New Mexico Instructional Scope

# 2nd Grade Operations and Algebraic Thinking Guide

The NMIS is a teacher-influenced tool, designed to provide instructional planning support at the programmatic level for districts and instructional level for teachers. Its foundation stems from the vision and mission of the PED and came into existence to assure that students in NM will be engaged in a culturally and linguistically responsive educational system that meets the social, emotional, and academic needs of ALL students. This is also rooted in the belief that all students must have access to on-grade-level standards, focusing on acceleration. The purpose of this tool is to help educators understand each of the grade level standards and how those standards connect to the students' overall preparation for college and career readiness.

Standards are defined as the most critical prerequisite skills and knowledge. This document is color-coded to reflect both anchor and priority standards. Though previous emphasis was placed on priority standards to address lost learning due to COVID-19, New Mexico teachers should note that moving forward, while priority standards allow for acceleration of learning, all standards should be addressed in instruction throughout the school year.

In this guide you will find:

- A breakdown of each of the grade level standards within the cluster, including:
  - Standards of Mathematical Practice
  - Common Misconceptions
  - Identification of Priority Standards, as identified by NMPED.
  - Level of Rigor Identification
- Sample aligned assessment items
- Suggested Student Discourse Guide **(only provided for clusters with Conceptual Understanding standards)**
- A multilayered system of supports (MLSS) and culturally and linguistically responsive instruction (CLR) guide

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# 2nd Grade Operations and Algebraic Thinking Guide

| Key | | |
|---|---|---|
| | *Priority Standard* | Priority standards, as identified by NMPED, are denoted with red highlighting. Priority standards are the most critical prerequisite skills and knowledge a student needs. This does not mean that these are only standards required to be taught, just these are the standards that will allow for the acceleration the students of New Mexico need during this time. |
|  | *Conceptual Understanding* | Conceptual Understanding standards help students build a deep understanding of the **how** and **why** of mathematics. |
|  | *Application* | Application standards help students identify the appropriate concepts and skills to tackle **novel real-world problems.** |
|  | *Procedural Skill and Fluency* | Procedural standards help students develop **efficiency** and **accuracy** in computations. |

## Standards Breakdown

- Represent and solve problems involving addition and subtraction.
  - 2.OA.A.1
- Add and subtract within 20.
  - 2.OA.B.2
- Work with equal groups of objects to gain foundations for multiplication.
  - 2.OA.C.3
  - 2.OA.C.4

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# 2nd Grade Operations and Algebraic Thinking Guide

| *Grade* | *CCSS Domain* | *CCSS Cluster* |
|---|---|---|
| **2** | **Operations and Algebraic Thinking** | **Represent and solve problems involving addition and subtraction.** |

## Cluster Standard: 2.OA.A.1

| Standard | Standards for Mathematical Practice |
|---|---|
| Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. | • **SMP 1:** Make sense of problems and persevere in solving them.<br>• **SMP 2:** Reason abstractly and quantitatively.<br>• **SMP 4:** Model with mathematics. |
| **Clarification Statement** | **Students Who Demonstrate Understanding Can...** |
| • Students extend their work with addition and subtraction word problems in two major ways. First, they represent and solve word problems within 100, building upon their previous work to 20. In addition, they represent and solve one and two-step word problems of all three types (Result Unknown, Change Unknown, Start Unknown).<br>• As students solve one-and two-step problems, they use manipulatives such as snap cubes, place value materials (groupable and pre-grouped), ten frames, etc.; create drawings of manipulatives to show their thinking; or use number lines to solve and describe their strategies. They then relate their drawings and materials to equations. By solving a variety of addition and subtraction word problems, second grade students determine the unknown in all positions (Result Unknown, Change Unknown, and Start Unknown). Rather than a letter (“n”), boxes or pictures are used to represent the unknown number.<br>• Students use a range of methods, often mastering more complex strategies such as making tens, | • Identify the unknown in an addition or subtraction word problem.<br>• Determine operation needed to solve addition and subtraction problems in situations including add to, take from, put together, take apart, and compare.<br>• Use drawings or equations to represent one- and two-step word problems.<br>• Add and subtract within 100 to solve one-step word problems with unknowns in all positions.<br>• Write an addition and subtraction equation with a symbol for the unknown. |

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| doubles, and near-doubles for problems involving addition and subtraction within 20. Moving beyond counting and counting-on, second grade students apply their understanding of place value to solve problems. | |
| **DOK** | **Blooms** |
| 1-2 | Understand and Apply |

| *Grade* | *CCSS Domain* | *CCSS Cluster* |
|---|---|---|
| **2** | **Operations and Algebraic Thinking** | **Add and Subtract within 20.** |

## Cluster Standard: 2.OA.B.2

| **Standard** | **Standards for Mathematical Practice** |
|---|---|
| • Fluently add and subtract within 20 using mental strategies. By the end of Grade 2, know from memory all sums of two one-digit numbers. | • **SMP 2**: Reason abstractly and quantitatively.<br>• **SMP 6:** Attend to precision. |
| **Clarification Statement** | **Students Who Demonstrate Understanding Can...** |
| • This standard is strongly connected to all the standards in this domain. It focuses on students being able to fluently add and subtract numbers to 20. Adding and subtracting fluently refers to knowledge of procedures, knowledge of when and how to use them appropriately, and skill in performing them flexibly, accurately, and efficiently. Mental strategies help students make sense of number relationships as they are adding and subtracting within 20. The ability to calculate mentally with efficiency is very important for all students. Mental strategies may include the following:<br>• Counting on | • Efficiently choose mental strategies for addition and subtraction within 20.<br>• Quickly recall all sums of two one-digit numbers.<br>• Fluently add and subtract within 20. |

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| • Making tens (9 + 7 = 10 + 6)<br>• Decomposing a number leading to a ten (14 – 6 = 14 – 4 – 2 = 10 – 2 = 8)<br>• Fact families (8 + 5 = 13 is the same as 13 - 8 = 5)<br>• Doubles<br>• Doubles plus one (7 + 8 = 7 + 7 + 1) | |
| **DOK** | **Blooms** |
| 1-2 | Remember |

| *Grade* | *CCSS Domain* | *CCSS Cluster* |
|---|---|---|
| **2** | **Operations and Algebraic Thinking** | **Work with equal groups of objects to gain foundations for multiplication.** |

## Cluster Standard: 2.OA.C.3

| **Standard** | **Standards for Mathematical Practice** |
|---|---|
| Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2's; write an equation to express an even number as a sum of two equal addends. | • **SMP 3:** Construct viable arguments and critique the reasoning of others.<br>• **SMP 4:** Model with mathematics. |
| **Clarification Statement** | **Students Who Demonstrate Understanding Can...** |
| • Students apply their work with doubles to the concept of odd and even numbers. Students should have ample experiences exploring the concept that if a number can be decomposed (broken apart) into two equal addends or doubles addition facts (e.g., 10 = 5 +5), then that number (10 in this case) is an even number. Students | • Recognize that in groups of even numbers objects will pair up evenly.<br>• Determine whether a group of objects is odd or even, using a variety of strategies.<br>• Generalize the fact that all even numbers can be formed from the addition of 2 equal addends.<br>• Count a group of objects up to 20 by 2s. |

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| should explore this concept with concrete objects (e.g., counters, cubes, etc.) before moving towards pictorial representations such as circles or arrays.<br>● Students apply their work with doubles to the concept of odd and even numbers. Students should have ample experiences exploring the concept that if a number can be decomposed (broken apart) into two equal addends or doubles addition facts (e.g., 10 = 5 +5), then that number (10 in this case) is an even number. Students should explore this concept with concrete objects (e.g., counters, cubes, etc.) before moving towards pictorial representations such as circles or arrays.<br>● Students use rectangular arrays to work with repeated addition, a building block for multiplication in third grade. A rectangular array is any arrangement of things in rows and columns, such as a rectangle of square tiles. Students explore this concept with concrete objects (e.g., counters, bears, square tiles, etc.) as well as pictorial representations on grid paper or other drawings. Due to the commutative property of multiplication, students can add either the rows or the columns and still arrive at the same solution. | ● Write an equation to express a given even number as a sum of two equal addends. |
| **DOK** | **Blooms** |
| 1. | Understand and Apply |

| *Grade* | *CCSS Domain* | *CCSS Cluster* |
|---|---|---|
| **2** | **Operations and Algebraic Thinking** | **Work with equal groups of objects to gain foundation for multiplication.** |

## Cluster Standard: 2.OA.C.4

| Standard | Standards for Mathematical Practice |
|---|---|

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|---|---|
| Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends. | • **SMP 3:** Construct viable arguments and critique the reasoning of others.<br>• **SMP 4:** Model with mathematics. |
| **Clarification Statement** | **Students Who Demonstrate Understanding Can...** |
| • Students apply their work with doubles to the concept of odd and even numbers. Students should have ample experiences exploring the concept that if a number can be decomposed (broken apart) into two equal addends or doubles addition facts (e.g., 10 = 5 +5), then that number (10 in this case) is an even number. Students should explore this concept with concrete objects (e.g., counters, cubes, etc.) before moving towards pictorial representations such as circles or arrays.<br>• Students use rectangular arrays to work with repeated addition, a building block for multiplication in third grade. A rectangular array is any arrangement of things in rows and columns, such as a rectangle of square tiles. Students explore this concept with concrete objects (e.g., counters, bears, square tiles, etc.) as well as pictorial representations on grid paper or other drawings. Due to the commutative property of multiplication, students can add either the rows or the columns and still arrive at the same solution. | • Write an equation with repeated equal addends from an array.<br>• Generalize the fact that arrays can be written as repeated addition problems.<br>• Solve repeated addition problems to find the number of objects using rectangular arrays. |
| **DOK** | **Blooms** |
| 1-2 | Understand and Apply |

## Common Misconceptions

- Students may struggle with determining if a number greater than 9 is even or odd if they simply memorize a rule about digits because they won't understand whether 23 is even or odd based on the digits of 2 and 3 in the number.

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# 2nd Grade Operations and Algebraic Thinking Guide

## Student Discourse Guide

- **Purposeful, rich classroom discourse offers students the opportunity to express their ideas, thinking, and to critique the reasoning of others in a variety of ways (writing, drawing, verbal). Purposeful implementation of classroom discourse allows students to activate funds of knowledge and to refine their mathematical understanding. When students have frequent opportunities for discourse they find various paths to solutions and reveal knowledge or misunderstandings to educators. The process also allows educators to honor students' culture, lived experiences and evolving math identities.**
- **Discourse that focuses on tasks that promote reasoning and problem solving is a primary mechanism for developing conceptual understanding and meaningful learning of mathematics (Michaels, O'Connor, and Resnick, 2008)**

| Domain: **Operations and Algebraic Thinking** | Strand: **Represent and solve problems involving multiplication and division.** |
|---|---|

## Suggested Student Discourse Questions

- How are equal groups related to the quotient in a division equation?
- Explain how your partner's strategy could be used to reach an acceptable solution?
- Which strategy to solve multiplication is more effective, tape diagrams or arrays?
- Where do you normally see arrays outside of school?

## ASSESSMENT GUIDE

- Represent and solve problems involving addition and subtraction
- Add and subtract within 2
- Work with equal groups of objects to gain foundations for multiplication

| *Grade* | *CCSS Domain* | *CCSS Strand* |
|---|---|---|

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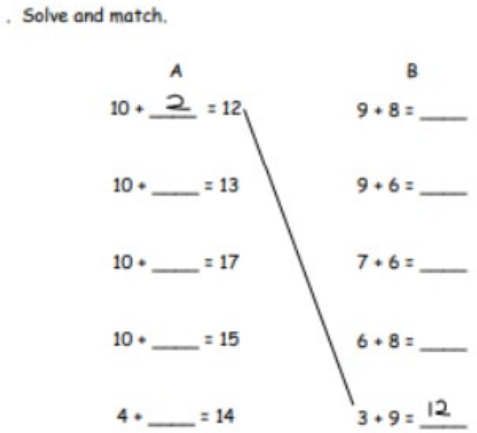
**2nd Grade Operations and Algebraic Thinking Guide**

| 2 | Operations and Algebraic Thinking | Represent and solve problems involving addition and subtraction. |
|---|---|---|

**Sample Task #1 (Constructed Response)**




**Sample Task #2**

**Solve.**

8 + 6 =_____

| *Grade* | *CCSS Domain* | *CCSS Strand* |
|---|---|---|
| 2 | Operations and Algebraic Thinking | Add and Subtract within 20 |

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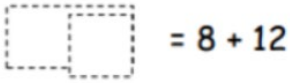
|---|---|
| | **Sample Task #1 (Constructed Response)** |
| | Shane has 12 pencils. He gives some pencils to his friends. Now, he has 7 left. How many pencils did he give away? |
| | **Sample Task #2 (Multiple Choice)** |
| | Solve the problems. Write your answers to show how many **tens** and **ones**. If there is only 1 ten, cross off the "s."<br>Add.<br>  <br>_____ tens and _____ ones |

| *Grade* | *CCSS Domain* | *CCSS Strand* |
|---|---|---|
| **2** | **Operations and Algebraic Thinking** | **Work with equal groups of objects to gain foundations for multiplication** |
| | **Sample Task #1 (Constructed Response)** | |

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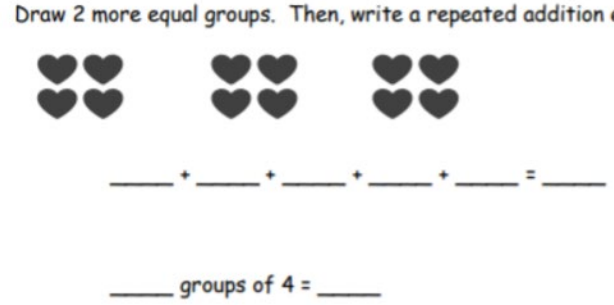
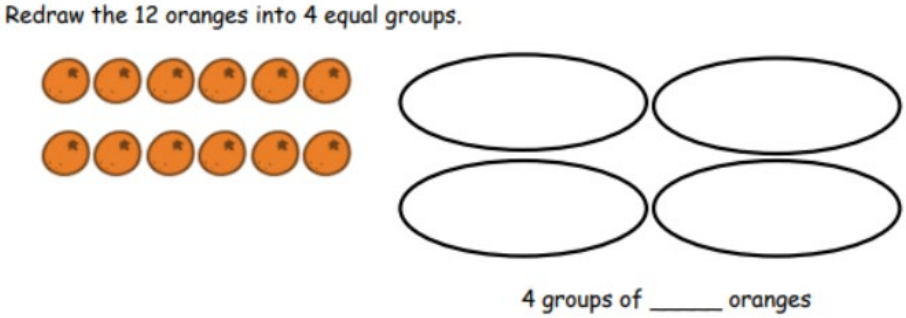



**Sample Task #2**




## MLSS AND CLR GUIDE

- Represent and solve problems involving addition and subtraction
- Add and subtract within 2
- Work with equal groups of objects to gain foundations for multiplication

| *CCSS Domain* | *CCSS Cluster* |
|---|---|
| **Operations and Algebraic Thinking** | **Represent and solve problems involving addition and subtraction** |

## Culturally and Linguistically Responsive Instruction

| | |
|---|---|
| **Relevance to Families and Communities** | During a unit focused on representing and solving problems involving addition and subtraction consider options for learning from your families and communities the |

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| | cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students, for example, letting students experiment with drawing and solving representations that are familiar to them can benefit their understanding of the concept of addition and subtraction. | |
| **Cross-Curricular Connections** | Social Studies: Students can connect the idea of solving multi-step problems to analyzing information from tables and graphs. | |
| **Validate/Affirm/Build/ Bridge** | • *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?*<br>• *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?* | • Building Procedural Fluency from Conceptual Understanding: Instruction should build from conceptual understanding to allow students opportunities to make meaning of mathematics before focusing on procedures. When new learning begins with procedures, it privileges those with strong prior familiarity with school mathematics procedures for solving problems and does not allow learning to build for more methods for solving tasks that occur outside of school mathematics. For example, when studying representing and solving problems involving addition and subtraction, the types of mathematical tasks are critical because not all students learn procedurally. Some students need to know why before how while others like to know how before why. All students should be encouraged to explain the relationship between place value and regrouping and how this applies to the procedures for addition and subtraction. |

## Planning for Multi-Layered System of Supports

**Vertical Alignment**

| *Previous Learning* | *Current Learning* | *Future Learning* |
|---|---|---|

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|---|---|---|
| • Connect to experiences solving all addition and subtraction problems types. Initially, the meaning of addition is separate from the meaning of subtraction. The problems are limited to numbers within 20 and one-step problems **(1.OA.1).** | • Connect to relationships between addition and subtraction. Students apply strategies to solve one- and two-step addition/subtraction problems within 100 to length situations **(2.MD.5, 2.MD.6)** and to problems with bar graphs **(2.MD.10)**.<br>• Connect to the developing understanding of the meaning of operations and computational fluency **(2.OA.2).** | • Connect to applying strategies to one and two-step problems involving the four operations (addition, subtraction, multiplication, division). Students will learn to use a letter to represent an unknown **(3.OA.8)**. |

**Suggested Instructional Strategies**

**Pre-Teach**

| ***Level of Intensity*** | ***Essential Question*** | ***Examples*** |
|---|---|---|
| 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 analyzes common misconceptions when studying representing and solving problems involving addition and subtraction because there is a common misconception when students begin to bridge their skills to working within word problems. Students can benefit from analyzing common errors and misunderstandings and connecting them to their own. For example, students can perform an error analysis with an anonymous work sample or mock work sample, looking for patterns in misconceptions. |
| Intensive | *What critical understandings will prepare students to access the mathematics for this cluster?* | 1 NBT.C4: This standard provides a foundation for work with representing and solving problems involving addition and subtraction because adding and subtracting within 100 fluently will help students move to within 1000. 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. |

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# 2nd Grade Operations and Algebraic Thinking Guide

| Universal Support Framework | | |
|---|---|---|
| A student should know/understand... | A student should be able to do... | ***Potential Scaffolds*** |
| • What is happening in a word problem and how to identify what they are looking for in each situation.<br>• The relationship between addition and subtraction when solving for unknowns in all positions. | • Solve addition and subtraction word problems within 100 using a strategy that makes sense to them.<br>• Use pictures, number lines, diagrams, and other representations to represent and solve single and multi-step situational problems which involve addition and subtraction.<br>• Write equations that represent the work they have shown with concrete materials or pictures. | • Build on students' experience with the following skills:<br>  ○ Add within 100, including adding a two-digit number and a one-digit number (1.NBT.C.4)<br>  ○ Understand that the two digits of a two-digit number represent tens and ones (1.NBT.B.2)<br>  ○ Add and subtract within 20, demonstrating fluency for addition and subtraction within 10 (1.OA.C.6)<br>• Cognitive Strategies<br>  ○ Repeatedly model the strategies<br>  ○ Monitor the students' use of the strategies<br>  ○ Provide feedback to students<br>  ○ Teach self-questioning and self-monitoring strategies<br>  ○ Introduce multiple means of representation for mathematical ideas<br>• Encourage students to use alternative tools to better access the grade level content. Examples include:<br>  ○ Use objects or drawings to represent problems.<br>  ○ Use of ten frames.<br>  ○ Base-10 blocks. |
| **Re-Teach** | | |
| ***Level of Intensity*** | ***Essential Question*** | ***Examples*** |
| Targeted | What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to | For example, students may benefit from re-engaging with content during a unit on representing and solving problems involving addition and subtraction by providing specific feedback to students on their work through a |

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| | be revisited during a unit? | short mini-lesson because it is imperative that students understand their own learning, misconceptions and ideas. |
| 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 representing and solving problems involving addition and subtraction unit by offering opportunities to understand and explore different strategies because one strategy does not fit all learners. For example, some students may benefit from breaking the numbers apart into place value pieces for spatial disconnects. |

| **Extension** | |
|---|---|
| ***Essential Question*** | ***Examples*** |
| 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 representing and solving problems involving addition and subtraction because students can benefit from looking at numbers in different ways. For example, if a student is finding the sum of 10 and 9 students can be asked for other ways to find that sum other than adding the two numbers. |

| ***CCSS Domain*** | ***CCSS Cluster*** |
|---|---|
| **Operations and Algebraic Thinking** | **Add and subtract within 20** |

## Culturally and Linguistically Responsive Instruction

| | |
|---|---|
| **Relevance to Families and Communities** | During a unit focused on using addition and subtraction within 100 to solve one- and two-step word problems, 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, learning about the different mental strategies to add and subtract within 100 to solve one- and two-step word problems, students are more successful when strategies include examples that are culturally relevant and familiar. Students will retain more knowledge when interacting |

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| | with the concept in a more meaningful way. | |
| **Cross-Curricular Connections** | Music: Students can practice fluency with addition facts through the use of music. | |
| **Validate/Affirm/Build/ Bridge** | • *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?*<br>• *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, during a unit focusing on adding and subtracting fluently within 20 using mental strategies, goal setting is critical because while this standard covers a long-term goal, students may set independent goals for academic achievement. |

## Planning for Multi-Layered System of Supports

**Vertical Alignment**

| *Previous Learning* | *Current Learning* | *Future Learning* |
|---|---|---|
| • Connecting to adding and subtracting within 20, demonstrating fluency for addition and subtraction within 10 and using strategies such as | • Connect to strategies to mentally/fluently solve addition/subtraction problems within 20. **(2.OA.2a)**<br>• Connect to knowing from | • Connect to the future work of fluently adding and subtracting within 1000 using strategies and algorithms based on place value, properties of operations, and/or |

| | | |
|---|---|---|
| counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 - 4 = 13 - 3 - 1 = 10 - 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 - 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). **(1.OA.6)** | memory one digit plus one-digit math facts. **(2.OA.2b)** | the relationship between addition and subtraction. **(3.NBT.2)** |

## Suggested Instructional Strategies

### Pre-Teach

| ***Level of Intensity*** | ***Essential Question*** | ***Examples*** |
|---|---|---|
| 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 mental strategies that support fluently adding and subtracting within 20, by introducing new representations (e.g., number lines) because targeted pre-teaching assists students in making new connections to background knowledge while introducing new content. |
| Intensive | *What critical understandings will prepare students to access the mathematics for this cluster?* | 1.OA.6: This standard provides a foundation for work with fluently adding and subtracting within 20, by focusing first on adding and subtracting within 10. |

### Universal Support Framework

| A student should know/understand... | A student should be able to do... | ***Potential Scaffolds*** |
|---|---|---|
| • The importance of making a 10 when adding and subtracting.<br>• How to use number | • Know from memory one digit plus one digit math facts.<br>• Explain their strategy for finding the | • Build on students' experience with the following skills:<br>○ Add and subtract within 20, demonstrating fluency for addition and subtraction within 10 (1.OA.C.6) |

| | | |
|---|---|---|
| relationships and previously-mastered facts to solve more difficult facts. | answer to addition and subtraction facts within 20.<br>● Use strategies to mentally/fluently solve addition/subtraction problems within 20. | ○ Use addition and subtraction within 20 to solve word problems (1.OA.A.1)<br><br>● Cognitive Strategies<br>○ Repeatedly model the strategies<br>○ Monitor the students' use of the strategies<br>○ Provide feedback to students<br>○ Teach self-questioning and self-monitoring strategies<br>○ Introduce multiple means of representation for mathematical ideas<br><br>● Encourage students to use alternative tools to better access the grade level content. Examples include:<br>○ Use objects or drawings to represent problems.<br>○ Use of ten frame.<br>○ Base-10 blocks. |

**Re-Teach**

| ***Level of Intensity*** | ***Essential Question*** | ***Examples*** |
|---|---|---|
| Targeted | What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisited during a unit? | For example, students may benefit from re-engaging with content during a unit on adding and subtracting fluently within 20 using mental strategies by revisiting student thinking through a short mini-lesson. The teacher can address students' misconceptions, academic and cognitive gaps, and target instruction through a student-centered approach in a small group setting. |
| 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. During a unit on adding and subtracting fluently within 20, students can develop using mental strategies by receiving opportunities to understand and explore different strategies. Offering different strategies as an intensive re-teach can support students as they internalize the concept of using addition and subtraction and how those are related. |

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# 2nd Grade Operations and Algebraic Thinking Guide

| Extension | |
|---|---|
| ***Essential Question*** | ***Examples*** |
| 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 opportunity to understand concepts more quickly and explore them in greater depth than other students. When studying during a unit on adding and subtracting within 20 fluently, using mental strategies could extend student understanding of the relationship between addition and subtraction and encourage them to seek for patterns in adding and subtracting larger numbers. |

| *CCSS Domain* | *CCSS Cluster* |
|---|---|
| **Operations and Algebraic Thinking** | **Work with equal groups of objects to gain foundations for multiplication** |

## Culturally and Linguistically Responsive Instruction

| | | |
|---|---|---|
| **Relevance to Families and Communities** | During a unit focused on Working with equal groups of objects to gain foundations for multiplication, 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 developing real world connections that are culturally relevant to students make more meaningful interactions for students to engage and conceptualize new ideas and vocabulary. | |
| **Cross-Curricular Connections** | Art: Students can study the use of arrays and even and odd in the creation of pieces of art. | |
| **Validate/Affirm/Build/ Bridge** | • *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* | • Posing Purposeful Questions: CLRI requires intentional planning around the questions posed in a mathematics classroom. It is critical to consider "who is being positioned as competent, and whose ideas are featured and privileged" within the classroom through both the types of questioning and who is being questioned. Mathematics classrooms traditionally ask short answer questions and reward |

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| | *the mathematical abilities of students of marginalized cultures and languages?*<br>• *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?* | students that can respond quickly and correctly. When questioning seeks to understand students' thinking by taking their ideas seriously and asking the community to build upon one another's ideas a greater sense of belonging in mathematics is created for students from marginalized cultures and languages. For example, when studying working with equal groups of objects to gain foundations for multiplication the pattern of questions within the classroom is critical because students are gaining knowledge of conceptual understanding, procedural skills, and fluencies that lead into multiplication. Students need to make that connection to the relationship between operations. |

# Planning for Multi-Layered System of Supports

## Vertical Alignment

| *Previous Learning* | *Current Learning* | *Future Learning* |
|---|---|---|
| • Connect to decomposing numbers within 10 into pairs. **(K.OA.3)** and with addition of numbers within 20, specifically with doubles. **(1.OA.6)** | • Connect to their understanding of number groupings to skip count within 1000. **(2.NBT.2)** and partitioning rectangles into rows and columns of same-size squares and counting to find the total number of them. **(2.G.2)** | • Connect to future work with understanding of odd and even to develop and apply more sophisticated mathematical arguments and proofs (MP3, MP4) and relating arrays to equal group situations. **(3.OA.1)** |

## Suggested Instructional Strategies

### Pre-Teach

| *Level of Intensity* | *Essential Question* | *Examples* |
|---|---|---|
| Targeted | *What pre-teaching will prepare students to productively struggle with* | For example, some learners may benefit from targeted pre-teaching that uses images/resources (especially those being used the first time) when studying equal |

| | | |
|---|---|---|
| | *the mathematics for this cluster within your HQIM?* | groups of objects to gain foundations for multiplication because working with equal groups of objects can be used for students to understand how these facts are derived and allows them to make those connections to multiplication. |
| Intensive | *What critical understandings will prepare students to access the mathematics for this cluster?* | 1.OA.D.7: This standard provides a foundation for work with equal groups of objects to gain foundations for multiplication because students need the skill of adding and subtracting to understand the connection of how repeated addition can represent the action of adding equal groups or rows/columns. |

| **Re-Teach** | | |
|---|---|---|
| ***Level of Intensity*** | ***Essential Question*** | ***Examples*** |
| Targeted | What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisited during a unit? | For example, students may benefit from re-engaging with content during a unit that focuses on working with equal groups of objects to gain foundations for multiplication by clarifying mathematical ideas and/or concepts through a short mini-lesson because clarifying ideas or concepts are a targeted re-engagement that can support students understanding of the relationship between operations and clarifies their distinction as they internalize the content while still maintaining the flow of the unit. |
| 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 working with equal groups of objects to gain foundations for multiplication by offering opportunities to understand and explore different strategies. Offering different strategies as an intensive re-teach can support students as they internalize the concept of grouping equal groups in using repeated addition for multiplication. |

| **Extension** | |
|---|---|
| ***Essential Question*** | ***Examples*** |
| 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 opportunity to understand concepts more quickly and explore them in greater depth |

| | |
|---|---|
| | than other students when studying working with equal groups of objects to gain foundations for multiplication because students could extend their understanding of the relationship between multiplication to use their understanding of the properties of operations to multiply and divide. |