NEW MEXICO
Public Education Department

3.MD: MEASUREMENT & DATA

Cluster Statement: C: Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

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.MD.C.5: Recognize area as an attribute of plane figures and understand concepts of area measurement. • 3.MD.C.5.A: A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. • 3.MD.C.5.B: A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.	SMP 6: Students can attend to precision by using specific vocabulary to describe the dimensions when measuring area. SMP 7: Students can look for and make use of structure by using their knowledge of the mathematical structure of multiplication and/or arrays and applying that knowledge to area.	• Recognize that area is the measurement as the space occupied by a flat shape or the surface of an object. • Recognize a unit square has 1 square unit of area and is used to measure area of two-dimensional shapes. • Recognize any plane figure covered without gaps or overlaps and filled with *n* unit squares indicates the total square units or area.
		Depth of Knowledge: 1
		Bloom's Taxonomy: Remember
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
3.MD.C.6: Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).	SMP 4: Students can model with mathematics by using tiles or unit squares to solve area problems by filling in the area and counting squares or by coloring and counting squares on a graph paper. SMP 5: Students can use tools by using manipulatives to tile or cover areas without gaps or overlaps and discover the formula for area of a rectangle.	• Measure areas by counting unit squares of cm, m, in, ft, ad other sizes.

	SMP 6: Students can attend to precision by using consistent unit squares for measuring area for a given shape.	**Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Understand and Apply
Standard Text 3.MD.C.7: Relate area to the operations of multiplication and addition. • 3.MD.C.7.A: Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. • 3.MD.C.7.B: Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. • 3.MD.C.7.C: Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. • 3.MD.C.7.D: Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.	**Standard for Mathematical Practices** SMP 1: Students can make sense of problems and persevere in solving them by solving area problems involving decomposing larger rectangles (i.e. a double-digit length) or rectilinear figures. SMP 4: Students can model with mathematics by illustrating the distributive property with a drawing, graph paper, or tiles and explaining how multiplication and addition are used to find the area of a rectangle or rectilinear figure. SMP 8: Students look for and express regularity in repeated reasoning by recognizing the shortcut of multiplying length by width for rectangles gives the same area as using repeated addition.	**Students who demonstrate understanding can:** • Relate area to the operations of multiplication and addition. • Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. • Apply their knowledge of area of rectangles with whole-number side lengths in the context of problem solving. • Illustrate and explain that the area of a rectangle can be found by partitioning it into two smaller rectangles using tiles and/or arrays to and that the area of the larger rectangle is the sum of the two smaller rectangles. **Depth of Knowledge:** 2-3 **Bloom's Taxonomy:** Understand, Apply and Analyze

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Previous Learning Connections	Current Learning Connections	Future Learning Connections
• Connect to measuring the length of an object by selecting and using appropriate tools such as rulers, yardsticks meter sticks, and measuring tapes. **(2.MD.1)** • Connect to partitioning a rectangle into rows and columns of same-size squares and counting to find the total number of them. **(2.G.2)** • Connect to using addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns and writing an equation to express the total as a sum of equal addends. **(2.OA.4)**	• Connect to understanding division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8. **(3.OA.6)** • Connect to solving two-step word problems using the four operations and representing these problems using equations with a letter standing for the unknown quantity. **(3.OA.8)** • Connect to applying properties of operations as strategies to multiply and divide. **(3.OA.5)**	• Connect to applying the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. **(4.MD.3)**

Clarification Statement:
3.MD.C.5: Students need to learn to conceptualize **area** as the amount of **two-dimensional space** in a bounded region and to measure it by choosing a **unit of area**, often a **square**. A **two-dimensional geometric figure** that is covered by a certain number of squares without **gaps** or **overlaps** can be said to have an area of that number of **square units**.

3.MD.C.6: To begin an explicit focus on area, teachers might then ask students which of three rectangles covers the most area. Students may first solve the problem with **decomposition** (cutting and/or folding) and r**e-composition**, and eventually analyses with **area-units**, by covering each with unit squares (tiles).

3.MD.C.7: Students can be taught to **multiply length measurements** to find the area of a **rectangular** region. But, in order that they make sense of these quantities, they first learn to interpret measurement of rectangular regions as a **multiplicative relationship** of the number of square units in a **row** and the number of rows. Students learn to understand and explain that the area of a rectangular region of, for example, 12 length-units by 5 length-units can be found either by multiplying 12 x 5 or by adding two products, e.g., 10 x 5 and 2 x 5, illustrating the **distributive property**.

Common Misconceptions
● Students may not understand how to find the number of square units for non-rectangular shapes, such as combining two half-square unites to make a whole square unit

● Students may confuse perimeter and area

● Students may believe that all shapes with a given perimeter have the same area

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 understanding concepts of area and relating area to multiplication and addition because students are building on prior understanding of linear measurement, tiling rectangles, and partitioning a rectangle into rows and columns of same-size squares and count to find the total number of them.

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

- 2.G.A.2: This standard provides a foundation for work with understanding concepts of area and relating area to multiplication and addition because this standard focuses on reasoning with shapes and their attributes and partitioning a rectangle into rows and columns of same-size squares and counting to find the total number of them. This prior knowledge and understanding is important because students can make connections from tiling rectangles and decomposing them into rows and columns of same-sized squares to using square units to measure the amount of space covered by a rectangle. 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

Perception: *How will the learning for students provide multiple formats to reduce barriers to learning, such as providing the same information through different modalities (e.g., through vision, hearing, or touch) and providing information in a format that will allow for adjustability by the user?*

- For example, learners engaging with understanding concepts of area and relating area to multiplication and addition benefit when learning experiences ensure information is accessible to learners with sensory and perceptual disabilities, but also easier to access and comprehend for many others such as offering alternatives for visual information such as descriptions (text or spoken) for all images, graphics, video, or animations; touch equivalents (tactile graphics or objects of reference) for key visuals that represent concepts; objects and spatial models to convey perspective or interaction; auditory cues for key concepts and transitions in visual information because this helps students make sense and understand important math vocabulary and will be able to focus more on the mathematics and not get frustrated or consumed by things that don't make sense to them or are confusing. Students use manipulatives and work with a partner.

Build

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

- For example, learners engaging with understanding concepts of area and relating area to multiplication and to addition benefit when learning experiences attend to student's attention and affect to support sustained effort and concentration such as encouraging and supporting opportunities for peer interactions and supports (e.g., peer-tutors) because using flexible grouping gives students the opportunity to ask questions, ask for clarification, or encourage one another through coaching and the use of questioning when students get stuck. Students working in groups are encouraged to persevere and are celebrated for their thinking and effort. Students may use different strategies to figure out the area of a two-dimensional figure. Students may use different manipulatives but are still exploring finding the area. Talking with peers provides opportunities for students to sustain their effort and perseverance.

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 understanding concepts of area and relating area to multiplication and to addition 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 it's important for students to have an understanding of important mathematical vocabulary so it doesn't impede their learning during the lesson. Before the lesson begins, the teacher may break down the objectives and use pictures, examples, or different words to pre teach vocabulary and symbols. This gives the students background knowledge and helps students make connections to their own experiences and prior knowledge.

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 understanding concepts of area and relating area to multiplication and to addition benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as solving problems using a variety of strategies because it allows for students to solve the problem in a way that makes sense to them and allows them to be able to talk about their thinking and their strategy when finding the area of two-dimensional figures.

Internalize

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

For example, learners engaging with understanding concepts of area and relating area to multiplication and to addition 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 giving students opportunities for review and practice when finding the area of two-dimensional figures helps them to build confidence and work through misconceptions and to build on their conceptual knowledge and fluency.

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 understanding concepts of area and relating area to multiplication and addition by critiquing student approaches/solutions to make connections through a short mini-lesson because being able to see different strategies and solutions and make connections between those strategies and solutions will promote discourse between students and helps to clear up misconceptions and give students the opportunity to reflect on where they are in their learning and what they might still be struggling with.

Re-teach (intensive) *What assessment data will help identify content needing to be revisited?*

- For example, students may benefit from re-engaging with content during a unit on understanding concepts of area and relating area to multiplication and addition by offering students opportunities to understand and explore different strategies in a small group setting or pull out if needed. In a smaller group setting, the teacher will be able to monitor students' progress on a

biweekly basis to assess student growth and their responses to intensive interventions.

Extension

What type of extension will offer additional challenges to 'broaden' your student's knowledge of 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 understanding concepts of area and relating area to multiplication and addition because it gives students the opportunity to explore with measuring efficiently and effectively using standard units, their learning experiences can be directed to situations that encourage them to "discover" measurement formula. Students can also make connections to what types of jobs might utilize area and why it is important to be accurate and efficient.

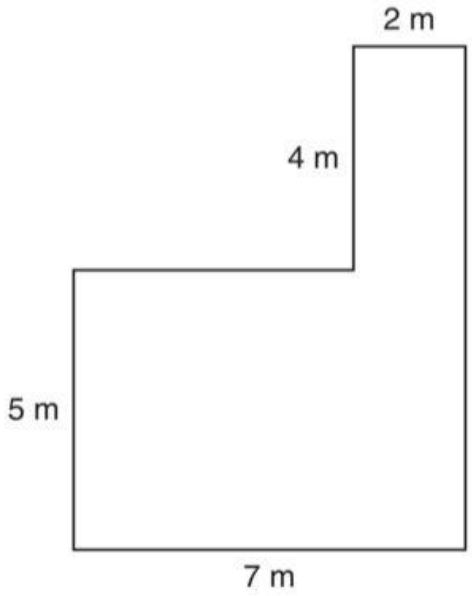
Culturally and Linguistically Responsive Instruction:

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 understanding concepts of area and relate area to multiplication and addition goal setting is critical because students understand and know the learning goals and expectations for the lesson. When using both content and language objectives, the students are able to clearly understand the expectations and learning goals for the lesson, feel comfortable in the classroom setting, and are immersed in a classroom culture where ALL students can engage with interesting and rigorous mathematical content and achieve in mathematics to high levels.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source Cognia Testlet for Grade 3 Measurement and Data
STANDARD: Relate area to the operations of multiplication and addition: Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. (03. MD.03.07. d)
LEARNING TARGET: I can find the area of a shape by breaking it down into smaller rectangles and then adding those areas to find the total area. DOK: 2

5. A patio is in the shape of two rectangles, as shown below.



What is the area of the patio?

Ⓐ 18 square meters
Ⓑ 35 square meters
Ⓒ 41 square meters
Ⓓ 43 square meters

Relevance to families and communities:

During a unit focused on area, 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 area is used in the home and community can a be a great way to connect schools tasks with home tasks. Students can talk with their family members about the concept of area. They can make connections to buying and laying flooring or carpet, planning and building a garden, or planning and laying bricks to build a rectangular patio floor.

Cross-Curricular Connections:

Science: In third grade the NGSS states students should be able to "make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard." Consider providing a connection where students look at how area can relate to the impact of weather-related hazards, such as tsunamis and stilt houses.

Art: Painting a wall requires knowing the area of the wall and also how much area each paint can will cover. Consider providing an opportunity for students to apply their knowledge of area to a real-life application within the school, such as painting an outside wall used during recess.