

*Parent Packet*

HAUPPAUGE MATH

DEPARTMENT

CCLS

Grade 2

MODULE 2

<http://www.hauppauge.k12.ny.us/math>

# **Grade 2 Module 2**

## **Addition and Subtraction of Length Units**

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**

### **Understand Concepts About the Ruler**

Topic A begins with students exploring concepts about the ruler. In Lesson 1, they relate length to physical units, by measuring various objects with multiple centimeter cubes. Students create a mental benchmark for the centimeter. In Lesson 2, they apply their knowledge of using centimeter cubes to measure by moving from repeated physical units to iteration of one physical unit. This enables them to internalize their understanding of a length unit as the amount of space between one end of the cube to the other (or space between hash marks). Thus, they begin moving from the concrete to the conceptual. Finally, in Lesson 3, they apply knowledge of known measurements to create unit rulers using one centimeter cube. This deepens the understanding of distance on a ruler and the ruler as a number line.

## **Topic B**

### **Measure and Estimate Length Using Different Measurement Tools**

In Topic B, Lesson 4, students begin using centimeter rulers, meter sticks, and meter tapes to measure various objects. Through the practice of measuring various items and learning mental benchmarks for measurement, students organically develop estimation skills in Lesson 5. They also develop their skills for selecting an appropriate measuring tool by referencing prior knowledge of objects they have already measured, as well as by using mental benchmarks.

## **Topic C**

### **Measure and Compare Lengths Using Different Length Units**

In Topic C, students use different length units to measure and compare lengths. In Lesson 6, they practice applying their knowledge of centimeters and meters to choose an appropriate measurement tool. They discover that there is a relationship between unit size and measurement when they measure one object twice using different length units. They learn that the larger the unit, the fewer number of units in a given measurement. In Lesson 7, students continue to measure and compare lengths using standard and non-standard length units. At this point students are prepared to explicitly compare different nonstandard length units and can make inferences about the relative size of objects.

# **Topic D**

## **Relate Addition and Subtraction to Length**

In Topic D, students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies (e.g., the ruler as a number line, benchmarks for estimation, tape diagrams for comparison) to solve word problems (2.MD.5, 2.MD.6). In Topic A, students had their first experience creating and using a ruler as a number line. Now, students solve addition and subtraction word problems using the ruler as a number line. This concept is reinforced and practiced throughout the module in the fluency activities that involve using the meter strip for counting on and counting back, and is incorporated into the accompanying Problem Sets. Students then progress in the second lesson from concrete to abstract by creating tape diagrams to represent and compare lengths. The third lesson culminates with students solving two-step word problems involving measurement using like units.

## 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 rulers<sup>1</sup> 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.

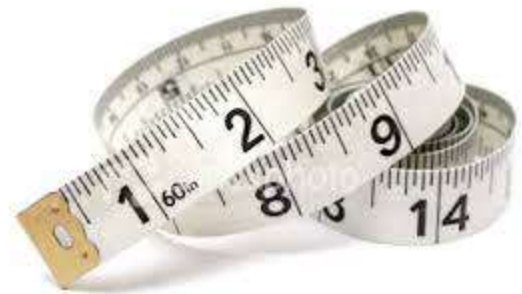
The module culminates as students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies, such as the ruler as a number line, benchmarks for estimation, and tape diagrams for comparison, to solve word problems. The problems progress 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?

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

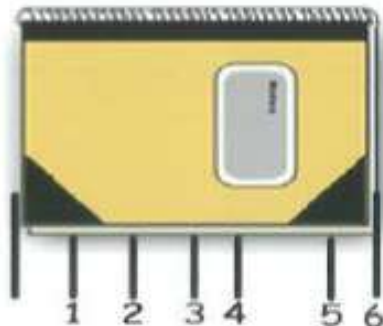
## Lesson 2

Objective: Use iteration with one physical unit to measure.

4. Joyla 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. Bookcase	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?

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

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

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

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

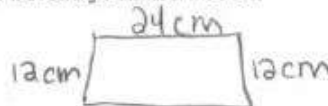
5. Carol's ribbon is 76 centimeters long. Alice's ribbon is 1 meter long. How much longer is Alice's ribbon than Carol's?

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

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.



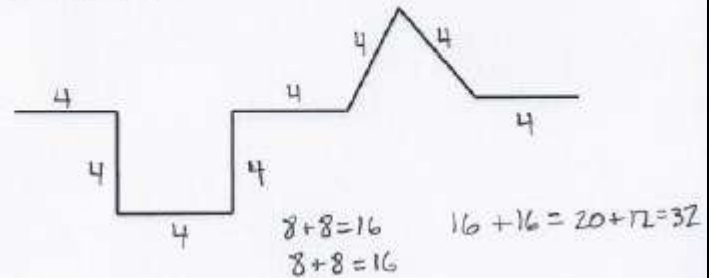
Line F measured the length of about 6 quarters.  
 Line G measured the length of about 8 pennies.  
 Christina said line G is longer because 8 is a bigger number than 6.  
 Explain why Christina is incorrect.

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

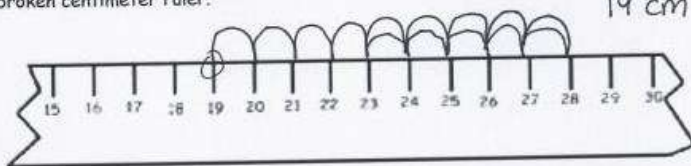
## Lesson 8

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?

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

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

## **Technology Resources**

[www.k-5mathteachingresources.com](http://www.k-5mathteachingresources.com) -This site provides an extensive collection of free resources, math games, and hands-on math activities aligned with the Common Core State Standards for Mathematics.

[www.parccgames.com](http://www.parccgames.com) – fun games to help kids master the common core standards.

<http://www.mathplayground.com> –common core educational math games and videos.

[www.learnzillion.com](http://www.learnzillion.com) – math video tutorials.

[www.ixl.com](http://www.ixl.com) – practice common core interactive math skills practice.

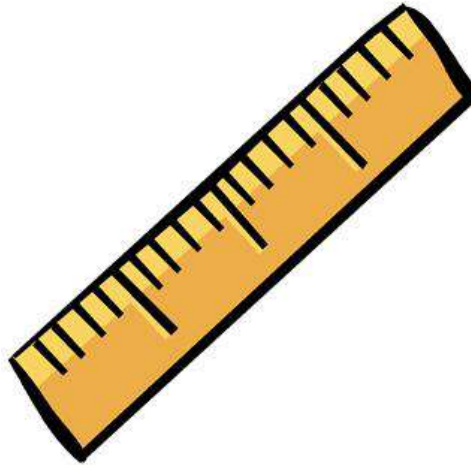
[www.mathnook.com](http://www.mathnook.com) –common core interactive math skill practice/ games, worksheets and tutorials.

[www.adaptedmind.com](http://www.adaptedmind.com) – common core interactive practice, video lessons and worksheets

[www.brainpop.com](http://www.brainpop.com) – animated tutorials of curriculum content that engages students. Can use a limited free version or buy a subscription.

### Addition and Subtraction of Length Units

In this module, we will be exploring the ruler, estimating and measuring lengths using various tools and units, and finally, relating addition and subtraction to length.



### Key Words to Know

**Endpoint:** Where something ends, where measurement begins

**Hash mark:** The marks on a ruler or other measurement tool

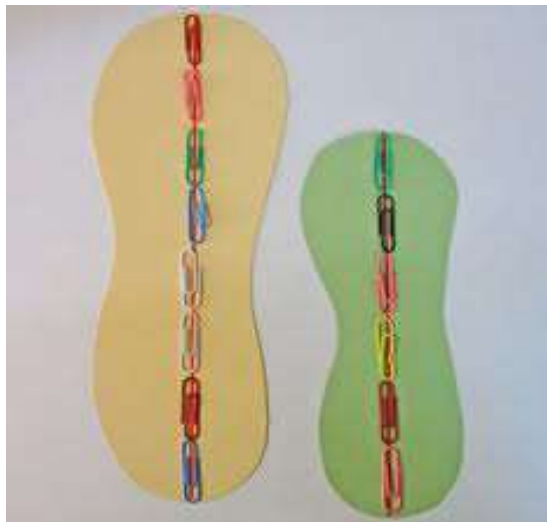
**Number Line:** A line marked at evenly spaced intervals

**Estimate:** An approximation of the value of a quantity or number

**Tape Diagram:** See back of this sheet!

### Common Words:

Length  
Combine  
Difference  
Meter  
Height  
Compare  
Centimeter



**What Came Before this Module:** We practiced making sums and differences to the number 20

**What Comes After this Module:** We will begin work with the base-10 place value system

### + How you can help at home:

- Ask questions that encourage your student to estimate lengths of household items
- Continue to review adding and subtracting up to 20
- Practice measuring lengths longer than a ruler by marking and measuring from a mark

## Key Common Core Standards:

### • **Relate addition and subtraction to length**

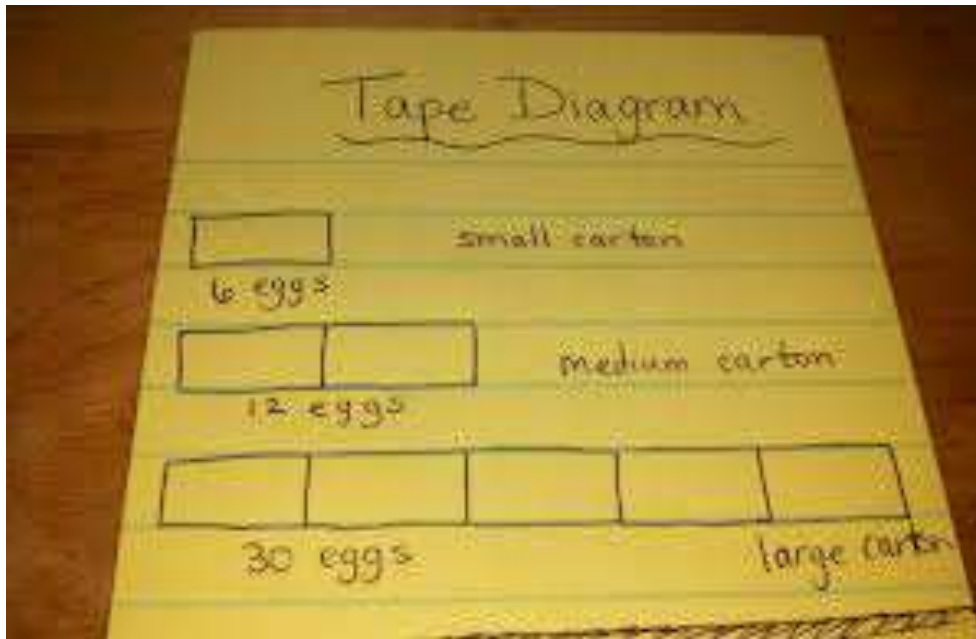
Examples:

- Line A is 4 cm long, and Line B is 7 cm long. Together, Lines A and B measure \_\_\_\_\_ cm.
- In the example above, how much shorter is Line A than Line B?

### • **Measure and estimate lengths in standard and non-standard units**

Examples:

- How many centimeter cubes long is my pencil?
- How many Lego-pieces long is this bracelet?



Spotlight on Math Models:

## Tape Diagram

You will often see this mathematical representation in *A Story of Units*.

*A Story of Units* has several key mathematical “models” that will be used throughout a student’s elementary years.

The tape diagram is a powerful model that students can use to solve various kinds of problems. In second grade, you will often see this model as an aid to addition and subtraction problems. Tape diagrams are also called “bar models” and consist of a simple bar drawing that students make and adjust to fit a word problem. They then use the drawing to discuss and solve the problem.

As students move through the grades, tape diagrams provide an essential bridge to algebra. Below is a sample word problem from Module 2 solved using a tape diagram to show the parts of the problem.

Sample Problem from Module 2:  
(Example taken from Module 2, Lesson 7)

Natalia, Chloe, and Lucas are making clay snakes. Natalia’s snake is 16 centimeters. Chloe’s snake is 5 centimeters shorter than Natalia’s. How long is Chloe’s snake?

Lucas’s snake is 3 centimeters longer than Chloe’s snake. Who has the longest snake: Natalia, Lucas, or Chloe?

