Grade 2 • Module 2

Addition and Subtraction of Length Units

OVERVIEW

In this 12-day Grade 2 module, students engage in activities designed to deepen their conceptual understanding of measurement and to relate addition and subtraction to length. Their work in Module 2 is exclusively with metric units in order to support place value concepts. Customary units are introduced in Module 7.

Topic A opens with students exploring concepts related to the centimeter ruler. In the first lesson, they are guided to connect measurement with physical units as they find the total number of length units by laying multiple copies of centimeter cubes (physical units) end to end along various objects. Through this, students discover that to get an accurate measurement, there must be no gaps or overlaps between consecutive length units.

Next, students measure by iterating with one physical unit, using the *mark and advance* technique, also known as *mark and move forward*. Students then repeat the process by laying both multiple copies and a single cube along a centimeter ruler. This helps students create a mental benchmark for the centimeter. It also helps them realize that the distance between 0 and 1 on the ruler indicates the amount of space already covered. Hence 0, not 1, marks the beginning of the total length. Students use this understanding to create their own centimeter rulers using a centimeter cube and the mark and advance technique. Topic A ends with students using their unit rulers to measure lengths (**2.9A, 2.9D**), thereby connecting measurement with a ruler.

Students build skill in measuring using centimeter rulers and meter sticks in Topic B. They learn to see that a length unit is not a cube, or a portion of a ruler (which has width), but is a segment of a line. By measuring a variety of objects, students build a bank of known measurements or benchmark lengths, such as a doorknob being a meter from the floor, or the width of a finger being a centimeter. Then, students learn to estimate length using knowledge of previously measured objects and benchmarks. This enables students to internalize the mental rulers of a centimeter or meter, empowering them to mentally iterate units relevant to measuring a given length (**2.9E**). The knowledge and experience signal that students are determining which tool is appropriate to make certain measurements (**2.9A, 2.9D**).

In Topic C, students measure and compare to determine how much longer one object is than another (**2.9A**). They also measure objects twice using different length units, both standard and non-standard, thereby developing their understanding of how the total measurement relates to the size of the length unit (**2.9B**). Repeated experience and explicit comparisons help students recognize that the smaller the length unit, the larger the number of units, and the larger the length unit, the smaller the number of units.

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The module culminates as students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies, such as the ruler as a number line, benchmarks for estimation, and strip diagrams for comparison, to solve word problems (**2.2E, 2.2F, 2.9C, 2.9E**). The problems progress from concrete (i.e., measuring objects and using the ruler as a number line to add and subtract) to abstract (e.g., representing lengths with strip diagrams to solve *start unknown* and two-step problems).

Notes on Pacing for Differentiation

If pacing is a challenge, consider the following modifications and omissions. If students show conceptual understanding of iterated length units in Lesson 1, consider consolidating Lessons 2 and 3. If consolidated, students can apply the "mark and move forward" strategy to making a ruler.

Consider consolidating Lesson 4, which provides practice measuring the lengths of various objects using rulers and meter sticks, with Lesson 5, if a chart of benchmarks is created while measuring. Lesson 8 could be omitted unless students demonstrate a need to use the number line to solve addition and subtraction problems.

Focus Grade Level Standards

Number and Operations

The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

2.2E	locate the position of a given whole number on an open number line;
2.2F	name the whole number that corresponds to a specific point on a number line.

Geometry and Measurement

The student applies mathematical process standards to select and use units to describe length, area, and time.[1] The student is expected to:

2.9A	find the length of objects using concrete models for standard units of length;
2.9B	describe the inverse relationship between the size of the unit and the number of units needed to equal the length of an object;
2.9C	represent whole numbers as distances from any given location on a number line;
2.9D	determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes;
2.9E	determine a solution to a problem involving length, including estimating lengths.

Foundational Standards

The student is expected to:

1.7A	use measuring tools to measure the length of objects to reinforce the continuous nature of linear measurement;
1.7B	illustrate that the length of an object is the number of same-size units of length that, when laid end-to-end with no gaps or overlaps, reach from one end of the object to the other;
1.7D	describe a length to the nearest whole unit using a number and a unit.

Focus Mathematical Process Standards

Mathematical Process Standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(C)	select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
(E)	create and use representations to organize, record, and communicate mathematical ideas;
(F)	analyze mathematical relationships to connect and communicate mathematical ideas;
(G)	display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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[1]Focus is on metric measurement in preparation for place value in Module 3. Customary measurement is addressed in Module 7.

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Overview of Module Topics and Lesson Objectives

TEKS	ELPS		Topics and Objectives	Days
2.9A **2.9D**	1.C 1.E 2.E 2.I 3.E 3.F 4.G 5.B	A	**Understand Concepts About the Ruler** Lesson 1: Connect measurement with physical units by using multiple copies of the same physical unit to measure. Lesson 2: Use iteration with one physical unit to measure. Lesson 3: Apply concepts to create unit rulers and measure lengths using unit rulers.	3
2.9A **2.9D** **2.9E**	1.C 2.E 2.I 3.D 3.E 4.G 5.B	B	**Measure and Estimate Length Using Different Measurement Tools** Lesson 4: Measure various objects using centimeter rulers and meter sticks. Lesson 5: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks.	2
2.9A **2.9B** **2.9D**	1.C 2.E 2.I 3.E 3.H 4.G 5.B	C	**Measure and Compare Lengths Using Different Length Units** Lesson 6: Measure and compare lengths using centimeters and meters. Lesson 7: Measure and compare lengths using standard metric length units and non-standard length units; relate measurement to unit size.	2
2.2E **2.2F** **2.9C** **2.9E** 2.9A 2.9D	1.C 1.F 2.C 2.G 2.I 3.C 3.E 4.G 5.B	D	**Relate Addition and Subtraction to Length** Lesson 8: Solve addition and subtraction word problems using the ruler as a number line. Lesson 9: Measure lengths of string using measurement tools, and use strip diagrams to represent and compare the lengths. Lesson 10: Apply conceptual understanding of measurement by solving two-step word problems.	3
			End-of-Module Assessment: Topics A–D (assessment ½ day, return ½ day, remediation or further applications 1 day)	2
Total Number of Instructional Days				**12**

Terminology

New or Recently Introduced Terms

- Benchmark (e.g., "round" numbers like multiples of 10)
- Endpoint (point where something begins or ends)
- Estimate (an approximation of a quantity or number)
- Hash mark (marks on a ruler or other measurement tool)
- Meter (standard unit of length in the metric system)
- Meter stick or strip (tool used to measure length)
- Number line
- Overlap (extend over, or cover partly)
- Ruler (tool used to measure length)
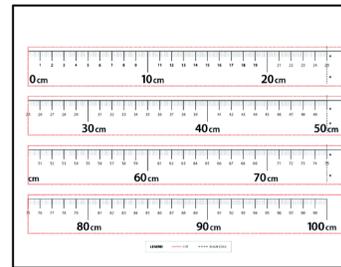
Meter Strip
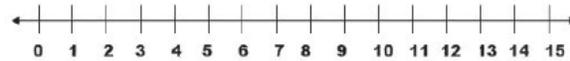
Familiar Terms and Symbols[2]

- Centimeter (standard length unit within the metric system)
- Combine (join or put together)
- Compare (specifically using direct comparison)
- Difference (to find the difference between two numbers, subtract the smaller number from the greater number)
- Height (vertical distance measurement from bottom to top)
- Length (distance measurement from end to end; in a rectangular shape, length can be used to describe any of the four sides)
- Length unit (e.g., centimeters, inches)

Number Line

Suggested Tools and Representations

- Centimeter cubes
- Centimeter rulers
- Large and small paper clips
- Meter sticks
- Paper meter strips (Lesson 6 Template)
- Personal white boards
- Strip diagram

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[2]These are terms and symbols students have used or seen previously.

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Scaffolds

The scaffolds integrated into *A Story of Units*® give alternatives for how students access information as well as express and demonstrate their learning. Strategically placed margin notes are provided within each lesson elaborating on the use of specific scaffolds at applicable times. They address many needs presented by English language learners, students with disabilities, students performing above grade level, and students performing below grade level. Many of the suggestions are organized by Universal Design for Learning (UDL) principles and are applicable to more than one population. To read more about the approach to differentiated instruction in *A Story of Units*, please refer to "How to Implement *A Story of Units*."

Assessment Summary

Type	Administered	Format	Standards Addressed
End-of-Module Assessment Task	After Topic D	Constructed response with rubric	2.2E 2.2F 2.9A 2.9B 2.9C 2.9D 2.9E