NEW MEXICO
Public Education Department

1.OA: OPERATIONS & ALGEBRAIC THINKING

Cluster Statement: A: Represent and solve problems involving addition and subtraction.

Major Cluster (Students should spend the large majority of their time (65-85%) on the major work of the grade/course. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.)

Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
1.OA.A.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 equations with a symbol for the unknown number to represent the problem.	SMP 1: Students can make sense of problems and persevere in solving them by creating models and connecting those models to pictorial representations, number lines, and other representations. SMP 2: Students can reason abstractly and quantitatively by relating what is happening in a story problem to an add to, take from, put together, take apart, or comparison situation and then represent that situation using mathematical symbols. SMP 3: Students can construct viable arguments by explaining their solving strategy and critique the reasoning of others by comparing their solving strategy to the solving strategy of others.	• Represent word problems involving adding to, taking from, putting together, taking apart, or comparison situations using objects and drawings. • Write equations involving adding to, taking from, putting together, taking apart, or comparison situations with unknown numbers in different positions. • Explain how an equation represents an adding to, taking from, putting together, taking apart, or comparison situation. • Solve word problems representing adding to, taking from, putting together, taking apart, or comparison situations with unknown numbers in different positions. **Depth of Knowledge:** 2 **Bloom's Taxonomy:** Apply and Analyze
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
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 equations with a symbol for the unknown number to represent the problem.	SMP 1: Students can make sense of problems and persevere in solving them by creating models and connecting those models to pictorial representations, number lines, and other representations. SMP 2: Students can reason abstractly and quantitatively by relating what is happening in a story problem that calls for addition of three whole numbers	• Represent and solve word problems requiring the addition of three whole numbers using objects and drawings. • Write equations involving the addition of three whole numbers representing the unknown using a symbol. • Add three whole numbers whose sum is less than or equal to 20. • Reorder three addends to add efficiently (e.g. 3 + 8 + 7 can be thought of as 3 + 7 + 8 knowing that 3 + 7 = 10).

	and then represent that situation using mathematical symbols. SMP 3: Students can construct viable arguments by explaining their solving strategy and critique the reasoning of others by comparing their solving strategy to the solving strategy of others.	**Depth of Knowledge:** 2 **Bloom's Taxonomy:** Apply and Analyze
Previous Learning Connections • Connect to learning the partners that make 10 for any number and knowing all decompositions for any number below 10. The idea of decomposing numbers (taking apart numbers) lays a foundation for developing strategies based on place value and properties of operations. **(K.OA.3-4)** • Connect to knowing all teen numbers as10 ones and some more. **(K.NBT.1)**	**Current Learning Connections** • Connect to using what students know about making 10 to work with larger numbers and problems with multiple addends. **(1OA.3,6)** • Connect to working to gain confidence and fluency with strategies when solving problems and using these skills to answer questions regarding data in a graph. **(1. MD.4)**	**Future Learning Connections** • Connect to working to become fluent within 100 and to extend their known strategies to larger numbers and two-step word problems. **(2.OA.1)** • Connect to applying this skill with problems in a variety of contexts involving length, picture graphs and bar graphs. **(2.NBT.5)**
Clarification Statement: • 1.OA.A.1: In a **Compare situation**, two **quantities** are compared to find "how many **more**" or "how many **less**." **Addition and Subtraction Situations** by Grade Level.		

sign (=, here with the meaning of "becomes," rather than the more general "equals").

Table 2: Addition and subtraction situations by grade level.

	Result Unknown	Change Unknown	Start Unknown
Add To	A bunnies sat on the grass. B more bunnies hopped there. How many bunnies are on the grass now? $A + B = \square$	A bunnies were sitting on the grass. Some more bunnies hopped there. Then there were C bunnies. How many bunnies hopped over to the first A bunnies? $A + \square = C$	Some bunnies were sitting on the grass. B more bunnies hopped there. Then there were C bunnies. How many bunnies were on the grass before? $\square + B = C$
Take From	C apples were on the table. I ate B apples. How many apples are on the table now? $C - B = \square$	C apples were on the table. I ate some apples. Then there were A apples. How many apples did I eat? $C - \square = A$	Some apples were on the table. I ate B apples. Then there were A apples. How many apples were on the table before? $\square - B = A$
	Total Unknown	**Both Addends Unknown[1]**	**Addend Unknown[2]**
Put Together /Take Apart	A red apples and B green apples are on the table. How many apples are on the table? $A + B = \square$	Grandma has C flowers. How many can she put in her red vase and how many in her blue vase? $C = \square + \square$	C apples are on the table. A are red and the rest are green. How many apples are green? $A + \square = C$ $C - A = \square$
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare	*"How many more?" version.* Lucy has A apples. Julie has C apples. How many more apples does Julie have than Lucy? *"How many fewer?" version.* Lucy has A apples. Julie has C apples. How many fewer apples does Lucy have than Julie? $A + \square = C$ $C - A = \square$	*"More" version suggests operation.* Julie has B more apples than Lucy. Lucy has A apples. How many apples does Julie have? *"Fewer" version suggests wrong operation.* Lucy has B fewer apples than Julie. Lucy has A apples. How many apples does Julie have? $A + B = \square$	*"Fewer" version suggests operation.* Lucy has B fewer apples than Julie. Julie has C apples. How many apples does Lucy have? *"More" version suggests wrong operation.* Julie has B more apples than Lucy. Julie has C apples. How many apples does Lucy have? $C - B = \square$ $\square + B = C$

Darker shading indicates the four Kindergarten problem subtypes. Grade 1 and 2 students work with all subtypes and variants. Unshaded (white) problems are the four difficult subtypes or variants that students should work with in Grade 1 but need not master until Grade 2. Adapted from CCSS, p. 88, which is based on *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity*, National Research Council, 2009, pp. 32–33.

[1] This can be used to show all decompositions of a given number, especially important for numbers within 10. Equations with totals on the left help children understand that = does not always mean "makes" or "results in" but always means "is the same number as." Such problems are not a problem subtype with one unknown, as is the Addend Unknown subtype to the right. These problems are a productive variation with two unknowns that give experience with finding all of the decompositions of a number and reflecting on the patterns involved.

[2] Either addend can be unknown; both variations should be included.

- 1.OA.A.2: In all mathematical problem solving, what matters is the explanation a student gives to relate a representation to a context, and not the representation separated from its context.

Common Misconceptions

- Students may believe that certain words always indicate a particular operation.
- Students may believe it is not possible to add or subtract more than two numbers.

Multi-Layered System of Supports (MLSS)/Suggested Instructional Strategies

Pre-Teach

Pre-teach (targeted): *What pre-teaching will prepare students to productively struggle with the mathematics for this cluster within your HQIM?*

- For example, some learners may benefit from targeted pre-teaching that rehearses prior learning when studying how to represent and solve problems involving addition and subtraction because it is building on the foundational skills that students learn in kindergarten such as understanding addition as adding to and subtraction as being taking apart, or taking away from.

Pre-teach (intensive): *What critical understandings will prepare students to access the mathematics for this cluster?*

- K.OA.A.1 This standard provides a foundation for work with being able to represent addition and subtraction with objects, fingers, mental images, drawings*, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations because this standard is critical for students to understand what counting through addition and subtraction is. Also, it allows for students to fluently add or subtract within 10 using manipulatives or drawings if needed. If students have unfinished learning within this standard, based on assessment data, consider ways to provide intensive pre-teaching support prior to the start of the unit to ensure students are ready to access grade level instruction and assignments.

Core Instruction

Access

Interest: *How will the learning for students provide multiple options for recruiting student interest?*

- For example, learners engaging with being able to represent and solve problems involving addition and subtraction benefit when learning experiences include ways to recruit interest such as providing time for self-reflection about the content and activities relating to being able to add and subtract numbers correctly because students may recognize this new understanding and build on skills of decomposing and composing numbers, and comparing numbers while solving for unknown values in all positions.

Build

Effort and Persistence: *How will the learning for students provide options for sustaining effort and persistence?*

- For example, learners engaging with being able to represent and solve problems involving addition and subtraction benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as encouraging and supporting opportunities for peer interactions and supports (e.g., peer-tutors because being able to solve addition and subtraction problems within the number 20 will allow students to improve their fluency skills. Also, students will apply this knowledge as they engage in solving real world word problems when identifying and solving for an unknown.

Language and Symbols: *How will the learning for students provide alternative representations to ensure accessibility, clarity and comprehensibility for all learners? (e.g., a graph illustrating the relationship between two variables may be informative to one learner and inaccessible or puzzling to another; picture or image may carry very different meanings for learners from differing cultural or familial backgrounds)*

- For example, learners engaging with being able to represent and solve problems involving addition and subtraction benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as pre-teaching vocabulary and symbols, especially in ways that promote connection to the learners' experience and prior knowledge because students gain knowledge and familiarity with the vocabulary and function of words such as, "sum" and "difference." In addition, students utilize the use of what an "unknown" value is, especially representing a variable. Students can solve problems when the unknown value is in any part of the equation.

Expression and Communication: *How will the learning provide multiple modalities for students to easily express knowledge, ideas, and concepts in the learning environment?*

- For example, learners engaging with being able to represent and solve problems involving addition and subtraction benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing sentence starters or sentence strips because this supporting tool will allow all students to be able to communicate their understanding in both verbal and written communication methods. Also, students can demonstrate their understanding of this skill and not be hung up on the initial wording of how to explain their understanding.

Internalize

Comprehension: *How will the learning for student's support transforming accessible information into usable knowledge, knowledge that is accessible for future learning and decision-making?*

- For example, learners engaging with being able to represent and solve problems involving addition and subtraction benefit when learning experiences attend to students by intentionally building connections to prior understandings and experiences; relating important information to the learning goals; providing a process for meaning making of new learning; and, applying learning to new contexts such as anchoring instruction by linking to and activating relevant prior knowledge (e.g., using visual imagery, concept anchoring, or concept mastery routines), because students can make connections from previously taught skills in kindergarten of number combinations within 10. Students can continue to look for patterns across number combinations including the concept of doubling numbers.

Re-teach

Re-teach (targeted): *What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisiting during a unit?*

- For example, students may benefit from re-engaging with content during a unit on being able to represent and solve problems involving addition and subtraction by examining tasks from a different perspective through a short mini-lesson because students may benefit from seeing things in a new way and gaining a new perspective to make meaning. In addition, students can benefit from the use of manipulatives and/or drawings to solidify the understanding of this skill.

Re-teach (intensive): *What assessment data will help identify content needing to be revisited for intensive interventions?*

- For example, some students may benefit from intensive extra time during and after a unit in which students are able to represent and solve problems involving addition and subtraction by offering opportunities to understand and explore different strategies because students can better understand the skill if they have multiple strategies to approach and solve a problem. Students may make more connections and see things differently if they have knowledge of multiple strategies. Also, students may recognize patterns within numbers while adding and subtracting, such as looking for and identifying a combination of 10 and patterns with doubling of a number.

Extension

What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?

- For example, some learners may benefit from an extension such as the application of and development of abstract thinking skills when studying the skill of being able to represent and solve problems involving addition and subtraction because students are now thinking about numbers in a more abstract way. This allows them to shift their thinking from concrete and pictorial to abstract which allows for more depth of

knowledge to take place. Students can also apply this knowledge to multiple problems without having the items in front of them.

Culturally and Linguistically Responsive Instruction:

Validate/Affirm: How can you design your mathematics classroom to intentionally and purposefully legitimize the home culture and languages of students and reverse the negative stereotypes regarding the mathematical abilities of students of marginalized cultures and languages?
Build/Bridge: How can you create connections between the cultural and linguistic behaviors of your students' home culture and language the culture and language of school mathematics to support students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?

Goal Setting: Setting challenging but attainable goals with students can communicate the belief and expectation that all students can engage with interesting and rigorous mathematical content and achieve in mathematics. Unfortunately, the reverse is also true, when students encounter low expectations through their interactions with adults and the media, they may see little reason to persist in mathematics, which can create a vicious cycle of low expectations and low achievement. For example, when studying how to represent and solve problems involving addition and subtraction with the use of up to 3 numbers within 20 goal setting is critical because it allows students to take ownership of their own learning related to addition and subtraction. Students can self-reflect on their level of comfort related to this skill and reflect on areas in which they need support. Students can also make goals of making real world connections relevant to their culture using addition and subtraction. Students may benefit from using objects, drawings or equations to solve for the unknown value. Another example is students may use objects or drawings that are significant to them culturally, and this may allow for more student engagement to take place.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: https://achievethecore.org/coherence-map/1/5/34/34

Daisies in vases

Jasmine has eight daisies and three vases - one large, one medium-sized and one small.

She puts 5 daisies in the large vase, 2 in the medium vase and 1 in the small vase.

Can you find another way to put daisies so that there are the most in the large vase and least in the small vase? Try to find as many ways as you can put the daisies in the vases with the most in the large vase and the least in the smallest vase. If you think you have found them all, explain how you know those are all the possibilities.

This type of assessment question requires students to This task helps illustrate Mathematical Practice Standard 2, Reason abstractly and quantitatively. Students make sense of quantities and how they are related in a problem situation. In the task at hand, students first create a meaningful representation of the problem by using objects, pictures, or equations. Then, they manipulate the objects, pictures, or equations by finding different 3-number combinations of daisies in the vases totaling eight. Lastly, students periodically contextualize the problem by connecting the mathematical objects or symbols back to the context. Thus, students build meaning for the mathematical symbols by reasoning about the problem rather than memorizing an abstract set of rules or procedures. Problems that begin with a context and are represented with mathematical objects or symbols can also be examples of modeling with mathematics (MP.4). The Standards for Mathematical Practice focus on the nature of the learning experiences by attending to the thinking processes and habits of mind that students need to develop in order to attain a deep and flexible understanding of mathematics.

Relevance to families and communities: During a unit focused on how to represent and solve problems involving addition and subtraction with the use of up to 3 numbers within 20, consider options for learning from your families and communities the cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students, since students are learning to solve addition and subtraction problems, they can relate this skill to real world examples relevant to their city and culture. Students can bring in examples that relate to them and even provide pictures of the items to support their knowledge of adding to and taking away.	**Cross-Curricular Connections:** Social Studies: In first grade the New Mexico Social Studies Standards state students should "understand the concept of goods and services". Consider providing a connection for students to "sell" goods to each other or the larger community (such as in a first-grade market) as a context for math story problems. Language Arts: Writer's Workshop in first grade includes a unit on Small Moments. Consider providing a connection between the beginning, middle and end of the stories students write and making sense of a math story problem using the structure of beginning, middle and end.