

Mathematics!



A Story of Units! **Parent Handbook**

Grade 2
Module 2

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 will be introduced in Module 7.

Topic A opens with students exploring concepts about the centimeter ruler. In the first lesson, they are guided to connect measurement with physical units as they find the total number of unit lengths by laying multiple copies of centimeter cubes (physical units) end-to-end along various objects. Through this, the students discover that to get an accurate measurement, there must not be any gaps or overlaps between consecutive length units.

Next, students measure by iterating with one physical unit, using the mark and advance technique. In the following lesson, students 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, 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 one 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 rulers¹ of a centimeter or meter, which empowers them to mentally iterate units relevant to measuring a given length. The knowledge and experience signal that students are determining which tool is appropriate to make certain measurements.

In Topic C, students measure and compare to determine how much longer one object is than another. They also measure objects twice using different length units, both standard and nonstandard, thereby developing their understanding of how the total measurement relates to the size of the length unit. Repeated experience and explicit comparisons will 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.

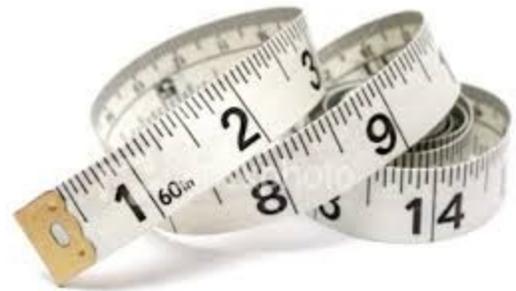
The module culminates as students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies, such as the ruler as a number line, benchmarks for estimation, and tape diagrams for comparison, to solve word problems. The problems progress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

The end-of-module assessment follows Topic D.

Terminology

New or Recently Introduced Terms

- Endpoint (where something ends, where measurement begins)
- Overlap (extend over, or cover partly)
- Ruler
- Centimeter (cm, unit of length measure)
- Meter
- Meter strip (pictured to the right)
- Meter stick
- Hash mark (the marks on a ruler or other measurement tool)
- Number line (a line marked at evenly spaced intervals)
- Estimate (an approximation of the value of a quantity or number)
- Benchmark (e.g., “round” numbers like multiples of 10)



Familiar Terms and Symbols

- Length
- Height
- Length Unit
- Combine
- Compare
- Difference
- Tape Diagram

Lesson 1

Objective: Connect measurement with physical units by using multiple copies of the same physical unit to measure.

4. The length of the picture of the shovel is about 9 centimeters.



5. The head of a grasshopper is 2 centimeters long. The rest of the grasshopper body is 7 centimeters long. What is the total length of the grasshopper?

$$2 + 7 = 9 \text{ cm}$$

6. The length of a screwdriver is 19 centimeters. The handle is 5 centimeters long.
- a. What is the length of the top of the screwdriver?

$$19 - 5 = 14 \text{ cm}$$

- b. How much shorter is the handle than the top of the screwdriver?

$$14 - 5 = 9 \text{ cm}$$

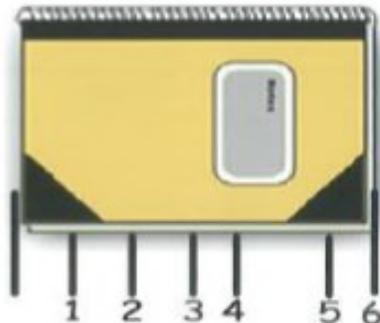
Lesson 2

Objective: Use iteration with one physical unit to measure.

4. Jayla measured her puppet's legs to be 23 centimeters long. The stomach was 7 centimeters long and the neck and head together were 10 centimeters long. What was the total length of the puppet?

$$23 + 7 + 10$$
$$30 + 10 = 40 \text{ cm}$$

5. Elijah begins measuring his math book with his centimeter cube. He marks off where each cube ends. After a few times, he decides this process is taking too long and starts to guess where the cube would end and then marks it.



Explain why Elijah's answer will be incorrect.

The spaces between the lines are not the same so you can't use it to measure.

Lesson 3

Objective: Apply concepts to create unit rulers and measure lengths using unit rulers.

a. Which side is the shortest? Side A Side B Side C

b. What is the length of Sides A and B together? 8 centimeters.
 $3 + 5 = 8$

c. How much shorter is Side C than Side B? 1 centimeters.
 $5 - 4 = 1$

Lesson 4

Objective: Measure various objects using centimeter rulers and meter sticks.

1. Measure 5 things in the classroom with a centimeter ruler. List the five things and their length in centimeters.

Object Name	Length in centimeters
a. Book	27 cm
b. Post-it	8 cm
c. Crayon	9 cm
d. Eraser	5 cm
e. Pencil sharpener	3 cm

2. Measure 4 things in the classroom with a meter stick or meter tape. List the four things and their length in meters.

Object Name	Length in meters
a. door width	1 m
b. rug	2 m
c. teachers desk	1 m
d. Book case	2 m

3. List 5 things in your house that you would measure with a meter stick or meter tape.

1. rug
2. table
3. stove
4. bed
5. door

Why would you want to measure these five items with a meter stick or meter tape instead of a centimeter ruler?

They are big. It would take too long to measure with centimeters

4. The distance from the cafeteria to the gym is 14 meters. The distance from the cafeteria to the playground is double the distance. How many times would you need to use a meter stick to measure the distance from the cafeteria to the playground?

$14 + 14 = 28$

Lesson 5

Objective: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks.

5.

- a) Estimate: 5 cm
b) Actual length: 5 cm

6. Circle the correct unit of measurement for each estimation.

- a) The height of a door is about 2 (centimeters/meters) tall.
What benchmark did you use to estimate? meter stick
- b) The length of a pen is about 10 (centimeters/meters) long.
What benchmark did you use to estimate? pencil
- c) The length of a car is about 4 (centimeters/meters) long.
What benchmark did you use to estimate? meter stick

Lesson 6

Objective: Measure and compare lengths using centimeters and meters.

4. Daniel measured the heights of some young trees in the orchard. He is trying to find out how many more centimeters are needed to have a height of 1 meter?

$$90 \text{ cm} + \underline{10} \text{ cm} = 1 \text{ m}$$

$$80 \text{ cm} + \underline{20} \text{ cm} = 1 \text{ m}$$

$$85 \text{ cm} + \underline{15} \text{ cm} = 1 \text{ m}$$

$$81 \text{ cm} + \underline{19} \text{ cm} = 1 \text{ m}$$

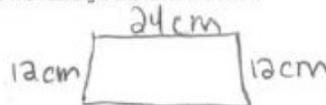
5. Carol's ribbon is 76 centimeters long. Alice's ribbon is 1 meter long. How much larger is Alice's ribbon than Carol's?

$$100 - 76 = 24 \text{ cm}$$

6. The cricket hopped a distance of 52 centimeters. The grasshopper hopped 19 centimeters farther than the cricket. How far did the grasshopper jump?

$$52 + 19 = 71 \text{ cm}$$

7. The pencil box is 24 centimeters in length and 12 centimeters wide. How many more centimeters is the length than the width? 12 more cm. Draw the rectangle and label the sides.



What is the total length of all four sides? 72 cm.

Lesson 7

Objective: Measure and compare lengths using standard metric length units and non-standard lengths units; relate measurement to unit size.

4. Draw a line that is 8 cm long and another line below it that is 20 cm long. Label the 8 cm line C and the 20 cm line D.

Line C is 3 paper clips long.
 Line D is 7 paper clips long.
 Line D is 12 cm longer than line C.
 Line C is 4 paper clips shorter than line D.
 Lines C and D are 10 paper clips long.
 Lines C and D are 28 centimeters long.

5. Christina measured line F with quarters and line G with pennies.



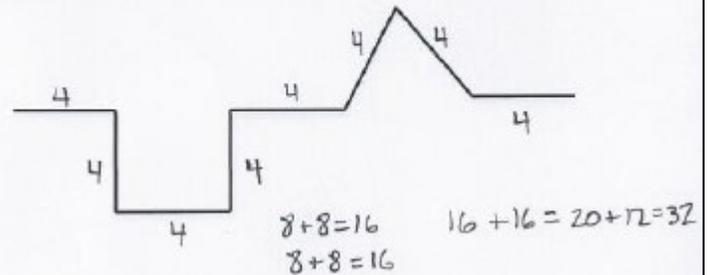
Line F measured the length of about 6 quarters.
 Line G measured the length of about 8 pennies.
 Christina said line G is longer because 8 is a bigger number than 6.
 Explain why Christina is incorrect.

Christina is wrong because pennies are a lot smaller than quarters.

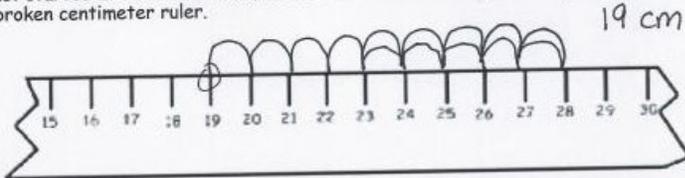
Lesson 8

Objective: Solve addition and subtraction word problems using the ruler as a number line.

4. Each of the parts of the path below is 4 length units. What is the total length of the path? 32 length units.



2. A cricket jumped 5 centimeters forward and 9 centimeters back then stopped. If the cricket started at 23 on the ruler, where did the cricket stop? Show your work on the broken centimeter ruler.



3. Marty made a train of red and yellow centimeter cubes that measured 16 centimeters in length. He added 11 more yellow cubes and removed 8 red cubes. What is the length of the train now?

$$\begin{array}{r} 16 \\ + 11 \\ \hline 27 \end{array}$$

$$\begin{array}{r} 27 - 8 = 19 \text{ cm} \\ 1 \\ 17 \ 10 \\ 17 + 2 = 19 \end{array}$$