4.OA: OPERATIONS & ALGEBRAIC THINKING

Cluster Statement: B: Gain familiarity with factors and multiples.

Supporting 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.B.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.	SMP 3: Students can construct viable arguments about whether a number is prime or composite using their understanding of factors. SMP 7: Students can look for and make use of structure by using basic multiplication facts to find factors for a number.	• Identify factor pairs for a number using basic multiplication facts. • Determine whether a number is a multiple of another number using basic multiplication facts. • Identify prime or composite numbers. • Find all factors pairs for whole numbers 1-100 • Determine if a number in the range of 1-100 is a multiple of a given one-digit number • Understand that a whole number is a multiple of its factors • Determine if a number in the range 1-100 is prime or composite number
		Depth Of Knowledge: 1-2
		Bloom's Taxonomy: Remember
<u>**Previous Learning Connections**</u> • Connect to determining the unknown value in a multiplication or division equation (3. OA.A.4) • Connect to fluently multiplying and dividing numbers within 100 (3.OA.C7) • Connect to learning about representing unknown quantities with a letter (3.OA. D8)	<u>**Current Learning Connections**</u> • Connect factor pairs to multiplicative comparisons (4.OA. A1)	<u>**Future Learning Connections**</u> • Connect to representing expressions with whole number exponents (6.EE.A1) • Connect to determining the greatest common factor and least common multiple of two whole numbers (6.NS.B4)

Clarification Statement:
4.OA.B4: This standard requires students to find all **factor pairs** for **whole number** in the range of **1-100**. It also requires students to determine whether a whole number in the range of 1-100 is **prime** or **composite**.

Common Misconceptions
• A common misconception is that the number 1 is prime, when in fact; it is neither prime nor composite.
• Another common misconception is that all prime numbers are odd numbers. This is not true, since the number 2 has only 2 factors, 1 and 2, and is also an even number.

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 gaining familiarity with factors and multiples because it helps students with conceptual understanding and being able to visually see patterns within factors and multiples. This can be connected to different standards in previous grades such as skip counting.
Pre-teach (intensive): *What critical understandings will prepare students to access the mathematics for this cluster?*
• 3.OA.C.7 This standard provides a foundation for work with gaining familiarity with factors and multiples because students will need to fluently multiply and divide within 100 and know from memory all products of two one-digit numbers. 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 gaining familiarity with factors and multiples benefit when learning experiences include ways to recruit interest such as creating socially relevant tasks because factors are about different patterns. Teachers can create interest by using topics that students are familiar with or can create interest as students work on them.
Build
Effort and Persistence: *How will the learning for students provide options for sustaining effort and persistence?*
• For example, learners engaging with gaining familiarity with factors and multiples benefit when learning experiences attend to students' attention and affect to support sustained effort and concentration such as providing alternatives in the mathematics representations and scaffolds because students need a way to conceptually see patterns. Using mathematics representations and scaffolds allows the teacher to give support without having to prompt students at every step.
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 gaining familiarity with factors and multiples benefit when learning experiences attend to the linguistic and nonlinguistic

representations of mathematics to ensure clarity can comprehensibility for all learners such as highlighting structural relations or make them more explicit because using highlighting or color coding to help students see patterns will help with conceptual understanding.

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 gaining familiarity with factors and multiples 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 students need a way to make sense of the patterns of factors and multiples by using manipulatives. As students can see patterns quicker, the manipulatives can be removed. Those who cannot see patterns will need more work with manipulatives.

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 gaining familiarity with factors and multiples 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 providing templates, graphic organizers, concept maps to support note-taking because giving students a way to organize factors and/or multiples will help them. This also will reduce students repeating factors (for example: 1 x 8 and 8 x 1).

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 gaining familiarity finding factor pairs of whole numbers by revisiting student thinking through a short mini-lesson because students that are struggling need support where they are having difficulty. Can they multiply or divide within 100? Do they need supports for determining factors? Are they confused with the vocabulary? These are student thinking that the teacher can work on in small groups

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 gaining familiarity finding factor pairs of whole numbers by addressing conceptual understanding because students who have trouble with coming up with factors quickly will need additional support with conceptual understanding. This includes manipulatives or visual models. It also might include the use of mathematical tools such as hundreds charts.

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 opportunity to explore links between various topics when studying gaining familiarity finding factor pairs of whole numbers because students can look for factor relations through

different curriculum data or real-world examples. This will help with work into 5th (fractions) and 6th (ratios).

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?

Facilitating Meaningful Mathematical Discourse: Mathematics discourse requires intentional planning to ensure all students feel comfortable to share, consider, build upon and critique the mathematical ideas under consideration. When student ideas serve as the basis for discussion, we position them as knowers and doers of mathematics by using equitable talk moves students and attending to the way students talk about who is and isn't capable of mathematics, we can disrupt the negative images and stereotypes around mathematics of marginalized cultures and languages. "A discourse-based mathematics classroom provides stronger access for every student — those who have an immediate answer or approach to share, those who have begun to formulate a mathematical approach to a task but have not fully developed their thoughts, and those who may not have an approach but can provide feedback to others." For example, when studying gaining familiarity with factors and multiples facilitating meaningful mathematical discourse is critical because factors and multiples can be interpreted in many different ways. These are types of patterns that are seen in different areas of academic and life. Supporting mathematical discourse around tasks or problems with factors and multiples allows the teacher to determine misconceptions and helps the classroom develop different strategies for determining answers. A teacher can use questioning to guide and further students thinking through discourse. In the same way, the teacher can ask guiding questions about misconceptions and lead students to understanding

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: http://tasks.illustrativemathematics.org/content-standards/4/OA/B/4/tasks/938
Standard: 4.OA.B.4
Task: The Locker Game

The Locker Game ✕

The 20 students in Mr. Wolf's 4th grade class are playing a game in a hallway that is lined with 20 lockers in a row.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

- The first student starts with the first locker and goes down the hallway and opens all the lockers.

- The second student starts with the second locker and goes down the hallway and shuts every other locker.

- The third student stops at every third locker and opens the locker if it is closed or closes the locker if it is open.

- The fourth student stops at every fourth locker and opens the locker if it is closed or closes the locker if it is open.

This process continues until all 20 students in the class have passed through the hallway.

This type of assessment question requires students to extend work on understanding of multiplication. Students will look for patterns within problem and connect those to factors. Students might have this task towards the end of unit work. This task can also be differentiated to meet needs of students, but still give teacher the reteach information they need.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on gaining familiarity with factors and multiples, 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 discover different patterns that lend to factors and multiples in their home. They can further mathematical discourse with family about patterns and different ways factors and multiples are used in everyday life.	Social Studies: Connect students to the history behind the Sieve of Eratosthenes, the ancient algorithm that helps us to determine factors, multiples, primes, and composites for all numbers. Study the life and accomplishments of the Greek astronomer Eratosthenes of Cyrene and teach students how to use the Sieve.