



Arizona Mathematics Standards

Kindergarten

ARIZONA DEPARTMENT OF EDUCATION
HIGH ACADEMIC STANDARDS FOR STUDENTS
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Arizona Mathematics Standards Kindergarten

Kindergarten Overview

Counting and Cardinality (CC)

- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking (OA)

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

Number and Operations in Base Ten (NBT)

- Work with numbers 11–19 to gain foundations for place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data (MD)

- Describe and compare measurable attributes.
- Classify objects and count the number of objects in each category.

Geometry (G)

- Identify and describe shapes.
- Analyze, compare, create, and compose shapes.

Standards for Mathematical Practices (MP)

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.

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Kindergarten: Critical Areas

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

- 1. Develop competency with counting and cardinality.**
- 2. Develop understanding of addition and subtraction and strategies for addition and subtraction within 10.**

More learning time in Kindergarten should be devoted to quantity and number than to other topics.

(1) Students use numbers, including written numerals, to represent quantities such as counting objects in a set; counting out a given number of objects; comparing sets or numerals and recognizing the cardinalities of small sets of objects.

(2) Students use numbers including written numerals to represent and solve quantitative problems. Students choose, combine, and apply effective strategies to solve problems. They will model simple joining and separating situations with sets of objects or eventually with equations. Kindergarten students should see addition and subtraction equations; student writing of equations is encouraged but not required.

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years.

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Counting and Cardinality (CC)

K.CC.A Know number names and the count sequence.	K.CC.A.1	Count to 100 by ones and by tens.
	K.CC.A.2	Count forward from a given number other than one, within the known sequence (e.g., "Starting at the number 5, count up to 11.").
	K.CC.A.3	Write numbers from 0 to 20. Represent a number of objects with a written numeral 0 to 20 (with 0 representing a count of no objects).
K.CC.B Count to tell the number of objects.	K.CC.B.4	Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (one to one correspondence). b. 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 (cardinality). c. Understand that each successive number name refers to a quantity that is one larger (hierarchical inclusion).
	K.CC.B.5	Count to answer questions about "How many?" when 20 or fewer objects are arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1 to 20, count out that many objects.
K.CC.C Compare numbers.	K.CC.C.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. (Include groups with up to ten objects.)
	K.CC.C.7	Compare two numbers between 0 and 10 presented as written numerals.

Operations and Algebraic Thinking (OA)

K.OA.A Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	K.OA.A.1	Represent addition and subtraction concretely. <i>See Table 1.</i>
	K.OA.A.2	Solve addition and subtraction word problems and add and subtract within 10. <i>See Table 1.</i>
	K.OA.A.3	Decompose numbers less than or equal to 10 into pairs in more than one way (e.g., using fingers, objects, symbols, tally marks, drawings, expressions).
	K.OA.A.4	For any number from 1 to 9, find the number that makes 10 when added to the given number (e.g., using fingers, objects, symbols, tally marks, drawings, or equation).
	K.OA.A.5	Fluently add and subtract within 5.

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Number and Operations in Base Ten (NBT)

K.NBT.A Work with numbers 11 to 19 to gain foundations for place value.	K.NBT.A.1	Compose and decompose numbers from 11 to 19 into ten ones and additional ones by using objects, drawings and/or equations. Understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones (e.g., $18 = 10 + 8$).
K.NBT.B Use place value understanding and properties of operations to add and subtract.	K.NBT.B.2	Demonstrate understanding of addition and subtraction within 10 using place value. <i>See Table 1.</i>

Measurement and Data (MD)

K.MD.A Describe and compare measurable attributes.	K.MD.A.1	Describe measurable attributes of a single object (e.g., length and weight).
	K.MD.A.2	Directly compare two objects with a measurable attribute in common to see which object has “more of” or “less of” the attribute, and describe the difference (e.g., directly compare the length of 10 cubes to a pencil and describe one as longer or shorter).
K.MD.B Classify objects and count the number of objects in each category.	K.MD.B.3	Classify objects into given categories; count the number in each category and sort the categories by count. (Note: limit category counts to be less than or equal to 10.)

Geometry (G)

K.G.A Identify and describe shapes.	K.G.A.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.A.2	Correctly name shapes regardless of their orientation or overall size (e.g., circle, triangle, square, rectangle, rhombus, trapezoid, hexagon, cube, cone, cylinder, sphere).
	K.G.A.3	Identify shapes as two-dimensional (lying in a plane, flat) or three-dimensional (solid).
K.G.B Analyze, compare, create, and compose shapes.	K.G.B.4	Analyze and compare two-dimensional and three-dimensional shapes, in different sizes and orientations, 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.B.5	Model shapes in the world by building shapes from components (e.g., use sticks and clay balls) and drawing shapes.
	K.G.B.6	Use simple shapes to form composite shapes. <i>For example, “Can you join these two triangles with full sides touching to make a rectangle?”</i>

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Standards for Mathematical Practice

K.MP.1	<p>Make sense of problems and persevere in solving them.</p> <p>Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, “Does this make sense?” to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.</p>
K.MP.2	<p>Reason abstractly and quantitatively.</p> <p>Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.</p>
K.MP.3	<p>Construct viable arguments and critique the reasoning of others.</p> <p>Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students 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. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.</p>
K.MP.4	<p>Model with mathematics.</p> <p>Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They 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.</p>

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K.MP.5	Use appropriate tools strategically. Mathematically proficient students consider available tools when solving a mathematical problem. They choose tools that are relevant and useful to the problem at hand. 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. Students deepen their understanding of mathematical concepts when using tools to visualize, explore, compare, communicate, make and test predictions, and understand the thinking of others.
K.MP.6	Attend to precision. Mathematically proficient students clearly communicate to others using appropriate mathematical terminology, and craft explanations that convey their reasoning. When making mathematical arguments about a solution, strategy, or conjecture, they describe mathematical relationships and connect their words clearly to their representations. Mathematically proficient students understand meanings of symbols used in mathematics, calculate accurately and efficiently, label quantities appropriately, and record their work clearly and concisely.
K.MP.7	Look for and make use of structure. Mathematically proficient students use structure and patterns to assist in making connections among mathematical ideas or concepts when making sense of mathematics. Students recognize and apply general mathematical rules to complex situations. They are able to compose and decompose mathematical ideas and notations into familiar relationships. Mathematically proficient students manage their own progress, stepping back for an overview and shifting perspective when needed.
K.MP.8	Look for and express regularity in repeated reasoning. Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.

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Table 1. Common Addition and Subtraction Problem Types/Situations.¹

	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? $2 + 3 = ?$	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? $2 + ? = 5$	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? $? + 3 = 5$
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? $5 - ? = 3$	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? $? - 2 = 3$
	Total Unknown	Addend Unknown	Both Addends Unknown ²
Put Together / Take Apart³	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$	Five apples are on the table. Three are red and the rest are green. How many apples are green? $3 + ? = 5, 5 - 3 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$
	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare	(“How many more?” version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? (“How many fewer?” version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? $2 + ? = 5, 5 - 2 = ?$	(Version with “more”): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with “fewer”): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? $2 + 3 = ?, 3 + 2 = ?$	(Version with “more”): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with “fewer”): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? $5 - 3 = ?, ? + 3 = 5$

¹Adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp. 32, 33).

²These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean *makes* or *results* in but always does mean *is the same quantity as*.

³Either addend can be unknown, so there are three variations of these problem situations. Both Addends Unknown is a productive extension of this basic situation, especially for small numbers less than or equal to 10.