1.OA: OPERATIONS & ALGEBRAIC THINKING

Cluster Statement: B: Understand and apply properties of operations and the relationship between 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.B.3: Apply properties of operations as strategies to add and subtract. *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*	SMP 2: Students can reason abstractly and quantitatively by flexibly using properties of operations (such as commutative and associative) without having to name them. SMP 7: Students can look for and make use of structure by seeing and using patterns that help them add and subtract more efficiently.	• Use representations to solve addition and subtraction problems • Describe and make generations regarding properties (adding or subtracting 0 does not change the number) and strategies (making a ten when adding more than two numbers) • Show or explain their thinking
		Depth of Knowledge: 2
		Bloom's Taxonomy: Apply and Analyze
Standard Text **1.OA.B.4: Understand subtraction as an unknown-addend problem.** *For example, subtract 10 - 8 by finding the number that makes 10 when added to 8.*	**Standard for Mathematical Practices** SMP 4: Students can model with mathematics by representing related addition and subtraction facts using objects, pictures, numbers and words. SMP 7: Students can look for and make use of structure by using the relationship between addition and subtraction to practice and become more automatic as basic facts.	**Students who demonstrate understanding can:** • Explain the relationship between addition and subtraction using objects, pictures, numbers and words. • Represent the relationship between addition and subtraction using objects, pictures, numbers and words. • Rewrite a subtraction equation as an addition equation with a missing addend.
		Depth of Knowledge: 2
		Bloom's Taxonomy: Apply and Analyze

Previous Learning Connections	Current Learning Connections	Future Learning Connections
• Connect to developing the understanding that addition means putting together and subtraction means taking apart and representing and solve word problems within 10. **(K.OA.2)**	• Connect to using patterns that students notice such as place value understanding and properties of operations to add and subtract within100. **(1.NBT.4)** • Connect to becoming fluent adding and subtracting within10, using strategies that make sense to them and explaining the reasoning behind the strategies used. **(1.OA.6)**	• Connect to using place value understanding and properties of operations to add and subtract within100 using up to four 2-digit numbers and explaining why certain strategies work. Connect to using concrete models, drawings and place value strategies to explore addition and subtraction within 1000. **(2.NBT.5-9)**

Clarification Statement:

• 1.OA.B.3: Methods involve **decomposing** an **addend** and **composing** it with the other addend to form an **equivalent** but easier problem. This relies on **properties of operations**. Students do not necessarily have to **justify** their **representations** or **solution** using properties, but they can begin to learn to recognize these properties in action and discuss their use after **solving**.

• 1.OA.B.4: **Put Together/Take Apart problems** with **Addend Unknown** afford students the opportunity to see **subtraction** as the **opposite** of **addition** in a different way than as reversing the action, namely as finding an unknown addend. The meaning of subtraction as an unknown-addend addition problem is one of the essential understandings' students will need in middle school in order to extend arithmetic to **negative rational numbers**.

Common Misconceptions

● Students might believe that subtraction is commutative.

● Students may not realize they can count on to find the difference.

● Students confuse the parts of addition and subtraction equations.

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 provides additional time for confusion to happen with new mathematical ideas when studying the skill of being able to understand and apply properties of operations and the relationship between addition and subtraction because students are learning about the commutative property along with the associative property to support the understanding of addition. Students are also looking for combinations to make ten and may benefit from having additional time with this new thinking.

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

• K.OA.A.2: This standard provides a foundation for work with having access to solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem because this skill allows students to fully understand that addition is adding parts together and subtraction is taking

apart from a total. Students can use manipulative and/or drawings to support their thinking and development of the skill. 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 engage with being able to understand and apply properties of operations and the relationship between addition and subtraction benefit when learning experiences include ways to recruit interest such as setting personal academic goals because students can be given time to self-reflect on their understanding of the content based on an individual goal that was set. Students would be given the opportunity to self-reflect, ask questions and learn from peers in order to better improve their understanding.

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 understand and apply properties of operations and the relationship between addition and subtraction benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that models how to incorporate evaluation, including identifying patterns of errors and wrong answers, into positive strategies for future success because this can allow students to recognize and better understand common misconceptions related to the task and content being taught. Students can learn multiple strategies to explain their own thinking, but also be able to solve a problem if an error is present.

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 understand and apply properties of operations and the relationship between 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 can learn new math vocabulary language such as "addend," to better explain and demonstrate their understanding. In addition, students can mathematically communicate with peers about the content being taught.

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 understand and apply properties of operations and the relationship between addition and subtraction benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as using physical manipulatives (e.g., blocks, 3D models,

base-ten blocks), because the use of manipulatives can support all student learners to better understand the skill, verify their answer through the use of manipulatives, or even present a concrete working model for students to physically move as they add or subtract numbers.

Internalize
Executive Functions: *How will the learning for students support the development of executive functions to allow them to take advantage of their environment?*
- For example, learners engaging with being able to understand and apply properties of operations and the relationship between addition and subtraction benefit when learning experiences provide opportunities for students to set goals; formulate plans; use tool and processes to support organization and memory; and analyze their growth in learning and how to build from it such as posting goals, objectives, and schedules in an obvious place because students can benefit from visual objectives and goals to keep them on track and understand what they are learning and why. In addition, students can see how previous and upcoming skills being taught connect over time and relate to one another.

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 understand and apply properties of operations and the relationships between addition and subtraction by providing specific feedback to students on their work through a short mini-lesson because the students can then receive immediate feedback to support and correct any misconceptions the students may have. It is important to ensure that students are following the correct procedure when adding or subtracting, and immediate feedback and help support students to follow the correct order of steps.

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 on being able to understand and apply properties of operations and the relationships between addition and subtraction by offering opportunities to understand and explore different strategies because this allows students to rely on multiple strategies to approach and solve a problem rather than one that may be causing confusion. Also, students can benefit from knowing multiple strategies because it can deepen their understanding and allow them to make connections about addition and subtraction.

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 how to understand and apply properties of operations and the relationships between addition and subtraction because students can move from concrete and pictorial representations of addition and subtraction to more abstract concepts. This allows students to build on their skills and understand mathematical relationships, specifically related to addition and subtraction.

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?

Tasks: The type of mathematical tasks and instruction students receive provides the foundation for students' mathematical learning and their mathematical identity. Tasks and instruction that provide greater access to the mathematics and convey the creativity of mathematics by allowing for multiple solution strategies and development of the standards for mathematical practice lead to more students viewing themselves mathematically successful capable mathematicians than tasks and instruction which define success as memorizing and repeating a procedure demonstrated by the teacher. For example, when studying the skill of being able to understand and apply properties of operations and the relationship between addition and subtraction the types of mathematical tasks are critical because students are building the foundation and understanding of numbers and the relationship between them, while also solving for an unknown value. Also, students are developing multiple strategies associated with the commutative property and associative property. As students are developing skills related to addition and subtraction, they can relate to real world examples that can be important to their culture and language. Students can also incorporate their language and how to count in their language as they work to solve math problems.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: https://achievethecore.org/coherence-map/1/5/37/37

Domino Addition
Materials
- ▫ A large set of dominoes to affix to a whiteboard or place in a pocket chart, or a regular set to use on a document projector.
- ▫ One set of dominoes for each student or pair of students
- ▫ Domino addition worksheets

Actions
The teacher asks a child to choose a domino from a stack or bag. As the teacher holds up the domino, the students call out how many dots are on the domino altogether.

Next the class counts the number of dots on each end of the domino to check their responses. Then the class names an addition equation that represents the relation between total number of dots and the number of dots on each end. For example, if the domino has 4 dots on one side and 2 dots on the other, the teacher can show the domino with the 4 on the left and the 2 on the right and the class names the equation 4+2=6. The teacher then writes the equation.

Then the teacher rotates the domino so the 2 is on the left and the 4 is on the right, and the class can name the equation 2+4=6. The teacher then writes the equation. The teacher then draws the dots from the chosen domino on a blank domino.

Once the students understand the task, they can work on their own. Students should have a set of dominoes to explore individually or with a partner, along with the domino addition worksheet. There are two variants of this task.

Students can choose dominoes at random, draw the dot pattern, and write the two related equations.

Students can find all the dominoes that have a sum, and then draw all the related dot patterns and equations.

For example, they could look for all the dominoes that have 6 dots all together, then draw the dot patterns for those dominoes and write the corresponding equations.

This type of assessment question requires students to understand the commutative property of addition. Because the total number of dots is the same regardless of how a domino is oriented, the domino reinforces the idea that the addends can be written in any order. Using dominoes in this way can help bridge between using moveable manipulatives such as cubes and using only symbolic representations of numbers and equations. This task is especially appropriate once students have internalized the dot patterns shown on dominoes and dice. If the teacher does not already have dominoes, they are easily found online and can be printed onto colored construction paper and cut out.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on the skill of being able to understand and apply properties of operations and the relationship between addition and subtraction, 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, for example, students can share ways to count or refer to numbers in their language, or a language spoken at home, to support their learning and extension of peers' learning. Also, this can promote engagement will all students and provide a more robust understanding of numbers as students make connections to different structures of number-names in other languages.	Language Arts: Literature can offer connections to help students move from counting to addition such as: *Math Fables* by Greg Tang and *Math Fables Too* by Greg Tang. Art: Even though it is not explicit in the standard, the clarification statement makes it clear that it is important for students to share, discuss and compare their strategies as a class. Consider providing a connection where they can work together to make posters that illustrate each strategy.