NEW MEXICO
Public Education Department

3.OA: OPERATIONS & ALGEBRAIC THINKING

Cluster Statement: C: Multiply and divide within 100.
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:**
3.OA.C.7 **Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.**	SMP 5: Students can use appropriate tools strategically: by selection various tools and to show equal sets to determine the product or the missing factor. SMP6: Students can attend to precision by use appropriate vocabulary (factor, product, quotient) to associate meaning to their work and describe their thinking accurately to others. SMP8 Look for and express regularity in repeated reasoning by understanding how to apply the inverse properties of multiplying & dividing to build fluency.	• Solve problems using models and drawings as visuals as examples that represent multiplication and division facts. • Relate models to written equations. • Utilize strategies based on properties and patterns of multiplication to learn multiplication facts. • Use multiplication facts in terms of missing factors to learn division facts **Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Remember, Understand

Previous Learning Connections	**Current Learning Connections**	**Future Learning Connections**
Connect to previous work understanding equal groups, skip counting by 2, 5, 10, 100's, work with arrays up to 5 rows and 5 columns. (**2.OA.3, 2.OA. 4 and 2.NBT.2)**	Connections to multiplication and division exist across the standards in third grade. (**3.OA.1) (3.OA.2)(3.OA.3) (3.MD.7) (3.OA.5) (3.OA.6) (3.NBT.3) (3.OA.4) (3.OA.7) (3.OA.8) (3.OA.9**)	Connect to 4th grade, where students use multiplication and division with larger numbers. (**4.NBT.5) (4.NBT.6**)

Clarification Statement:
•This standard requires students to be fluent with multiplication and division facts
•They need to use strategies, knowledge of relationships between multiplication and division, and the properties of operations, to recall basic facts quickly and accurately.
•It is not enough for students to recall facts from memory from timed tests alone, but from experiences with

manipulatives, pictures, arrays, and word problems to internalize the basic facts.
•There are many strategies students may use to attain fluency:

- Multiplication by zeros and ones
- Doubles (2s facts), Doubling twice (4s), Doubling three times (8s)
- Tens facts (relating to place value, 5 x 10 is 5 tens or 50)
- Five facts (half of tens)
- Skip counting (counting groups of __ and knowing how many groups have been counted)
- Square numbers (ex: 3 x 3)
- Nines (10 groups less one group, e.g., 9 x 3 is 10 groups of 3 minus one group of 3)
- Decomposing into known facts (6 x 7 is 6 x 6 plus one more group of 6)
- Commutative Property of Multiplication
- Fact families (Ex: 6 x 4 = 24; 24 ÷ 6 = 4; 24 ÷ 4 = 6; 4 x 6 = 24)
- Missing factors

•Students should have exposure to multiplication and division problems presented in both vertical and horizontal forms.
•Students should have exposure to equations in the form of a x b = c and c = a x b should be used interchangeably, with the unknown in different positions.

Common Misconceptions
•Students may struggle with fully comprehending the strategies that will help them achieve fluency. It is critical for each of these strategies to be taught explicitly.
•Students think a symbol (? or []) is always the place for the answer. This is especially true when the problem is written as 15 ÷ 3 =? or 15 = • x 3.
•Students may think that 3 ÷ 15 = 5 and 15 ÷ 3 = 5 are the same 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 uses images/resources (especially those being used the first time) when studying multiplying and dividing within 100 fluently because students will need to use many different strategies and properties for understanding multiplication and division in order to find products & quotients for both smaller and larger numbers.

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

- 3.OA.A.1 & 2.OA.A.2 These standards provide a foundation for work with representing and solving problems involving multiplication and division by interpreting products of whole numbers & interpreting whole-number quotients of whole numbers because students need to have a clear understanding of what multiplication & division means (using arrays, equal groups, area models, and repeated addition) before they would be able to find products, quotients, and become fluent . 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

Physical Action: *How will the learning for students provide a variety of methods for navigation to support access?*

- For example, learners engaging with fluently multiplying and dividing within 100 benefit when learning experiences ensure information is accessible to learners through a variety of methods for navigation, such as varying methods for response and navigation by providing alternatives to <requirements for rate, timing, speed, and range of motor action with instructional materials, physical manipulatives, and technologies; physically responding or indicating selections; physically interacting with materials by hand, voice, single switch, joystick, keyboard, or adapted keyboard> because students need to use a variety of strategies at multiple levels and speeds to understand, practice and learn all the different multiplication & division facts with accuracy so they can become fluent with all the facts while meeting their individual learning needs.

Build

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

- For example, learners engaging with fluently multiplying and dividing within 100 benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that emphasizes effort, improvement, and achieving a standard rather than on relative performance because with feedback, students can keep data tracking their progress towards mastery of the multiplication & division facts so they can celebrate growth, and know which facts need maintenance versus which facts still need more practice for learning and memorizing.

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 fluently multiplying and dividing within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as allowing for flexibility and easy access to multiple representations of notation where appropriate (e.g., formulas, word problems, graphs) because students need to rely on previously taught strategies such as drawing arrays or skip counting and properties such as decomposing numbers into known facts and fact families to understand and find products & quotients accurately before they can memorize them.

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 fluently multiplying and dividing within 100 benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing different approaches to motivate, guide, feedback or inform students of progress towards fluency because students will need extensive practice (and motivation) with facts using different modalities and materials such as computer programs & games, timed tests, making visual support flash cards, buddy practice, board games, making arrays, oral recitation, and problem solving to both learn & move the fact knowledge to memory with accuracy and fluency.

Internalize

Self-Regulation: *How will the design of the learning strategically support students to effectively cope and engage with the environment?*

- For example, learners engaging with fluently multiplying and dividing within 100 benefit when learning experiences set personal goals that increase ownership of learning goals and support healthy responses and interactions (e.g., learning from mistakes), such as using activities that include a means by which learners get feedback and have access to alternative scaffolds (e.g.,

charts, templates, feedback displays) that support understanding progress in a manner that is understandable and timely because the student can set smaller achievable goals (learning their 3's facts) and get enough feedback to monitor progress and see growth to be aware of where they are in the process of meeting each goal and how that relates to final goal of learning all their facts fluently.

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 3.OA.B Understanding properties of multiplication and the relationship between multiplication and division by clarifying mathematical ideas and/or concepts through a short mini-lesson because applying properties like the commutative property, associative property, distributive property, and fact family knowledge of multiplication & division and their relationship is crucial for students to use to access multiple strategies for finding products & quotients before becoming fluent with facts.

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 3.OA.A Represent and solve problems involving multiplication and division by addressing conceptual understanding because students need to concretely understand the meaning of multiplication concretely using arrays, equal groups, area models, tape diagrams, and repeated addition before they can become proficient at fact knowledge and retrieval.

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 open ended tasks linking multiple disciplines when studying multiplying and dividing within 100 fluently because students could see the application of multiplying & dividing as well as be provided with a realistic opportunity to extend their ability to multiply by a double digit number based on prior strategies when learning to multiply (such as decomposing numbers).

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 multiplying and dividing within 100 fluently goal setting is critical because students will need short term goals for learning facts clusters from memory because there are too many facts which would be overwhelming for students to memorize without having them broken down into smaller achievable pieces.

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 multiplying and dividing within 100 fluently the types of mathematical tasks are critical because students need to rely on a multitude of strategies to be able to understand and find products and quotients before they can commit the facts to memory.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: http://tasks.illustrativemathematics.org/content-standards/3/OA/C/7

Kiri's Multiplication Matching Game Task

There were no Cognia Testlets for this cluster of standards.

Addresses standard 3. OA.C.7 - Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8×5=40, one knows 40÷5=8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

This game is a fun way for the student to practice arithmetic skills to the point where the single-digit facts are committed to memory. It reinforces the relationship between multiplication and division, and depending on the target cards can also connect these recall skills with other skills such as estimation and understanding of properties. The only necessary materials, the cards, can be produced easily and can be re-used. After playing regularly, students could be engaged in making new target cards.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on multiplying and dividing within 100 fluently, 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 ways multiplying is used in the home and community for planning, shopping and cooking can a be a great way to connect schools tasks with home tasks.	Social Studies: Calculations related to populations, supply, goods, costs.