Topic E
Problem Solving with Customary and Metric Units

2.MD.5, **2.MD.6**, 2.NBT.2, 2.NBT.4, 2.NBT.5

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Focus Standards:	2.MD.5	Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.
	2.MD.6	Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, …, and represent whole-number sums and differences within 100 on a number line diagram.
Instructional Days:	3	
Coherence -Links from:	G2–M2	Addition and Subtraction of Length Units
	G2–M3	Place Value, Counting, and Comparison of Numbers to 1,000
-Links to:	G3–M2	Place Value and Problem Solving with Units of Measure

In Topic E Lesson 20, students use drawings to compare lengths and write equations with an unknown to represent problems, just as they did in Module 2 (**2.MD.5**). In this lesson, however, students solve *two-digit* addition and subtraction measurement problems using customary *or* metric units, composing or decomposing a ten, if necessary. Just as they made comparisons and found differences using bar graphs in Topic A, students now compare lengths using the tape diagram, essentially a horizontal bar, to solve two-step problems. For example, "Frankie has a 54-inch piece of rope and another piece that is 18 inches shorter than the first. What is the total length of both ropes?" Students also solve problems in the context of geometry to find the missing lengths of a rectangle or triangle.

Building upon their understanding of length, students represent whole numbers as lengths on a number line (**2.MD.6**) in Lesson 21. Students identify unknown numbers by using mental benchmarks or reference points (e.g., 5, 10, 25, 50) and intervals of 1, 5, or 10. For example, on a number line with 6 equally spaced segments and endpoints 20 and 50, a student marks the middle segment as 35, realizing that 20 to 35 and 35 to 50 are the same distance, or length. Problems increase in complexity as students use their understanding of place value and the distance between positions to label points. For example, they label 340 as one endpoint when 350 is the midpoint and 360 is the other endpoint.

In Lesson 22, students represent two-digit sums and differences on a number line (**2.MD.6**) and write a number sentence to represent the addition or subtraction situation. For example, they solve the following problems using a number line marked with endpoints 0 and 50, marked intervals of 10 yards, and unmarked intervals of 5. "On a football field, Pepe starts running at the 10-yard line. He runs 25 yards, pauses, and runs 11 more yards. Which yard line is Pepe on now? How far has he run?" In comparison, "Marcel starts running at the 5-yard line. He runs 15 yards, pauses, runs 15 more yards, stumbles, and runs 6 more yards. Which yard line is Marcel on now? How far has he run?" Students show how they solve these problems on the number line with different starting points, and they consider how two different measurement situations can result in the same total and are thus equal to each other (e.g., 25 + 11 = 15 + 15 + 6), as shown below.
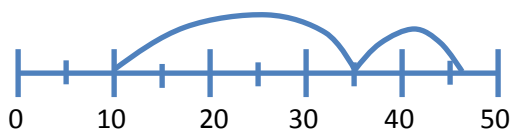
25 + 11 = 36
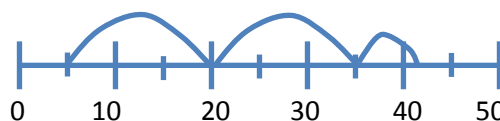
15 + 15 + 6 = 36

A Teaching Sequence Toward Mastery of Problem Solving with Customary and Metric Units
Objective 1: Solve two-digit addition and subtraction word problems involving length by using tape diagrams and writing equations to represent the problem. (Lesson 20)
Objective 2: Identify unknown numbers on a number line diagram by using the distance between numbers and reference points. (Lesson 21)
Objective 3: Represent two-digit sums and differences involving length by using the ruler as a number line. (Lesson 22)