and orientations. **K.G.B.5** Model shapes/solids in the world by building or drawing them. **K.G.B.6** Compose a figure using simple shapes/solids and identify smaller shapes/solids within the figure.

Table 1 Common addition and subtraction situations

	Result Unknown	Change Unknown	Start Unknown
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = ?$ **(K)**	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? $2 + ? = 5$ **(1ˢᵗ)**	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? $? + 3 = 5$ **One-Step Problem (2ⁿᵈ)**
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$ **(K)**	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? $5 - ? = 3$ **(1ˢᵗ)**	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? $? - 2 = 3$ **One-Step Problem (2ⁿᵈ)**

	Total Unknown	Addend Unknown	Both Addends Unknown[2]
Put Together/ Take Apart[3]	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$ **(K)**	Five apples are on the table. Three are red and the rest are green. How many apples are green? $3 + ? = 5, 5 - 3 = ?$ **(K)**	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$ **(1ˢᵗ)**

	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare[4]	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? **(1ˢᵗ)**	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? **One-Step Problem (1ˢᵗ)**	(Version with "more"): Julie has 3 more apples than Lucy. Julie has five apples. How many apples does Lucy have? $5 - 3 = ?$ $? + 3 = 5$ **One-Step Problem (2ⁿᵈ)**
	("How many fewer?" version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? $2 + ? = 5, 5 - 2 = ?$ **(1ˢᵗ)**	(Version with "fewer"): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? $2 + 3 = ?, 3 + 2 = ?$ **One-Step Problem (2ⁿᵈ)**	(Version with "fewer"): Lucy has three fewer apples than Julie. Julie has five apples. How many apples does Lucy have? **One-Step Problem (1ˢᵗ)**

K: Problem types to be mastered by the end of the Kindergarten year.

1st: Problem types to be mastered by the end of the First Grade year, including problem types from the previous year. However, First Grade students should have experiences with all 12 problem types.

2nd: Problem types to be mastered by the end of the Second Grade year, including problem types from the previous years.

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