



## Topic A

## Metric Unit Conversions

## 4.MD.1, 4.MD.2

<b>Focus Standard:</b>	4.MD.1 <sup>1</sup>	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. <i>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), ...</i>
	4.MD.2 <sup>2</sup>	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.
<b>Instructional Days:</b>	3	
<b>Coherence</b>	<b>-Links from:</b>	G2–M2 Addition and Subtraction of Length Units
		G3–M2 Place Value and Problem Solving with Units of Measure
	<b>-Links to:</b>	G5–M1 Place Value and Decimal Fractions
		G5–M2 Multi-Digit Whole Number and Decimal Fraction Operations

In order to explore the process of working with mixed units, Module 2 focuses on length, mass, and capacity in the metric system,<sup>3</sup> where place value serves as a natural guide for moving between larger and smaller units. In Topic A, students review place value concepts while building fluency with decomposing, or converting from larger to smaller units (**4.MD.1**). They learn the relative sizes of measurement units, building off prior knowledge of grams and kilograms from Grade 3 (**3.MD.2**) and meters and centimeters from Grade 2 (**2.MD.3**). Conversions between the units are recorded in a two-column table, beginning in Lesson 1. Recording the unit conversions in a table allows students to notice patterns when converting from a smaller unit to a larger unit (e.g., 200 centimeters is the same as 2 meters because 1 meter is equal to 100 centimeters). Single-step problems involving addition and subtraction of metric units provide an opportunity

<sup>1</sup> Pounds, ounces, and time are addressed in Module 7. This is a non-tested standard, but expressing metric measurements of length, mass, and capacity from larger to smaller units strengthens the upcoming modules.

<sup>2</sup> Time and money are addressed in Module 7. This is a non-tested standard, but the context of operating on distance, volume, and mass strengthens the upcoming modules. This module only focuses on addition and subtraction. Multiplication and division are addressed in future modules.

<sup>3</sup> Pounds, ounces, time, and money are covered in Module 7.

to practice simplifying strategies (e.g., mental math strategies) as well as the addition and subtraction algorithm established in Module 1 (4.NBT.4). Students practice reasoning by choosing to convert mixed units to a single unit before or after the computation (4.MD.2).

$$2 \text{ km } 608 \text{ m} + 3 \text{ km } 412 \text{ m}$$

*Algorithms:*

$$\begin{array}{r} 2 \text{ km } 608 \text{ m} \\ + 3 \text{ km } 412 \text{ m} \\ \hline 5 \text{ km } 1020 \text{ m} \\ \quad \quad \quad \uparrow \\ \quad \quad \quad 1 \text{ km } 20 \text{ m} \\ 6 \text{ km } 20 \text{ m} = 6,020 \text{ m} \end{array}$$

or

$$\begin{array}{r} 2,608 \text{ m} \\ + 3,412 \text{ m} \\ \hline 6,020 \text{ m} = 6 \text{ km } 20 \text{ m} \end{array}$$

*Simplifying Strategies:*

$$\begin{aligned} 2 \text{ km} + 3 \text{ km} &= 5 \text{ km} \\ 608 \text{ m} + 412 \text{ m} &= 600 \text{ m} + 420 \text{ m} \\ &\quad \quad \quad \uparrow \\ &\quad \quad \quad 600 \quad 8 \quad \quad \quad = 1,020 \text{ m} \\ 5 \text{ km} + 1 \text{ km } 20 \text{ m} &= 6 \text{ km } 20 \text{ m} \end{aligned}$$

or

$$\begin{array}{r} 2,608 \text{ m} + 3,412 \text{ m} \\ \begin{array}{ccc} 2,000 & 600 & 8 \\ 3,000 & 400 & 12 \end{array} \\ \hline 5,000 \text{ m} + 1,000 \text{ m} + 20 \text{ m} = 6,020 \text{ m} \end{array}$$

Word problems provide a context in which to apply the conversions and include the addition and subtraction of mixed units. Connecting students' familiarity with both metric units and place value, the module moves swiftly through each unit of conversion, spending only one day on each type of measurement. This initial understanding of unit conversions allows for further application and practice, such as when multiplying and dividing metric units, throughout subsequent modules.

### A Teaching Sequence Towards Mastery of Metric Unit Conversions

**Objective 1:** Express metric length measurements in terms of a smaller unit; model and solve addition and subtraction word problems involving metric length.  
(Lesson 1)

**Objective 2:** Express metric mass measurements in terms of a smaller unit; model and solve addition and subtraction word problems involving metric mass.  
(Lesson 2)

**Objective 3:** Express metric capacity measurements in terms of a smaller unit; model and solve addition and subtraction word problems involving metric capacity.  
(Lesson 3)