NEW MEXICO
Public Education Department

4.MD: MEASUREMENT & DATA

Cluster Statement: A: Solve problems involving measurement and conversion of measurements.

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.MD.A.1: Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*	SMP 1: Students can make sense of problems and persevere in solving them by solving problems involving measurement and the conversion of measurements from a larger unit to a smaller unit. SMP 2: Students can reason abstractly and quantitatively by visually seeing and thinking about benchmark (or landmark) measurements and associating them with approximate lengths (things they already know). SMP 6: Students can attend to precision by using measurement vocabulary for both metric and standard measurements and their associated measurement abbreviations.	• Recognize the relationship between kilometers, meters, and centimeters. • Recognize the relationship between yards, feet, and inches. • Recognize the relationship between pounds and ounces. • Recognize the relationship between hours, minutes, and seconds. • Recognize the relationship between liters and milliliters. • Express measurements in a large unit in terms of a smaller unit by recording measurements equivalent in a two-column table **Depth Of Knowledge:** 1 **Bloom's Taxonomy:** Remember and Understand
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
4.MD.A.2: Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	SMP 1: Students can make sense of problems and persevere in solving them by interpreting, analyzing, and solving word problems involving elapsed time, liquid volume, mass and money. SMP 4: Students can model with mathematics by representing the measurement quantities using diagrams that feature a measurement scale, such as number line diagrams.	• Solve word problems involving elapsed time, liquid volume, mass and money involving the operations of addition, subtraction, multiplication and division and including whole numbers, fractions and decimals within the 4th Grade Standards • Represent a word problem involving elapsed time, liquid volume, mass or money using a diagram that features a measurement scale, such as number line diagrams. • Express measurements in a large unit in terms of a smaller unit by

	SMP 6: Students can attend to precision by paying attention to the units given in the problem and including units in their answer.	recording measurements equivalent in a two-column table **Depth Of Knowledge:** 1-2 **Bloom's Taxonomy:** Understand, Apply and Analyze
Standard Text 4.MD.A.3: Apply 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.*	**Standard for Mathematical Practices** SMP 1: Students can make sense of problems and persevere in solving them by interpreting, analyzing, and solving word problems involving area and perimeter. SMP 7: Students can look for and make use of structure by noticing that perimeter is always measured in linear units and area is always measured in square units. SMP 8: Students look for and express regularity in repeated reasoning by seeing the area and perimeter formulas as summaries of all calculations to find the area or perimeter of a rectangle.	**Students who demonstrate understanding can:** • Apply the area formula to real-world and mathematics problems. • Apply the perimeter formula to real-world and mathematical problems. • Find an unknown length or width in an area problem by recognizing the area formula as a multiplication equation with an unknown factor • Find an unknown length or width in a perimeter problem by recognizing the perimeter formula as an addition equation with an unknown factor **Depth Of Knowledge:** 1-2 **Bloom's Taxonomy:** Understand, Apply and Analyze
<u>Previous Learning Connections</u> • Connect to measuring lengths with halve sand fourths of an inch. **(3.MD.4)** • Connect to estimating, measuring, adding , and subtracting lengths using inches, feet, yards, centimeters, and meters. **(2.MD.1-6)** • Connect to measuring and estimating masses of objects using grams and kilograms and liquid volumes using milliliters and liters. **(3.MD.2)**	**<u>Current Learning Connections</u>** • Connect to interpreting a multiplication equation as a comparison. **(4.OA.1)** • Connect to multiplying to solve word problems involving multiplicative comparisons. **(4.OA.2)**	**<u>Future Learning Connections</u>** • Connect to using unit conversions in solving multi-step, real world problems. **(5.MD.1)** • Connect to using ratio reasoning to convert measurement units; connect to manipulating and transforming units appropriately when multiplying or dividing quantities. **(6.RP.3.d)**

• Connect to measuring and estimating; and to adding, subtracting, multiplying, or dividing to solve one-step word problems given the same units. **(3.MD.2)** • Connect to telling and writing time to the nearest minute. Connect to adding and subtracting time intervals in minutes using number line diagrams. **(3.MD.1)**		

Clarification Statement:

- 4.MD.A.1: Relating **units** within the **metric system** is another opportunity to think about **place value**. For example, students need to able to create a **table** that shows **measurements** of the same **lengths** in **centimeters** and **meters**.
- 4.MD.A.2: Students combine competencies from different domains as they solve measurement problems using **all four arithmetic operations: addition, subtraction, multiplication, and division.** For example, "How many liters of juice does the class need to have at least 35 cups if each cup takes 225 ml?" Students may use **tape or number line diagrams** for solving such problems (MP1).
- 4.MD.A.3L Such abstraction and use of **formulas** underscores the importance of distinguishing between **area** and **perimeter** in Grade 3 (3.MD.8 3) and maintaining the distinction in Grade 4 and later grades, where **rectangle** perimeter and area problems may get more complex and problem solving can benefit from knowing or being able to rapidly remind oneself of how to find an area or perimeter. By repeatedly reasoning about how to calculate areas and perimeters of rectangles, students can come to see area and perimeter formulas as summaries of all such calculations (MP8).

Common Misconceptions

● Students may believe that larger units will give larger measures (as opposed to the larger the unit, the smaller the number you get when you measure).

● Students may confuse area and perimeter.

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 solving problems involving measurement and conversion of measurements because students need to understand the basic foundations of content being covered in this standard. This includes measurement names, abbreviations, and prior work in word problems. Eliciting prior learning will help in understanding what students already know and what needs to be covered more thoroughly.

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

- 3.MD.A.2: This standard provides a foundation for work with solving problems involving measurement and conversion of measurements from a larger unit to a smaller unit because it is essential for students to understand and be able to solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. 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 solving problems involving measurement and conversion of measurements will know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs. Also represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. Students will be able to 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. Students 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 displaying information in a flexible format to vary perceptual features such as visuals that will enhance the understanding of solving problems involving measurement because students can see and make connections and conversion of measurement. Students may also recognize the underlying mathematical relationships in representations quickly but may need support perceiving them in a different representation.

Build

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

- For example, learners engaging with measurement and conversions of measurement benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that encourages perseverance, focuses on development of efficacy and self-awareness, and encourages the use of specific supports and strategies in the face of challenge because analyzing proportional relationships is difficult and critical for all further development of mathematics.

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 measurement in the specific areas of length, distance, intervals of time, volume, mass, money, area, and perimeter 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 anchoring instruction by linking to and activating relevant prior knowledge (e.g., using visual imagery, concept anchoring, or concept mastery routines) because students will be able to apply knowledge to real world experiences to display understanding of content.

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 solving problems involving measurement and conversion of measurement from a larger unit to a smaller unit, by revisiting student thinking through a short mini-lesson because it is essential for students to be able to explain their thinking and reasoning behind it to portray understanding and learning of content. Revisiting student thinking will also allow the teacher to clear up misconceptions or student thinking that is not based in measurement.

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 to solve problems involving measurement and conversion of measurement from a larger unit to a smaller unit by addressing conceptual understanding because first students need to understand what they are doing and the why so sense making of the intended content is developed with an understanding and building on their knowledge. Students will need explicit work with concrete materials to build conceptual understand. For example, using centimeter blocks to see that 100 centimeters equals one meter.

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 solve problems involving measurement and conversion of measurement from a larger unit to a smaller unit because this will allow students to make connections to prior learning and build on their understanding and knowledge of measurement and data.

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 solving problems involving measurement and conversion of measurements, the pattern of questions within the classroom is critical because it is important to include every student in conversation to elicit their understanding and prior knowledge of content. Allowing students to collaborate will promote a culture of productive talk and allow students to express their thinking which is relevant to their life experiences. Students have the opportunity to take ownership of their learning and sense making of intended content. Through discussion, multiple strategies can evolve for students to utilize.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
*Source***:** http://tasks.illustrativemathematics.org/content-standards/4/MD/A/3/tasks/876

Standards: 4.MD.A.3 4.OA.A.3

Task: Karl's Garden

Karl's rectangular garden is 20 feet by 45 feet, Makenna's is 25 feet by 40 feet. Whose garden is larger in area?

This type of assessment question requires students to determine area using a strategy that works for them. They will use SMP 6 to communicate who has a larger garden using vocabulary from cluster and problem. This task could be an end of unit check or can be used within unit to check for understanding. This task could vary depending on the classroom, for example using groups and having groups share out rather than individually.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on solving problems involving measurement and conversion of measurements, 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 finding measurement of family garden, backyard or any space that is accessible from home so that there is relevance in finding measurement (finding the area or perimeter of the garden).	Science: In fourth grade the NGSS recommends students work with measurement related to erosion. Consider providing a connection for students to determine the area of vegetation in a certain place. Language Arts: Literature can offer connections about area and perimeter such as: *Spaghetti and Meatballs for All* by Marilyn Burns.