NEW MEXICO
Public Education Department

4.OA: OPERATIONS & ALGEBRAIC THINKING

Cluster Statement: A: Use the four operations with whole numbers to solve problems.

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:**
4.OA.A.1 **Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.**	SMP 3: Students can construct viable arguments and critique the reasoning of others by explaining their thinking and listening to the reasoning of others and look for similarities and differences in strategies SMP 7: Students can look for and make use of structure by using properties of operations to explain calculations.	• Explain multiplication equations as multiplicative comparisons (28 is 7 times as many 4 and 4 times as many as 7) • Explain how multiplication can compare quantities - Interpret multiplicative comparison language within a word problem • Represent multiplicative comparisons • Identify a multiplication equation as showing two ways to describe a product • Write equations to represent multiplicative comparisons • Write word problems using multiplicative comparisons to describe a multiplication equation **Depth Of Knowledge:** 1-2 **Bloom's Taxonomy:** Apply
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
4.OA.A.2 **Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.**	SMP 4: Students can model with mathematics by solving single and multistep problems that include all four operations using models, pictures, words, and numbers.	• Use drawings and equations (with symbols to represent an unknown) to solve multiplication word problems • Use drawings and equations (with symbols to represent an unknown) to solve division word problems • Contrast a multiplicative comparison from an additive comparison

<table>
<tr><td></td><td></td><td>Depth Of Knowledge: 1,2

Bloom’s Taxonomy: Apply</td></tr>
<tr><td>Standard Text

4.OA.A.3
Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.</td><td>Standard for Mathematical Practices

SMP 2: Students can reason abstractly and quantitatively by interpreting the remainder in a multi-step problem involving the four operations.</td><td>Students who demonstrate understanding can:
• Use drawings and equations (with symbols to represent an unknown) to solve multiplication word problems
• Use drawings and equations (with symbols to represent an unknown) to solve division word problems
• Use mental computation and estimation to check for reasonable solutions

Depth Of Knowledge: 1-2

Bloom’s Taxonomy: Apply</td></tr>
<tr><td><u>Previous Learning Connections</u>
• Connect to interpreting products of whole numbers as the total number of objects in a set of groups (3.OA.A1)
• Connect to using addition to find the total number of objects arranged in a rectangular array (2.OA.C4)</td><td><u>Current Learning Connections</u>
• Connect to process of generating a number or shape pattern that follows a given rule (4.OA.C5)</td><td><u>Future Learning Connections</u>
• Connect multiplying and dividing whole numbers to future work of multiplying and dividing fractions (5.NF.B3)</td></tr>
<tr><td colspan="3">Clarification Statement:
4.OA.A1: This standard requires students to use multiplication equations to represent verbal multiplicative comparisons. This standard also calls for students to conceptually represent multiplicative comparisons. The focus lies in understanding comparisons NOT simply identifying each factor or product without understanding the meaning. Students should relate multiplicative reasoning to iterating-that is, to making multiple copies- and partitioning sets of objects as well as to the length, area, and volume of physical space.

4.OA.A2: This standard requires students to use drawings and equations to solve word problems with multiplication and division. Symbols are used to represent the unknown. Students must distinguish between additive and multiplicative comparison. (more than vs. times as) In an additive comparison, the underlying question is ‘what amount would be added to one quantity in order to result in the other?’ In a multiplicative comparison, the underlying question is ‘what factor would multiply one quantity in order to result in the other?’</td></tr>
<tr><td colspan="3">Common Misconceptions
• Students may confuse addition and multiplication. For example, when asked to write an equation for 7 times as many as 5, a student may write 7 + 5 instead of 7 x 5.
• Students may have trouble with the language in the word problems. For example, "3 times fewer" may be interpreted as the same as "3 less than" when solving word problems.</td></tr>
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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 using the four operations with whole numbers to solve problems because students need to represent verbal statements of multiplicative comparisons as multiplication equations.

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

- 3.OA.D.8 This standard provides a foundation for work with using the four operations with whole numbers to solve problems because this standard works on two step problems using the four operations. It also asks students to create an equation using a letter for unknown. 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 using the four operations with whole numbers to solve problems benefit when learning experiences include ways to recruit interest such as creating socially relevant tasks because students develop interest in things they know such as using their names or topics that are relevant to students (i.e. money, video game points).

Build

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

- For example, learners engaging with using the four operations with whole numbers to solve problems benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as using prompts or scaffolds for visualizing desired outcomes because students need conceptual support and a place to refer for reference when working with word problems or different operations.

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 using the four operations with whole numbers to solve problems benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as making explicit links between information provided in texts and any accompanying representation of that information in illustrations, equations, charts, or diagrams because students need direct instruction on drawing models or using manipulatives to determine what word problems are asking. This is also true to the four operations. See CCSS Math Glossary Table 1 (http://www.corestandards.org/Math/Content/mathematics-glossary/Table-1/) and

CCSS Math Glossary Table 2 (http://www.corestandards.org/Math/Content/mathematics-glossary/Table-2/)

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 using the four operations with whole numbers to solve problems 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 manipulatives will help with this cluster. Students can create diagrams for word problems or create arrays to answer multiplication problems.

Internalize

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

- For example, learners engaging with using the four operations with whole numbers to solve problems 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 incorporating explicit opportunities for review and practice because students need repeated, ongoing practice with word problems. They need access to problems examples in CCSS Math Glossary Tables 1 & 2. This practice and review will help with this cluster.

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 using the four operations with whole numbers to solve problems by examining tasks from a different perspective through a short mini-lesson because students need support in discovering different ways to solve problems. This can be through group work or small group.

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 using the four operations with whole numbers to solve problems by confronting student misconceptions because students will need clear understanding to solve multi-step problems using the four operations. Students need practice and support when they don't understand word problems. Students need direct instruction using manipulatives.

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 the opportunity to understand concepts more quickly and explore them in greater depth than other students when studying using the four operations with whole numbers to solve problems because word problems are seen through the students' academic careers and will be found in a variety of places. Working on different real world problems or creating problems help students understand different situations and help with understanding of complex problems.

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?

Equity Based Practice (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 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, four operations with whole numbers to solve problems, the pattern of questions within the classroom is critical because it is important to include every student in no particular order. When grouped appropriately, students can share prior knowledge and support each other's strengths and weaknesses. Students set group norms in respect of their cultures. This enables the development of a culture of productive discourse/discussion. Encourages questioning and validation among students' groups, the use of sentence frames and positive reinforcement. The teacher can facilitate conversations through strategic questioning.

Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source: Cognia Testlet Grade 4- Operations and Algebraic Thinking

Standard: 4.OA.A.3

Learning Target: I can use the four operations to solve multistep word problems.

1. A garden store sells two types of flowers. The store sells 40 daisies. The store sells 8 times as many tulips as daisies.

a. How many tulips does the store sell? Show your work or explain how you know.

The garden store sells each daisy for $4 and each tulip for $6.

b. How much more money does the store make from the sale of tulips than from the sale of daisies? Show your work or explain how you know.

This type of assessment question requires students to interpret multiplication equations as a comparison, solve multiplication or division word problems, and solve multistep word problems using the four operations. These are all standards that make up this cluster. This task might be used towards the end of unit with this cluster because it asks students to do all operations stated in standards of this cluster. Teacher will be able to see misconceptions and where students are having errors for reteach.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on using the four operations with whole numbers to solve 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 teachers can encourage students to write a word problem about something at home. This could be written in conjunction with family members. This gets the family talking about the math and different examples brought back into the classroom.	Science: In fourth grade the NGSS recommends that students will study energy. Teachers should give students opportunities to use the four operations with whole numbers to solve problems. Students will also study Earth and human activity. Teachers should give students opportunities to be quantitative in descriptions. Consider providing a connection for students to be quantitative when discussing environmental effects.