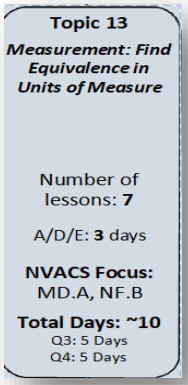
Grade 4 Topic 13: Measurement: Find Equivalence in Units of Measure



Big Conceptual Idea: Measurement and Data (Measurement Part) (pp. 87-92)

Prior to instruction, view the Topic 13 Professional Development Animation located in Pearson Realize online. Read the Teacher's Edition (TE): Cluster Overview/Math Background (pp. 671A-671F), the Topic Planner (pp. 671I-671J), all 7 lessons, and the Topic Assessments (pp. 727-728A).

Mathematical Background: Read Cluster Overview- (TE, pp. 671A-671F)	Topic Essential Questions: How can you convert from one unit to another? How can you be precise when solving math problems? *Reference TE (p. 671) and Answering the Topic Essential Questions (TE, pp. 725-726) for key elements of answers to the Essential Questions.*

The lesson map for this topic is as follows:

13-1	13-2	13-3	13-4	13-5	13-6	13-7	Assessment

3 A/D/E days used strategically throughout the topic.

4th grade Curriculum Pacing Framework: Balanced Calendar

Instructional note:

This topic focuses on converting units of measure and explores area and perimeter concepts. Focus for standard 4.MD.A, "solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit" (Nevada Academic Content Standards (NVACS), 2010). 4.MD.A.1 and 4.MD.A.3 focus on relative size of measurements, find equivalence among measurements of the same attribute and apply the area and perimeter formula for rectangles in real world and mathematical problems.

"Technically, a *measurement* is a number that indicates a comparison between the attributes of the object (or situation, or event) being measured and the same attribute of a given unit of measure. To measure means that the attribute being measured is "filled", "covered" or "matched". (Van de Walle, Karp, Bay-Williams, 2010, p. 370).

For measurement, "research indicates that when students see standard rulers with the numbers on the hash marks, they often believe that the numbers are counting the marks rather than indicating the units or spaces between the marks" (Van de Walle, et al., 2010, p. 376). Consider making a connection between the spaces on a ruler to the spaces on a number line. Two assessments teachers might use with students to check for understanding when measuring, is to give students a ruler with hash marks and no numbers or give students a 'broken ruler" with the first two units broken off (Van de Walle, et al., 2010, p. 376). In using these assessments, teachers can gain in-sight into students' knowledge of measuring before having students convert measurements.

In this topic, consider giving students multiple opportunities to use concrete tools or representations to support them as they work with abstract concepts.

Focus Math Practice 6: Attend to precision

Focus opportunities for students to develop *Mathematical Practice 6* behaviors, as this is the focus of the Math Practices and Problem Solving, lesson 12-7. Reference the Teacher's Edition (pp. F26-F26A) and the NVACS (2010, p. 7).

Note: The purpose of the curriculum guides is for additional considerations. Therefore, not all components may have additional notes included in this guide.

Essential Academic Vocabulary Use these words consistently during instruction.			
New Academic Vocabulary: (First time explicitly taught)		Review Academic Vocabulary: (Vocabulary explicitly taught in prior grades or topics)	
quart	pound	*capacity*	*milligram*
gallon	ton	*weight*	*kilogram*
cup	millimeter	*centimeter*	*perimeter*
pint	meter	*milliliter*	*area*
fluid ounce	kilometer	*liter*	*formula*
ounce	mass	*gram*	

Additional terminology that students may need support with: convert, units, customary units and metric units

*Consider adding measurement terminology to an anchor chart as they are discussed within the lessons.

*Collaborative Team Conversations (CTC)

Consider using *one* of the following as part of the formative assessment process at the lesson level to collect student work to analyze for evidence of mathematical understanding:

Guiding questions: "What strategies are students using to convert measurements?
Are students able to determine measurements based on given information?"

Lesson	Evidence	Look for
13-3	*Quick Check* (digital platform) Item 2	Focus CTC around the big idea: • students use the information on a line plot to convert pounds to ounces. Printable version available under "Teacher Resources".
13-6	*Math Practice and Problem Solving* (student work samples) Item 15	Focus CTC around the big idea: • students determine the dimensions of the rectangle based on the given area.

Learning Cycle Assessments (summative)	*Topic Assessments* SE pp. 725-728	Use *Scoring Guide* TE pp. 725-728A

Standards listed in **bold** indicate a focus of the lesson.

NVACS (Content and Math Practices)	Mathematical Development of the Big Idea	Instructional Clarifications & Considerations
Lesson 13-1: Equivalence with Customary Units of Length		
4.MD.A.1 4.MD.A.2 4.NF.B.3d 4.NF.B.4c MP.1 MP.6 MP.7 MP.8	Access Prior Learning: In previous grades, students estimated and measured length to the nearest inch or foot. Students measured the same object with two different units to gain an understanding of the principle that the smaller the unit, the greater the number of units needed. Beginning of the Big Idea: In this lesson, students use the relative size of customary units of length to convert from a larger unit to a smaller unit.	Note: Consider teaching this lesson over 2 days. Remember, this will count towards one of the A/D/E days in the WCSD Pacing Framework. Day 1: Consider giving students the opportunity to measure items using the customary unit of measure. Have students measure with a ruler. Consider having students write what they measured and the measurement amount on a sticky note (have students measure a few items or objects). Next, have students go to a sticky note and measure to critique the reasoning of others. If they disagree with a student, they need to justify why they disagree. (Idea from Mary Wilson, Pearson representative). Child-watch for students who are struggling with reading a ruler. Also look for students who may already be converting inches to feet, feet to yards and vice versa. Note: Students have been working with measuring using tools in both U.S. Customary and the Universal System of Measures (Metric System) since 2nd Grade. Day 2: Note: When students are converting between measurements, they need to understand the two measurements are equivalent. Solve & Share: Consider giving students an opportunity to solve the *Solve & Share* using yard sticks or other tools to see how many feet are in 75 yards. Consider removing the diagram as it may not be helpful for students when answering the question. Look Back: Consider connecting the *Look Back!* to the *Solve & Share* as students think about a multiplicative comparison between yards and feet. Visual Learning: Consider reading the *Prevent Misconceptions* and questions before teaching the lesson (TE, p. 680). Consider giving students an opportunity to solve the *Visual Learning* on their own and then facilitate a discussion around the problem as it is a multi-step problem. Convince Me: Consider connecting the *Convince Me!* back to Day 1 when students measured various objects. Have students think about when they measured in inches and feet. Did they notice any structures when measuring in a smaller unit versus a larger unit? *-continues on next page-*

		Another Example: Compare the *Another Example!* to the *Visual Learning*. In the *Visual Learning Animation*, students convert from feet to inches and in the *Another Example!*, students convert yards to inches. Have students reflect on patterns they notice when converting. Assess and Differentiate/Intervention Activity: Consider facilitating a discussion around the *Intervention Activity* with all students. Guide students in a discussion about relative size.
Lesson 13-2: Equivalence with Customary Units of Capacity		
4.MD.A.1 4.MD.A.2 4.NF.B.3d 4.NF.B.4c MP.1 MP.2 MP.8	Access Prior Learning: In the previous lesson, students learned how to convert a larger customary unit of length to a smaller unit. Beginning of the Big Idea: In this lesson, students will learn the relative size of customary units of capacity to convert from a larger unit to a smaller unit.	Solve & Share: Consider providing students with an opportunity to use tools to solve the problem. Students are given a table with conversion amounts, so consider giving them an opportunity to figure out the table on their own and solve the problem before explaining the table to them. Visual Learning: Students use a recipe to convert different customary units of capacity. Consider having students bring in their own recipe to use for the *Visual Learning*. Relate the *Visual Learning* to fraction strips instead of focusing attention on "Gallon Man". Independent Practice/Math Practices and Problem Solving: Consider facilitating a discussion around item 15 with students. Students are asked to use the information from a table to solve a problem. Assess and Differentiate/Intervention Activity: Consider facilitating a discussion around the *Intervention Activity* as students use "realia" to find equivalent capacities.
Lesson 13-3: Equivalence with Customary Units of Weight		
4.MD.A.1 4.MD.A.2 4.NF.B.3d 4.NF.B.4c MP.1 MP.2 MP.6 MP.8	Access Prior Learning: In the previous lessons, students converted between a larger unit and a smaller unit using customary units of measure and capacity. Beginning of the Big Idea: In this lesson, students learn about customary units of weight; the relative size of the units and how to convert from a larger weight to a smaller weight.	Visual Learning: Consider reading the *Prevent Misconceptions* prior to teaching the lesson (TE, p. 692). The *Visual Learning* is a multi-step problem. Consider giving students the opportunity to solve the problem before facilitating a discussion. Independent Practice/Math Practices and Problem Solving: Consider facilitating a discussion around items 13 and 14 as students think about patterns. This will support the work in Topic 14. *CTC: *Quick Check item 2* (digital platform)
Lesson 13-4: Equivalence with Metric Units of Length		
4.MD.A.1 4.MD.A.2 MP.1 MP.3 MP.5 MP.6 MP.8	Access Prior Learning: In previous grades, students estimated and measured length to the nearest centimeter or meter. In 13-1, students converted customary units of length. Developing the Big Idea: In this lesson, students will learn the relative size of metric units of length by converting from a larger unit of length to a smaller unit.	Note: Consider connecting the metric system to the base-ten system. Solve & Share: Consider having students solve the problem without a discussion about the ruler's marks. This will give you an opportunity to child-watch to see how students measure in centimeters and millimeters, and if they know the difference between the two measurements of length. Look Back: Consider facilitating a discussion around the *Look Back!*. Consider giving students an opportunity to use a ruler as a tool to support students in finding the answer. Visual Learning: Consider reading the *Prevent Misconceptions* prior to teaching the lesson (TE, p. 698). Convince Me: Consider using the *Convince Me!* as a formative assessment or facilitate a discussion around equivalence. Independent Practice/Math Practices and Problem Solving: Consider facilitating a discussion around items 10 and 11, as students make connections through patterns. See if students use our base-ten system as they work on these items.

Lesson 13-5: Equivalence with Metric Units of Capacity and Mass		
4.MD.A.1 4.MD.A.2 MP.1 MP.3 MP.5 MP.6 MP.8	Access Prior Learning: In third grade, students estimated and measured capacity and mass using metric units. Beginning of the Big Idea: In this lesson, students will learn the relative size of metric units of mass and capacity. Students will also convert from a larger metric unit of capacity or mass to a smaller unit.	Solve & Share: Consider having students use their own water bottle to help solve the problem. Look Back: This may be an opportunity to relate the units to the idea of looking at the same whole when converting. Visual Learning: In the *Visual Learning Animation*, students solve problems related to capacity. Consider facilitating a discussion around capacity. Another Example: In the *Another Example!*, students solve problems related to mass. Consider facilitating a discussion around mass.
Lesson 13-6: Solve Perimeter and Area Problems		
4.MD.A.3 4.MD.A.2 4.NBT.B.5 4.NF.B.4c MP.1 MP.2 MP.3	Access Prior Learning: In third grade, students learned the meaning of area as the number of square units needed to cover a plane. In Topic 4, students used an area model to multiply whole numbers. Developing the Big Idea: In this lesson, students solve problems using perimeter and area.	Solve & Share: Consider removing the picture of the wall given to students. Consider giving students the opportunity to use tools or representations, like grid paper to solve the problem. Visual Learning: Read the *Prevent Misconceptions* prior to the lesson to clarify students' misconceptions regarding area and perimeter (TE, p. 710). Consider giving students the opportunity to solve for perimeter and area before showing the animation. See if students can explain how they solved the problems before giving students the perimeter and area formulas. Convince Me: Consider facilitating a discussion around the *Convince Me!*. Students are given the area of the park, and solve for the dimensions and the perimeter of the park. Assess & Differentiate/Intervention Activity: Consider using the *Intervention Activity* with students who may be struggling with area and perimeter as students find the area and perimeter of rectangles using grid paper. *CTC: *Math Practice & Problem Solving item 15* (student work samples)
Lesson 13-7: Math Practices and Problem Solving- Precision		
4.MD.A.2 4.MD.A.3 4.NBT.B.5 4.NF.B.4 MP.6 MP.1 MP.2 MP.4	Access Prior Learning: In previous topics, students have had an opportunity to work with Math Practice 6. Developing the Big Idea: In this lesson, students will focus on the thinking habits that good problem solvers use, such as precision to solve measurement problems.	Solve & Share: Consider providing students the opportunity to use tools or representations to solve the problem. As an extension, consider relating this problem back to fractions by asking students, "What fraction of the wall does one poster cover?" This extension may support students as they work on the *Visual Learning*. Look Back: Consider using the *Look Back!* as an extension to the *Solve & Share*. Convince Me: In the *Convince Me!* students are asked to use mathematical language to explain how to solve the *Visual Learning*. Consider facilitating a discussion on how to use mathematical language to make an explanation clear.

References

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Council of Chief State School Officers. (2010). The Nevada Academic Content Standards. Retrieved from http://www.doe.nv.gov/uploadedFiles/nde.doe.nv.gov/content/Standards_Instructional_Support/Nevada_Academic_Standards/Math_Documents/mathstandards.pdf.

Van de Wall, J., Karp, K., & Bay-Williams, J. M. (2010). *Elementary and Middle School Mathematics: Teaching Developmentally. Boston, MA*: Pearson.