Arizona Mathematics Standards

First Grade

ARIZONA DEPARTMENT OF EDUCATION
HIGH ACADEMIC STANDARDS FOR STUDENTS
December 2016

First Grade: Overview

More learning time should be devoted to working with whole numbers than to other topics.

1. **Develop understanding of addition, subtraction, and strategies for addition and subtraction within 20.**
2. **Develop competency of whole number relationships and place value, including grouping in tens and ones through 100**
3. **Develop understanding of linear measurement.**

(1) Students develop strategies for adding and subtracting whole numbers. They use a variety of models to represent add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction (*Table 1*). Students understand connections between counting and addition and subtraction. They use properties of addition with whole numbers to solve addition and subtraction problems through 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.

(2) Students work with whole numbers between 10 and 100 in terms of tens and ones. Through activities that build number sense and place value, they understand the order of the counting sequence, compare whole numbers through 100, and model addition and subtraction situations. Students develop, discuss, and use efficient, accurate, and flexible strategies to add within 100 and subtract multiples of 10.

(3) Students develop an understanding of the meaning and processes of measurement, including iteration (finding the length of an object with repeated equal-sized units) and for indirect measurement (comparing the length of two objects using a third object).

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.

Content Emphasis of Arizona Mathematics Standards:

The content emphasis provides planning guidance regarding the major and supporting clusters found within the standards. The Major and Supporting Clusters align with the Blueprint for AzMERIT. Please consider the following designations when planning an instructional scope for the academic year.

Arizona considers **Major Clusters** ● as groups of related standards that require greater emphasis than some of the others due to the depth of the ideas and the time it takes to master these groups of related standards.

Arizona considers **Supporting Clusters** ▲ as groups of related standards that support standards within the major cluster in and across grade levels. SupportingCclusters also encompass pre-requisite and extension of grade level content

Arizona is suggesting instructional time encompass a range of at least 65%-75% for Major Clusters and a range of 25%-35% for Supporting Cluster instruction. See introduction, page 12 for more information.

First Grade Overview

Grade level content emphasis indicated by: ● Major Cluster: ▲ Supporting Cluster

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Operations and Algebraic Thinking (OA)

- ● Represent and solve problems involving addition and subtraction.
- ● Understand and apply properties of operations and the relationship between addition and subtraction.
- ● Add and subtract within 10.
- ● Work with addition and subtraction equations.

Number and Operations in Base Ten (NBT)

- ● Extend the counting sequence.
- ● Understand place value.
- ● Use place value understanding and properties to add and subtract.

Measurement and Data (MD)

- ● Measure lengths indirectly and by iterating length units.
- ▲ Work with time and money.
- ▲ Represent and interpret data.

Geometry (G)

- ▲ Reason with shapes and their attributes.

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.

Operations and Algebraic Thinking (OA)		
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 with unknowns in all positions (e.g., by using objects, drawings, and/or equations with a symbol for the unknown number to represent the problem). *See Table 1.*
	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/or equations with a symbol for the unknown number to represent the problem). *See Table 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 (commutative and associative properties of addition) as strategies to add and subtract within 20. (Students need not use formal terms for these properties.)
	1.OA.B.4	Understand subtraction as an unknown-addend problem within 20 (e.g., subtract 10 - 8 by finding the number that makes 10 when added to 8).
1.OA.C **Add and subtract within 10.**	**1.OA.C.5**	Relate counting to addition and subtraction (e.g., by using counting on 2 to add 2).
	1.OA.C.6	Fluently add and subtract within 10.
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 (e.g., Which of the following equations are true and which are false? 6 + 1 = 6 - 1, 7 = 8 - 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2).
	1.OA.D.8	Determine the unknown whole number in an addition or subtraction equation relating three whole numbers (e.g., determine the unknown number that makes the equation true in each of the equations 8 + ☐ = 11, 5 = ☐ - 3, 6 + 6 = ☐).
Number and Operations in Base Ten (NBT)		
1.NBT.A **Extend the counting sequence.**	**1.NBT.A.1**	Count to 120 by 1's, 2's, and 10's starting at any number less than 100. In this range, read and write numerals and represent a number of objects with a written numeral.
1.NBT.B **Understand place value.**	**1.NBT.B.2**	Understand that the two digits of a two-digit number represent groups of tens and ones. Understand the following as special cases: a. 10 can be thought of as a group of ten ones — called a "ten". b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. c. 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.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 <.

1.NBT.C **Use place value understanding and properties of operations to add and subtract.**	**1.NBT.C.4**	Demonstrate understanding of addition within 100, connecting objects or drawings to strategies based on place value (including multiples of 10), properties of operations, and/or the relationship between addition and subtraction. Relate the strategy to a written form. *See Table 1.*
	1.NBT.C.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count.
	1.NBT.C.6	Subtract multiples of 10 in the range of 10 to 90 (positive or zero differences), using objects 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 form.
Measurement and Data (MD)		
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.
	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.)
1.MD.B **Work with time and money.**	**1.MD.B.3a**	Tell and write time in hours and half-hours using analog and digital clocks.
	1.MD.B.3b	Identify coins by name and value (pennies, nickels, dimes and quarters).
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.
Geometry (G)		
1.G.A **Reason with shapes and their attributes.**	**1.G.A.1**	Distinguish between defining attributes (triangles are closed and 3 sided) versus non-defining attributes (color, orientation, overall size) for two-dimensional shapes; build and draw shapes that possess defining attributes.
	1.G.A.2	Compose two-dimensional shapes or three-dimensional shapes to create a composite shape.
	1.G.A.3	Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters. Describe the whole as two of, or four of the shares. Understand that decomposing into more equal shares creates smaller shares.

Standards for Mathematical Practice	
1.MP.1	**Make sense of problems and persevere in solving them.** 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.
1.MP.2	**Reason abstractly and quantitatively.** 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.
1.MP.3	**Construct viable arguments and critique the reasoning of others.** 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.
1.MP.4	**Model with mathematics.** 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.

1.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.
1.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.
1.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.
1.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.

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 Apart[3]	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

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

[2]These 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***.

[3]Either 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.