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GRADE 2 • MODULE 2

Addition and Subtraction of Length Units

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NOTE: Student sheets should be printed at 100% scale to preserve the intended size of figures for accurate measurements. Adjust your copier or printer settings to *actual size* and set page scaling to *none*.

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 unit lengths 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.MD.1**), 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 rulers¹ of a centimeter or meter, empowering them to mentally iterate units relevant to measuring a given length (**2.MD.3**). The knowledge and experience signal that students are determining which tool is appropriate to make certain measurements (**2.MD.1**).

In Topic C, students measure and compare to determine how much longer one object is than another (**2.MD.4**). 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.MD.2**). 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.

¹ See the Progression Document “Geometric Measurement,” page 14.

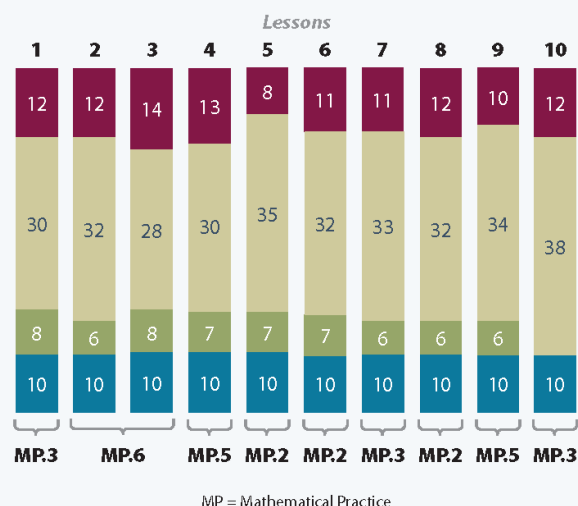
The module culminates as students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies, such as the ruler as a number line, benchmarks for estimation, and tape diagrams for comparison, to solve word problems (**2.MD.5**, **2.MD.6**). 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).



Distribution of Instructional Minutes

This diagram represents a suggested distribution of instructional minutes based on the emphasis of particular lesson components in different lessons throughout the module.

- **Fluency Practice**
- **Concept Development**
- **Application Problems**
- **Student Debrief**



Focus Grade Level Standards

Measure and estimate lengths in standard units.²

- 2.MD.1** Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
- 2.MD.2** Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
- 2.MD.3** Estimate lengths using units of inches, feet, centimeters, and meters.
- 2.MD.4** Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Relate addition and subtraction to length.

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

- 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.

Foundational Standards

- 1.MD.1** Order three objects by length; compare the lengths of two objects indirectly by using a third object.
- 1.MD.2** Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

Focus Standards for Mathematical Practice

- MP.2 Reason abstractly and quantitatively.** Students reason quantitatively when they measure and compare lengths. They reason abstractly when they use estimation strategies such as benchmarks and mental rulers and when they relate number line diagrams to measurement models.
- MP.3 Construct viable arguments and critique the reasoning of others.** Students reason to solve word problems involving length measurement using tape diagrams and analyze the reasonableness of the work of their peers.
- MP.5 Use appropriate tools strategically.** Students consider the object being measured and choose the appropriate measurement tool. They use the tape diagram as a tool to solve word problems.
- MP.6 Attend to precision.** Students accurately measure by laying physical units end-to-end with no gaps and by using a measurement tool. They correctly align the zero-point on a ruler as the beginning of the total length. They attend to precision when they verbally and in writing specify the length unit, when they use a ruler to measure or draw a straight line of a given length, and when they verify estimates by measuring.

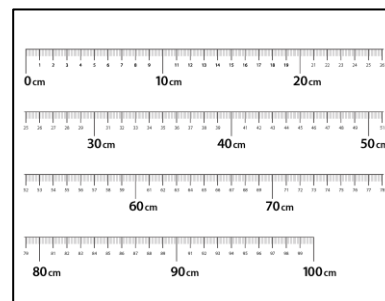
Overview of Module Topics and Lesson Objectives

Standards	Topics and Objectives	Days
2.MD.1	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.MD.1 2.MD.3	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.MD.1 2.MD.2 2.MD.4	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.MD.5 2.MD.6 2.MD.1 2.MD.3 2.MD.4	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 tape 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

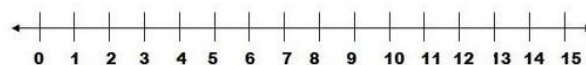
Terminology

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



Number Line

Familiar Terms and Symbols³

- 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)

Suggested Tools and Representations

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

³ These are terms and symbols students have used or seen previously.

Scaffolds⁴

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.MD.1 2.MD.2 2.MD.3 2.MD.4 2.MD.5 2.MD.6

⁴ Students with disabilities may require Braille, large print, audio, or special digital files. Please visit the website, www.p12.nysed.gov/specialed/aim, for specific information on how to obtain student materials that satisfy the National Instructional Materials Accessibility Standard (NIMAS) format.



Topic A

Understand Concepts About the Ruler

2.MD.1

Focus Standard:	2.MD.1	Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
Instructional Days:	3	
Coherence		
-Links from:	G1–M3	Ordering and Comparing Length Measurements as Numbers
-Links to:	G3–M4	Multiplication and Area

Topic A begins with an exploration of concepts about the ruler. In Lesson 1, students relate length to physical units by measuring various objects with multiple centimeter cubes, creating 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 the 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, students 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.

A Teaching Sequence Towards Mastery of Understanding Concepts About the Ruler

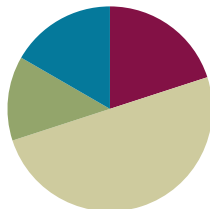
- Objective 1:** Connect measurement with physical units by using multiple copies of the same physical unit to measure.
(Lesson 1)
- Objective 2:** Use iteration with one physical unit to measure.
(Lesson 2)
- Objective 3:** Apply concepts to create unit rulers and measure lengths using unit rules.
(Lesson 3)

Lesson 1

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

Suggested Lesson Structure

■ Fluency Practice	(12 minutes)
■ Application Problem	(8 minutes)
■ Concept Development	(30 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (12 minutes)

- Happy Counting 20–40 **2.NBT.2** (2 minutes)
- Two More **2.OA.2** (1 minute)
- Sprint: Before, Between, After **2.NBT.2** (9 minutes)

Happy Counting 20–40 (2 minutes)

Note: Counting helps students prepare for counting centimeter cubes in the lesson.

- T: Let's count by ones, starting at 20. Ready? (Rhythmically point up until a change is desired. Show a closed hand, then point down. Continue, mixing it up.)
- S: 20, 21, 22, 23. (Switch direction.) 22, 21, 20. (Switch direction.) 21, 22, 23, 24, 25. (Switch direction.) 24, 23, 22, 21, 20. (Switch direction.) 21, 22, 23, 24, 25, 26, 27, 28, 29, 30. (Switch direction.) 29, 28, 27. (Switch direction.) 28, 29, 30, 31, 32. (Switch direction.) 31, 30, 29, 28. (Switch direction.) 29, 30, 31, 32, 33, 34. (Switch direction.) 33, 32, 31, 30, 29. (Switch direction.) 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.
- T: Excellent! Try it for 30 seconds with your partner starting at 28. Partner A, you are the teacher today.

Two More (1 minute)

Note: Students practice adding two more to make a ten, which builds fluency when crossing a ten.

- T: For every number I say, you will say the number that is 2 more. If I say 2, you would say 4. Ready? 3.
- S: 5.

Continue with the following possible sequences: 6, 8, 9, 18, 38, 58, 78, 79, 19, 29, and 39.

Sprint: Before, Between, After (9 minutes)

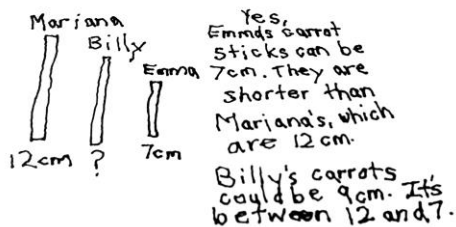
Materials: (S) Before, Between, After Sprint

Note: Students identify the missing number in a pattern to build fluency counting up and back.

Application Problem (8 minutes)

At the lunch table, Mariana, Billy, and Emma are eating carrot sticks. Billy's carrot sticks are longer than Emma's, and Mariana's carrot sticks are longer than Billy's. If Mariana's carrot sticks are 12 centimeters long, is it possible that Emma's carrot sticks are 7 centimeters long? Draw a picture and use words to explain your thinking.

Extension: What is one possible length for Billy's carrot sticks?

**NOTES ON
MULTIPLE MEANS
OF ENGAGEMENT:**

Some students may struggle to comprehend the transitive property. Divide the problem into small workable chunks so students can read and draw one step at a time.

For example:

T: Billy's carrot sticks are longer than Emma's.

S: (Draw 2 carrot sticks and label them.)

T: Mariana's carrot sticks are longer than Billy's.

S: (Draw a third carrot stick and label it, etc.)

Note: In Grade 1, students spent time comparing the lengths of two objects indirectly by using a third object (**1.MD.1**). In this problem, students practice working with the transitive property using comparative language. While the teacher circulates and provides support, students use personal white boards to draw a picture and compare with a partner before participating in a whole class discussion. The teacher may wish to segue into today's lesson by asking students if they could measure the carrot sticks with a small paper clip.

Concept Development (30 minutes)

Materials: (T) 2–3 crayons of varying lengths (S) Per pair: baggie with 30 or more centimeter cubes, baggie of used crayons; 2 pencil boxes

- T: (Call students to sit in a circle on the carpet.) I was looking at my pencil box this morning, and I was very curious about how long it might be. I also have this handful of centimeter cubes and I thought I might be able to measure the length of my pencil box with these cubes. Does anyone have an idea about how I might do that?
- S: You could put the cubes in a line along the pencil box and count how many!
- T: Does anyone want to guess, or **estimate**, about how many centimeter cubes long it will be?
- S: (Make estimates.)

- T: Let's see how many centimeter cubes we can line up along the length of the pencil box. (Place cubes along the length of the first pencil box with random spaces in between each cube.)
- T: OK. Should I go ahead and count my cubes now?
- S: No!
- T: Why not?
- S: You need to put the cubes right next to each other. → You need to start measuring at the beginning of the pencil box.
- T: You are right! There should be no gaps between the cubes. Also, we need to begin measuring where the object begins. That's called the **endpoint**.
- T: Come show me how you would place the cubes to measure this second pencil box. (Student volunteer lays the cubes along the length of the second pencil box starting at the beginning with no spaces between each cube. Demonstrate in center of circle so students can see alignment.)
- T: Let's count the cubes my way and your way. (Count the cubes chorally with the students, and write both measurements on the board.)
- T: Turn to your neighbor and tell them why there is a difference between my number of cubes and your number of cubes.
- S: You had fewer cubes because there were some empty spaces. → If you push all the cubes together, you have a lot of extra space not measured. → You didn't start at the endpoint.
- T: Let's look at a set of used crayons. Each crayon will be a different length, and some may not be an exact measurement.
- T: (Hold up a crayon with a measurement that will be rounded up.)
- T: Notice that this crayon is almost 8 centimeter cubes long. It is more than 7 and one-half cubes but not quite 8. I can say this crayon is about 8 centimeter cubes long.
- T: (Hold up a crayon with a measurement that will be rounded down.)
- T: Notice that this crayon is close to 6 centimeter cubes long. It is just a little bit longer than 6 cubes and not half way to 7 cubes. How long would you say this crayon is?
- S: About 6 centimeter cubes.
- T: Yes, and we can simply say the crayon is about 6 centimeters.
- T: You will now work with a partner to measure a set of used crayons. As you measure, be sure to use the word *about* to describe a measurement that is not exact. Turn to your neighbor and estimate how many centimeter cubes you think you will need for each crayon in the baggie. (Alternative items to measure are scissors, each other's pencils, and erasers.)
- S: (Share estimates with their partner, and then begin measuring their crayons.)
- T: Let's practice some more measuring on our Problem Set.



NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Post conversation starters during think-pair-share while measuring with cubes:

- Your solution is different from mine because....
- Your error was....
- My strategy was to....

These sentence starters will also be useful in the Student Debrief.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. Some problems do not specify a method for solving. This is an intentional reduction of scaffolding that invokes MP.5, Use Appropriate Tools Strategically. Students should solve these problems using the RDW approach used for Application Problems.

For some classes, it may be appropriate to modify the assignment by specifying which problems students should work on first. With this option, let the careful sequencing of the Problem Set guide your selections so that problems continue to be scaffolded. Balance word problems with other problem types to ensure a range of practice. Assign incomplete problems for homework or at another time during the day.

Student Debrief (10 minutes)

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

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

MP.3


- Turn to your partner and compare your answers to Problems 1–4. Explain what you had to do to measure correctly.
- Did anyone find, when sharing your work, that you had a different measurement than your? (Students will share that they may have not lined up the object with the edge of the first centimeter cube, or that they left spaces

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 1 Problem Set 2•2


Name Lauren Date _____

Use centimeter cubes to find the length of each object.


1. The picture of the fork and spoon is about 6 centimeter cubes long.



2. The picture of the hammer is about 5 centimeters long.




3. The length of the picture of the comb is about 7 centimeters.



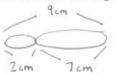
COMMON CORE Lesson 1: Connect measurement with physical units by using multiple copies of the same physical unit to measure. Date: 5/2/14 engage^{ny} 2.A.9

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 1 Problem Set 2•2

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's body is 7 centimeters long. What is the total length of the grasshopper?

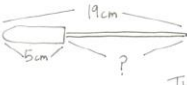


$2 + 7 = 9$

The total length of the grasshopper is 9 cm.

6. The length of a screwdriver is 19 centimeters. The handle is 5 centimeters long.

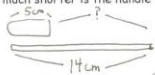
a. What is the length of the top of the screwdriver?



$5 + 14 = 19$

The top of the screwdriver is 14 cm.

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



$14 - 5 = 9$

The handle is 9 cm shorter than the top.

COMMON CORE Lesson 1: Connect measurement with physical units by using multiple copies of the same physical unit to measure. Date: 5/2/14 engage^{ny} 2.A.10

between cubes. This is an excellent opportunity to discuss **endpoint**.)

- How did your drawings help you to answer Problems 5 and 6? What new (or significant) vocabulary did we use today to talk about measurement? (Length, **estimate**, and longer.)
- What did you learn about how to measure with centimeter cubes? Could you have measured with a pocketful of coins?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

Note: Discuss Homework Problems 3 and 4 during the next day's lesson to point out that students should not count the extra cubes.

A

Correct _____

Add or subtract.

1	1, 2, ____		23	99, ____, 101	
2	11, 12, ____		24	19, 20, ____	
3	21, 22, ____		25	119, 120, ____	
4	71, 72, ____		26	35, ____, 37	
5	3, 4, ____		27	135, ____, 137	
6	3, ____, 5		28	____, 24, 25	
7	13, ____, 15		29	____, 124, 125	
8	23, ____, 25		30	142, 143, ____	
9	83, ____, 85		31	138, ____, 140	
10	7, 8, ____		32	____, 149, 150	
11	7, ____, 9		33	148, ____, 150	
12	____, 8, 9		34	____, 149, 150	
13	____, 18, 19		35	____, 163, 164	
14	____, 28, 29		36	187, ____, 189	
15	____, 58, 59		37	____, 170, 171	
16	12, 13, ____		38	178, 179, ____	
17	45, 46, ____		39	192, ____, 194	
18	12, ____, 14		40	____, 190, 191	
19	36, ____, 38		41	197, ____, 199	
20	____, 19, 20		42	168, 169, ____	
21	____, 89, 90		43	199, ____, 201	
22	98, 99, ____		44	____, 160, 161	

B

Improvement _____ # Correct _____

Add or subtract.

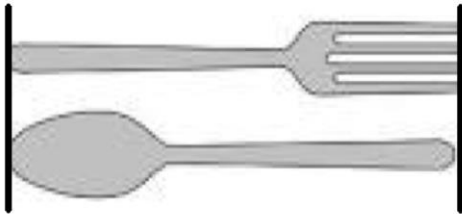
1	0, 1, ____		23	99, ____, 101	
2	10, 11, ____		24	29, 30, ____	
3	20, 21, ____		25	129, 130, ____	
4	70, 71, ____		26	34, ____, 36	
5	2, 3, ____		27	134, ____, 136	
6	2, ____, 4		28	____, 23, 24	
7	12, ____, 14		29	____, 123, 124	
8	22, ____, 24		30	141, 142, ____	
9	82, ____, 84		31	128, ____, 130	
10	6, 7, ____		32	____, 149, 150	
11	6, ____, 8		33	148, ____, 150	
12	____, 7, 8		34	____, 149, 150	
13	____, 17, 18		35	____, 173, 174	
14	____, 27, 28		36	167, ____, 169	
15	____, 57, 58		37	____, 160, 161	
16	11, 12, ____		38	188, 189, ____	
17	44, 45, ____		39	193, ____, 195	
18	11, ____, 13		40	____, 170, 171	
19	35, ____, 37		41	196, ____, 198	
20	____, 19, 20		42	178, 179, ____	
21	____, 79, 80		43	199, ____, 201	
22	98, 99, ____		44	____, 180, 181	

Name _____

Date _____

Use centimeter cubes to find the length of each object.

1. The picture of the fork and spoon is about _____ centimeter cubes long.



2. The picture of the hammer is about _____ centimeters long.



3. The length of the picture of the comb is about _____ centimeters..



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



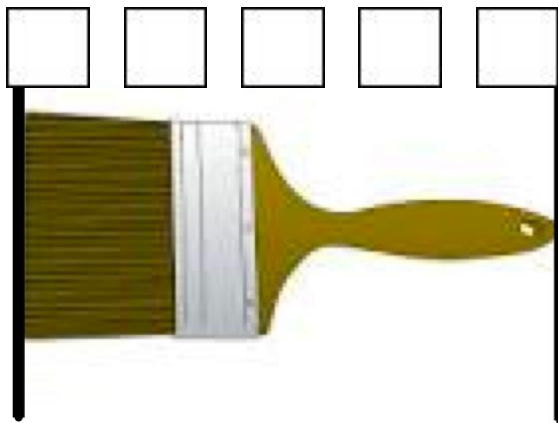
5. The head of a grasshopper is 2 centimeters long. The rest of the grasshopper's body is 7 centimeters long. What is the total length of the grasshopper?
6. The length of a screwdriver is 19 centimeters. The handle is 5 centimeters long.
- What is the length of the top of the screwdriver?
 - How much shorter is the handle than the top of the screwdriver?

Name _____

Date _____

Sara lined up her centimeter cubes to find the length of the picture of the paintbrush.

Sarah thinks the picture of the paintbrush is 5 centimeter cubes long.



Is her answer correct? Explain why or why not.

Name _____

Date _____

Count each centimeter cube to find the length of each object.



1.

--	--	--	--

The crayon is _____ centimeter cubes long.



2.

--	--	--	--	--

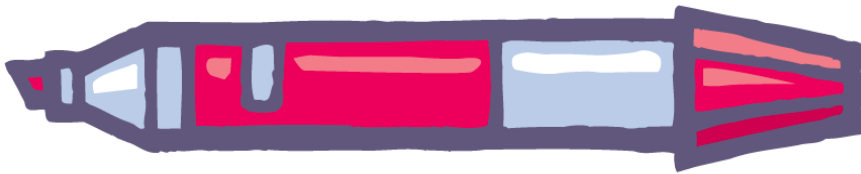
The pencil is _____ centimeters long.



3.

--	--	--	--	--

The clothespin is _____ centimeters long.



4.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

The length of the marker is _____ centimeters.

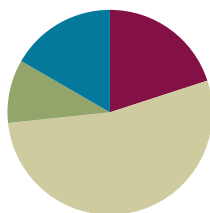
5. Richard has 43 centimeter cubes. Henry has 36 centimeter cubes. What is the length of their cubes altogether?
6. The length of Marisa's loaf of bread is 56 centimeters. She cut off of 32 centimeters of bread. What is the length of what she has left?
7. The length of Jimmy's math book is 17 centimeter cubes. His reading book is 12 centimeter cubes longer. What is the length of his reading book?

Lesson 2

Objective: Use iteration with one physical unit to measure.

Suggested Lesson Structure

■ Fluency Practice	(12 minutes)
■ Application Problem	(6 minutes)
■ Concept Development	(32 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (12 minutes)

- Say Ten Counting **2.NBT.1** (2 minutes)
- Say Ten Counting to the Next Ten **2.NBT.1** (4 minutes)
- Making the Next Ten to Add **2.OA.2** (6 minutes)

Say Ten Counting (2 minutes)

Note: Say Ten Counting reviews skills taught in Module 1 and reinforces using place value concepts to add. Use a Rekenrek to model the first few times to help students with visualization.

- T: Let's count the Say Ten way. When I say 52, you say 5 tens 2. Ready? 67.
- S: 6 tens 7.
- T: 98.
- S: 9 tens 8.
- T: 100.
- S: 10 tens.
- T: 113.
- S: 11 tens 3.

Continue with the following possible sequence: 103, 123, 127, 137, 132, 142, 143, 163, 168, 188, 198, and 200.

Say Ten Counting to the Next Ten (4 minutes)

Note: This activity helps students see the connection between counting the Say Ten way and making a ten. It provides practice adding ones to make a multiple of 10.

- T: Let's add to make the next ten the Say Ten way. I say 5 tens 2, you say 5 tens 2 + 8 = 6 tens. Ready?

6 tens 7.

S: 6 tens 7 + 3 = 7 tens.

T: 5 tens 1.

S: 5 tens 1 + 9 = 6 tens.

T: 7 tens 8.

S: 7 tens 8 + 2 = 8 tens.

Continue with the following possible sequence: 8 tens 4, 8 tens 5, 8 tens 9, 9 tens 6, 9 tens 3, and 9 tens 9.

Making the Next Ten to Add (6 minutes)

Materials: (S) Personal white board

Note: Students make a unit of 10 to add. This foundational fluency is a review of Module 1, Lesson 3.

T: Let's make 10 to add. If I say $9 + 2$, you say $9 + 2 = 10 + 1$. Ready? $9 + 3$.

S: $9 + 3 = 10 + 2$.

T: Answer?

S: 12.

T: $9 + 5$.

S: $9 + 5 = 10 + 4$.

T: Answer?

S: 14.

Post on board:

$$9 + 3 = \underline{\quad}$$

$$9 + 3 = 10 + 2$$

Continue with the following possible sequence: $9 + 7$, $9 + 6$, $9 + 8$, $8 + 3$, $8 + 5$, $7 + 4$, and $7 + 6$.

T: On your personal white board, write at least three other similar examples.

Application Problem (6 minutes)

Kaela is making 4 bracelets, and she wants them to be the same length. She found a jar of square Lego pieces that are all the same size. How can she use these Lego pieces to measure the length of the bracelets? Draw a picture and use words to explain your thinking.

Extension: What could Kaela do if she only had one Lego piece?



Kaela can measure the length of the bracelet by lining up the legos so there are no spaces and counting them.



NOTES ON WHOLE NUMBER MEASUREMENTS:

When stating the measurement, remind students to give the number closest to the end of the object being measured, as taught in Lesson 1. Teach students to use the word *about* to describe their measurements.

Note: This problem reviews the concept of measuring using multiple copies of the same physical unit. The extension sets the stage for today's objective, using iteration with one physical unit to measure. Students can brainstorm their ideas with a partner and create a shared picture and written statement to illustrate their understanding. Then, students return to the carpet with their completed work and explain their reasoning orally.

Concept Development (32 minutes)

Materials: (T/S) Baggie with 1 centimeter cube, 1 long paper clip, 3 linking cubes (joined), 1 crayon, 1 dry erase marker, 1 sticky note, 1 index card, pencil, paper

MP.6

- T: (Call students to the carpet.) Yesterday we measured a pencil box together using many centimeter cubes. Today we will measure some other objects, but this time we will only use one centimeter cube.
- T: Think back to the two different ways we measured the pencil boxes yesterday. What mistake did I make?
- S: You left spaces between the cubes. → You were supposed to put the cubes right next to each other.
- T: Talk with your partner: How could we measure with one cube?
- S: You could put the cube down and then put your finger down to show where it ends. → You could mark the end with a pencil.
- T: (Model measuring the paper clip with one centimeter cube using the mark and move forward technique. Use a document camera or an overhead projector so students can see. If such technology is unavailable, use a thousands block base-ten cube to measure a line drawn on the board to show students the mark and move forward technique.)
- T: Watch my measurement strategy. I make a mark where the cube ends. (Do so.) Then, I move my cube forward so that the mark is right at the beginning of the cube, with no **overlap**. (Do so.) I mark where the cube ends again. Now, talk to your partner about what I'll do next.
- S: Move the cube forward so the new mark is at the beginning of the cube!
- T: What did you notice about how I measured with my centimeter cube?
- S: You didn't leave any space between your pencil mark and the centimeter cube. → Your pencil line is very tiny. → You put the edge of the cube down right on the line.
- T: What do you notice about the distance between the pencil marks I've made? Talk with your partner.
- S: They're all the same length.
- T: When I measured my paperclip the length was just a little less than 3 centimeters. I can say my paperclip is *about* 3 centimeters because it is very close.
- T: Now, it's your turn to measure. Open your bag, and take out the paper clip and the centimeter



NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

Get moving! Demonstrate the iteration strategy by calling a student forward to measure the classroom board with her body, placing marks on either side of her shoulders and continuing to move forward along the length of the board.

cube.

T: Put the paper clip on your paper. Now, put your centimeter cube down alongside the paper clip. Make sure your centimeter cube is exactly even with the start of your paper clip. (Walk students through the mark and move forward strategy.)

S: (Measure.)

T: How many centimeters long is the paper clip? Thumbs up when you have your answer.

S: 4 centimeters!

T: Let's measure the crayon this time. Give me a thumbs-up when you know the length of the crayon. (Discuss answer with class.)

Next, have the students measure the linking cube stick. Send students to their seats to measure the remaining items in their bags. Keep students who need extra support on the carpet to guide them.

MP.6



NOTES ON MULTIPLE MEANS OF REPRESENTATION:

For Problem 5 on the Problem Set, clarify and make connections to important math concepts: repeating equal units and the mark and move forward strategy.

Model written response starters, such as, "Elijah's answer will be incorrect, because...."

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Use iteration with one physical unit to measure.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

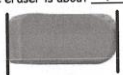
- Compare your answers to Problems 1–3 with a

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 2 Problem Set 2•2


Name Ella Date _____

Find the length of each object using one centimeter cube. Mark the endpoint of each centimeter cube as you measure.

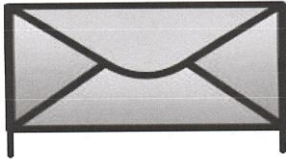
1. The picture of the eraser is about 4 centimeters long.



2. The picture of the calculator is about 6 centimeters long.



3. The length of the picture of the envelope is about 10 centimeters.



COMMON CORE Lesson 2: Date: 5/2/14 Use iteration with one physical unit to measure.

engage^{ny} 2.A.6

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partner. What did you do to measure accurately?

- What are your thoughts about Elijah's estimation strategy in Problem 5? (Students share answers. Elicit and reinforce the repetition of equal units being necessary to measure.)
- Turn and talk: Why do you think I called today's strategy for measuring the *mark and move forward* strategy? Why is it important not to **overlap**?
- Which method for measuring do you think is better, easier, or quicker? Measuring with multiple cubes or measuring with just one cube? Why?
- During our lesson, we measured 3 linking cubes with centimeter cubes. Could we use a linking cube to measure instead of a centimeter cube? Let's measure the picture of Elijah's notebook with one linking cube. What do you notice?

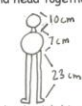
Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 2 Problem Set 2•2

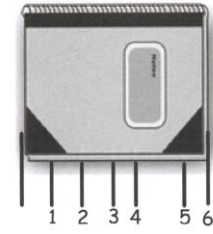
4. Jayla measured her puppet's legs to be 23 centimeters long. The stomach is 7 centimeters long and the neck and head together are 10 centimeters long. What is the total length of the puppet?

The total length of the puppet is 40 cm.



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

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.

Elijah's answer will be incorrect because not every
space is exactly one centimeter long.

COMMON CORE Lesson 2: Date: 5/22/14 Use iteration with one physical unit to measure. engage^{ny} 2.A.7

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Name _____

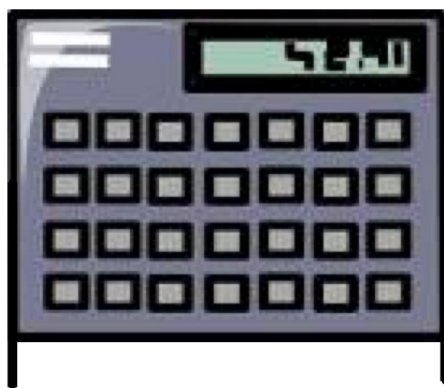
Date _____

Find the length of each object using one centimeter cube. Mark the endpoint of each centimeter cube as you measure.

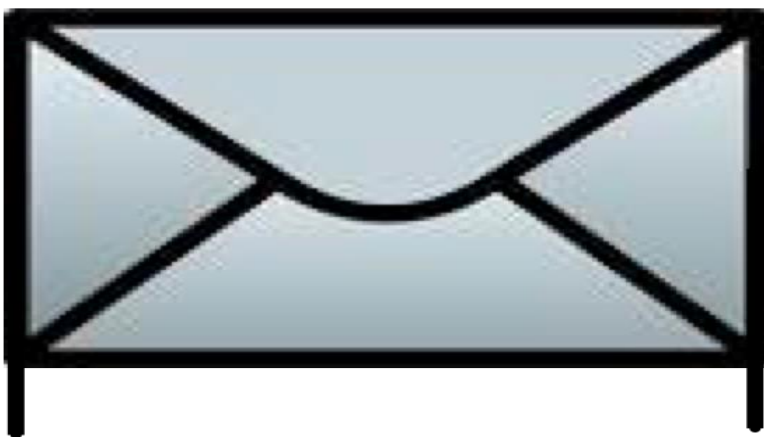
1. The picture of the eraser is about _____ centimeters long.



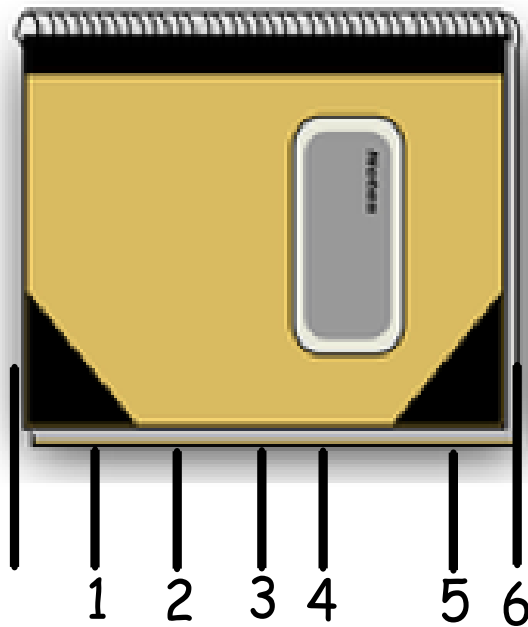
2. The picture of the calculator is about _____ centimeters long.



3. The length of the picture of the envelope is about _____ centimeters.



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

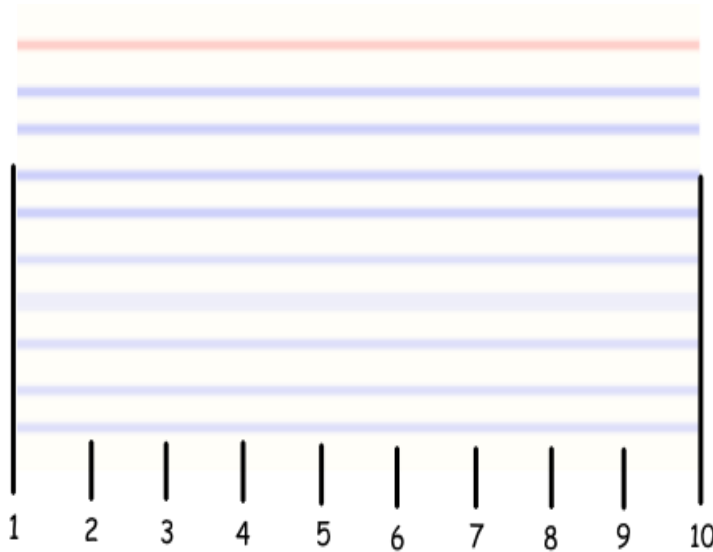


Explain why Elijah's answer will be incorrect.

Name _____

Date _____

1. Matt measured his index card using a centimeter cube. He marked the endpoint of the cube as he measured. He thinks the index card is 10 centimeters long.



- a. Is Matt's work correct? Explain why or why not.

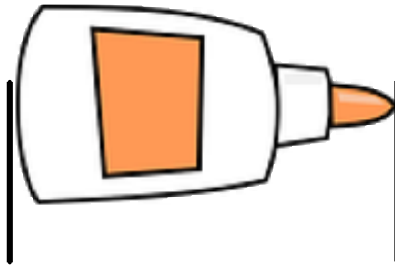
- b. If you were Matt's teacher what would you tell him?

Name _____

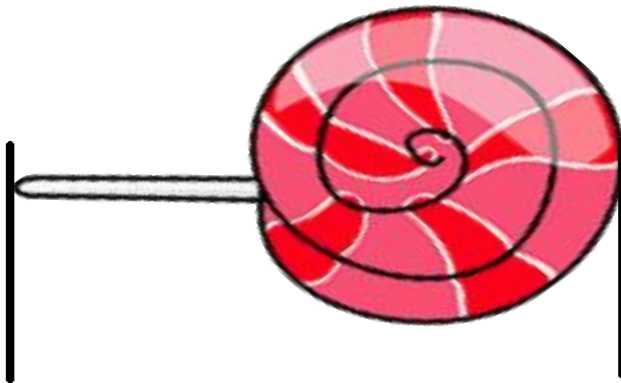
Date _____

Use the centimeter square at the bottom of the next page to measure the length of each object. Mark the endpoint of the square as you measure.

1. The picture of the glue is about _____ centimeters long.



2. The picture of the lollipop is about _____ centimeters long.

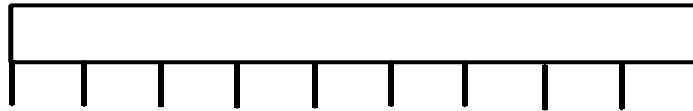


3. The picture of the scissors is about _____ centimeters long.

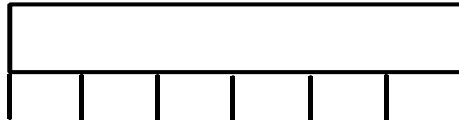


4. Samantha used a centimeter cube and the mark and move forward strategy to measure these ribbons. Use her work to answer the following questions.

Red Ribbon



Blue Ribbon



Yellow Ribbon



- a. How long is the red ribbon? _____ centimeters long.
- b. How long is the blue ribbon? _____ centimeters long.
- c. How long is the yellow ribbon? _____ centimeters long.
- d. Which ribbon is the longest? Red Blue Yellow
- e. Which ribbon is the shortest? Red Blue Yellow
- f. The total length of all the ribbons is _____ centimeters.

Cut out this centimeter square to measure the length of the glue bottle, lollipop, and scissors.

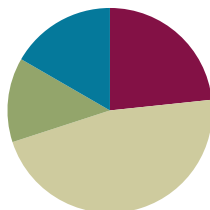


Lesson 3

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

Suggested Lesson Structure

■ Fluency Practice	(14 minutes)
■ Application Problem	(8 minutes)
■ Concept Development	(28 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (14 minutes)

- Happy Counting 40–60 **2.NBT.2** (2 minutes)
- Making Ten by Identifying the Missing Part **2.OA.2** (3 minutes)
- Sprint: Making Ten **2.OA.2** (9 minutes)

Happy Counting 40–60 (2 minutes)

Note: Students fluently count by ones with an emphasis on crossing the tens.

- T: Let's count by ones, starting at 40. Ready? (Rhythmically point up until a change is desired. Show a closed hand then point down. Continue, mixing it up.)
- S: 40, 41, 42, 43. (Switch direction.) 42, 41, 40. (Switch direction.) 41, 42, 43, 44, 45. (Switch direction.) 44, 43, 42, 41, 40. (Switch direction.) 41, 42, 43, 44, 45, 46, 47, 48, 49, 50. (Switch direction.) 49, 48, 47. (Switch direction.) 48, 49, 50, 51, 52. (Switch direction.) 51, 50, 49, 48. (Switch direction.) 49, 50, 51, 52, 53, 54. (Switch direction.) 53, 52, 51, 50, 49. (Switch direction.) 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60.
- T: Excellent! Try it for 30 seconds with your partner starting at 48. Partner B, you are the teacher today.

Make Ten by Identifying the Missing Part (3 minutes)

Materials: (S) Personal white board

Note: Students identify the missing part to make the next ten in preparation for the Sprint.

- T: If I say 9, you say 1 because 9 and 1 make 10.
- T: Wait for the signal, 5. (Signal with a snap.)

S: 5.

Continue with the following possible sequence: 15, 25, 16, 24, 19, and 21.

T: This time I'll say a number and you write the addition sentence to make ten on your personal white board.

T: 19. Get ready. Show me your board.

S: (Write $19 + 1 = 20$.)

T: Get ready. Show me your board.

Continue with the following possible sequence: 18, 12, 29, 31, 47, and 53.

T: Turn and tell your partner what pattern you noticed that helped you solve the problems.

T: Turn and tell your partner your strategy for finding the missing part.

Sprint: Making Ten (9 minutes)

Materials: (S) Making Ten Sprint

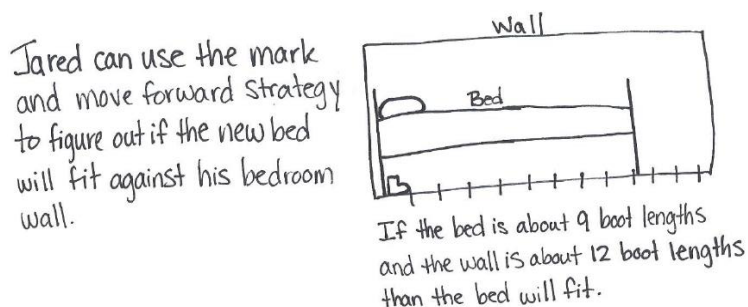
Note: Students fluently identify the missing part to make the next ten when adding and subtracting tens and ones.

Application Problem (8 minutes)

Jared's parents buy him a new bed, but they are not sure if it is short enough to fit against his bedroom wall. Jared only has his dad's boot and a craft stick as measurement tools.

What strategy can Jared use to figure out if the new bed will fit against his bedroom wall? Use numbers, pictures, or words to explain your thinking.

Extension: Which tool would you use to measure, the craft stick or the boot? Why?



Note: The first portion of this problem reviews using iteration with one physical unit to measure and asks students to recall the mark and move forward strategy. The second portion asks the student to make a comparison between the length of Jared's bed and the length of his bedroom wall and decide if the bed is short enough to fit. During the second portion, students use personal white boards to draw a picture, adding numbers and words to support their conclusions. The extension is designed for accelerated learners, as this measurement concept of inverse relationship will not be addressed until Lesson 7. When all students have had a reasonable amount of time to work, they trade work with a partner. The teacher circulates and chooses a few students to share their partner's work aloud.

Concept Development (28 minutes)

Materials: (S) 1 30 cm × 5 cm strip of tag board or sentence strip, 1 centimeter cube, 1 index card or sticky note

Note: In order for students to create an accurate ruler, the hash marks have to be precise. Show students they can make their marks precise by placing the centimeter cube directly below the tag board and making a line where the cube ends. By doing this, students avoid adding an incremental amount to each length unit.

- T: Yesterday, we used 1 centimeter cube to measure the length of different objects. Today, we're going to create a tool that will help us measure centimeters in a more efficient way.
- T: Let's make a centimeter **ruler**! Watch how I use my centimeter cube to measure and mark centimeters onto the tag board.
- T: (Model placing the cube and using the mark and move forward strategy to show 4 cm.) What did you notice about how I marked my tag board?
- S: You did what we did yesterday. → You didn't leave any space between the cube and your pencil mark. → You made all the spaces (intervals) the same size. → You called it the mark and move forward strategy.
- T: Now, take out your tag board, centimeter cube, and pencil. Let's do a few centimeters together. (Turn tag board over, and guide students to make their first 3 cm along with you.)

Support students who need assistance, and allow those who show mastery to complete their rulers independently. As students complete their rulers direct them to explore measuring items around the room.

After all students have completed their rulers, invite them to the carpet with their rulers, centimeter cubes, index cards, and pencils.

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- T: You have all completed a centimeter ruler. Now, let's explore how we can use this tool. Take a look at some of the objects students measured around the room. I see that someone measured a math book. Let's take a look at how we might do that.
- T: Turn to your neighbor and tell him how you would use your centimeter ruler to measure the length of your math book.
- S: You can put the ruler next to the book and count how many lines. → Line up the ruler with the edge of the math book. Count how many lines there are.
- T: (Line ruler up with the edge of the math book.) We call these marks on the ruler **hash marks**. Count the hash marks with me.
- S: (Count.)
- T: I notice there is a lot of room for mistakes here with so much counting. Does anyone have an idea about how I could make this easier the next time I use my ruler?
- S: You can label the hash marks with numbers!



NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Glue a toothpick or Wikki Stix to represent each of the hash marks for blind or visually impaired students, enabling them to feel the length units on their ruler.

- T: It is a wise idea to label the hash marks with numbers. I can keep count more easily, and also, next time, I won't have to count again. (Model marking the first two centimeters.)
- T: Notice that I am making my numbers small so they fit right on top of the hash marks. Now, it's your turn. (As students show mastery of marking their rulers with numbers, allow them to complete the numbers for all 30 hash marks.)
- T: What unit did we use to create our rulers?
- S: A centimeter.
- T: How many centimeters are on your ruler? Be sure to say the unit.
- S: 30 centimeters.
- T: (Record 30 centimeters on the board. Write 30 cm next to it.) This is another way we can write centimeters.
- T: Let's practice using our rulers together. Take out your index cards. Turn and talk with your partner: Where should I place my ruler to measure the long side of the index card?

Guide students through measuring their index card and at least two more objects, such as their pencil and pencil box. Direct students to write their measurements in the abbreviated form for centimeters (cm). As they show mastery, send them to their seats to complete the Problem Set. If students need more practice, provide them with another opportunity, such as measuring their pencil.



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Assign students a measurement discovery buddy to clarify directions and processes. Buddies compare answers to check their work.

Problem Set (7 minutes)

Students should do their personal best to complete the Problem Set within the allotted 7 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

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

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.


Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 3 Problem Set 2•2

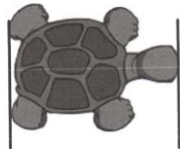
Name Roberto Date _____

Use your centimeter ruler to measure the length of the objects below.


1. The picture of the animal track is about 4 cm long.



2. The picture of the turtle is about 6 cm long.



3. The picture of the sandwich is about 9 cm long.



COMMON CORE Lesson 3: Apply concepts to create unit rulers, measure lengths using unit rulers. 5/2/14 engage^{ny} 2.A.31

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misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Turn to your partner and compare your measurements on Problems 1–3. What did you do to measure accurately with your centimeter ruler?
- Tell your partner how you made your ruler. What steps did you take to make it an accurate tool for measurement?
- What was different about using the mark and move forward strategy from using the ruler? Why is using the ruler more efficient than counting **hash marks**?
- Let's look at Problem 4(c) on the Problem Set. How could we use similar words to fit the situation in our Application Problem? (How much shorter is the length of Jared's bed than the length of his bedroom wall?) What strategy would you suggest to compare the two lengths?
- What are some objects that are longer than our centimeter rulers? How can we measure objects that are longer than our rulers?

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 3 Problem Set 2•2

4. Measure and label the length of each side of the triangle using your ruler.

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

b. What is the length of Sides A and B together? 13 centimeters.
 $4 + 9 = 13$ $10 + 3 = 13$

c. How much shorter is Side C than Side B? 1 centimeters.
 $9 - 8 = 1$

COMMON CORE Lesson 3: Apply concepts to create unit rulers, measure lengths using unit rulers. Date: 5/3/14 engage^{ny} 2.A.32

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

A

Correct _____

1	0 +	= 10	23	13 +	= 20
2	9 +	= 10	24	23 +	= 30
3	8 +	= 10	25	27 +	= 30
4	7 +	= 10	26	5 +	= 10
5	6 +	= 10	27	25 +	= 30
6	5 +	= 10	28	2 +	= 10
7	1 +	= 10	29	22 +	= 30
8	2 +	= 10	30	32 +	= 40
9	3 +	= 10	31	1 +	= 10
10	4 +	= 10	32	11 +	= 20
11	10 +	= 10	33	21 +	= 30
12	9 +	= 10	34	31 +	= 40
13	19 +	= 20	35	38 +	= 40
14	5 +	= 10	36	36 +	= 40
15	15 +	= 20	37	39 +	= 40
16	8 +	= 10	38	35 +	= 40
17	18 +	= 20	39		+ 6 = 30
18	6 +	= 10	40		+ 8 = 20
19	16 +	= 20	41		+ 7 = 40
20	7 +	= 10	42		+ 6 = 20
21	17 +	= 20	43		+ 4 = 30
22	3 +	= 10	44		+ 8 = 40

Improvement			# Correct		
B					
1	10 +	= 10	23	14 +	= 20
2	9 +	= 10	24	24 +	= 30
3	8 +	= 10	25	26 +	= 30
4	7 +	= 10	26	9 +	= 10
5	6 +	= 10	27	29 +	= 30
6	5 +	= 10	28	3 +	= 10
7	1 +	= 10	29	23 +	= 30
8	2 +	= 10	30	33 +	= 40
9	3 +	= 10	31	2 +	= 10
10	4 +	= 10	32	12 +	= 20
11	0 +	= 10	33	22 +	= 30
12	5 +	= 10	34	32 +	= 40
13	15 +	= 20	35	37 +	= 40
14	9 +	= 10	36	34 +	= 40
15	19 +	= 20	37	35 +	= 40
16	8 +	= 10	38	39 +	= 40
17	18 +	= 20	39		+ 4 = 30
18	7 +	= 10	40		+ 9 = 20
19	17 +	= 20	41		+ 4 = 40
20	6 +	= 10	42		+ 7 = 20
21	16 +	= 20	43		+ 3 = 30
22	4 +	= 10	44		+ 9 = 40

Name _____

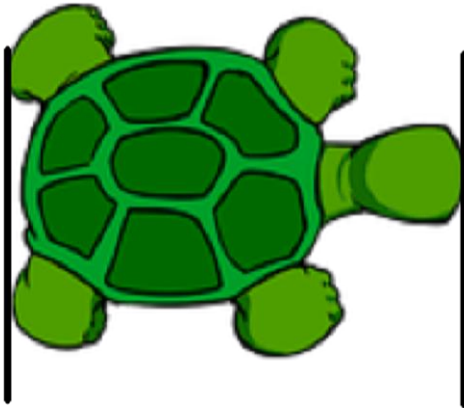
Date _____

Use your centimeter ruler to measure the length of the objects below.

1. The picture of the animal track is about _____ cm long.



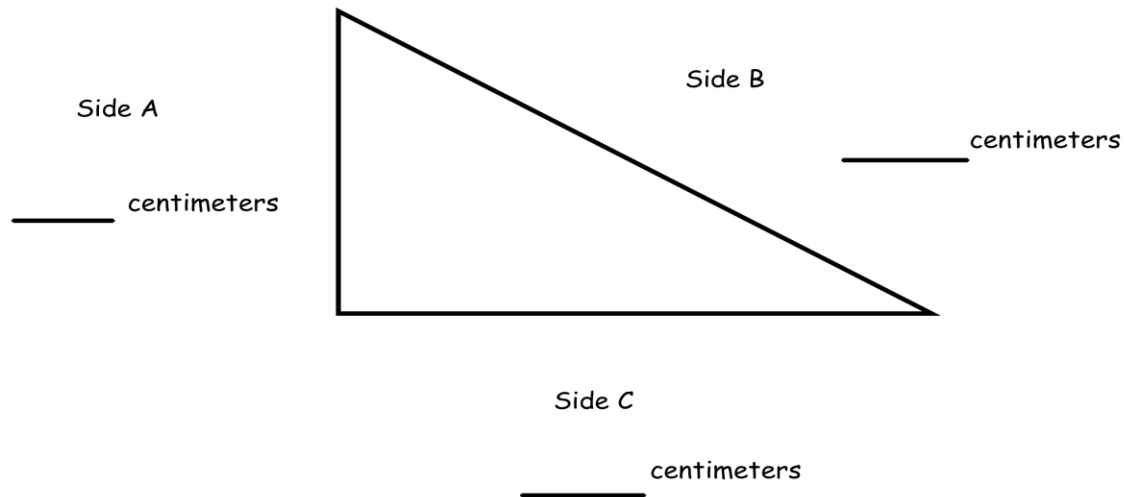
2. The picture of the turtle is about _____ cm long.



3. The picture of the sandwich is about _____ cm long.



4. Measure and label the length of each side of the triangle using your ruler.



- a. Which side is the shortest? Side A Side B Side C
- b. What is the length of Sides A and B together? _____ centimeters
- c. How much shorter is Side C than Side B? _____ centimeters

Name _____

Date _____

1. Use your centimeter ruler. What is the length in centimeters of each line?

a. Line A is _____ cm long.

Line A _____

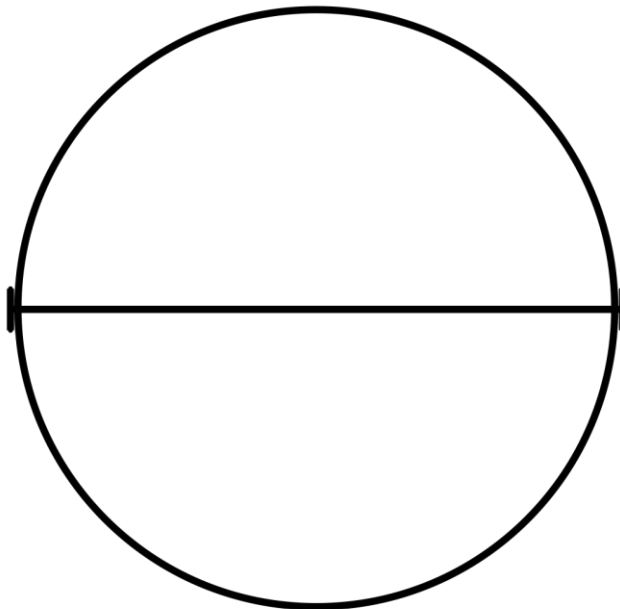
b. Line B is _____ cm long.

Line B _____

c. Line C is _____ cm long.

Line C _____

2. Find the length across the center of the circle.



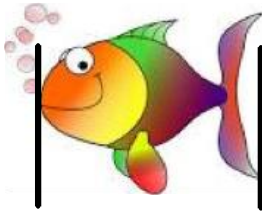
The length across the circle is _____ cm.

Name _____

Date _____

Measure the lengths of the objects with the centimeter ruler you made in class.

1. The picture of the fish is _____ cm long.

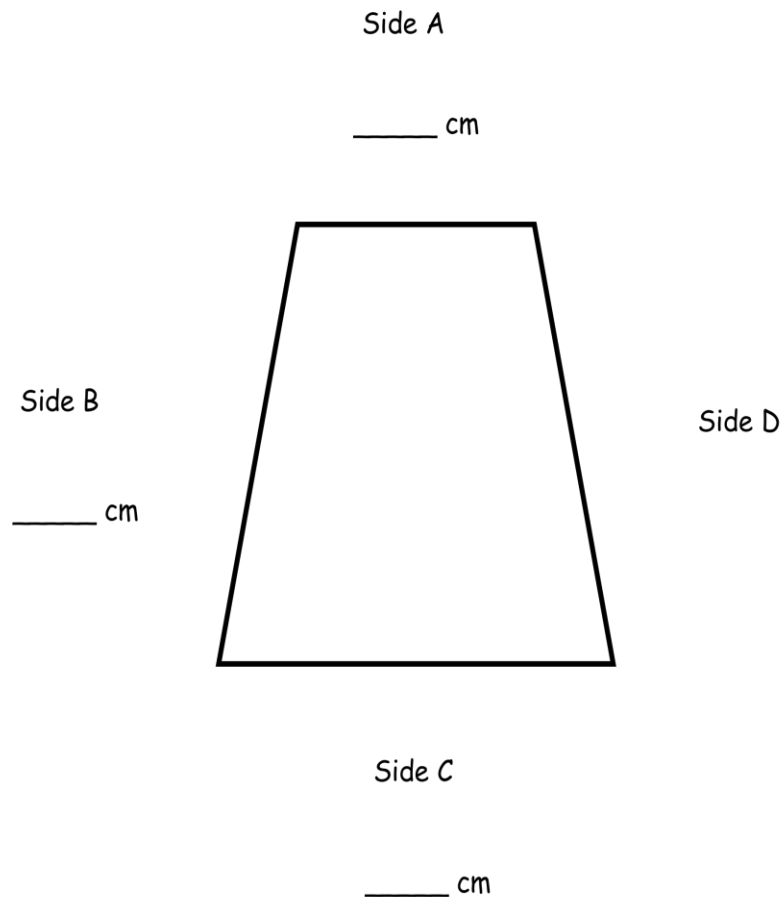


2. The picture of the fish tank is _____ cm long.



3. The picture of the fish tank is _____ cm longer than the picture of the fish.

4. Measure the lengths of Sides A, B, and C. Write their length on the line.



- a. Which side is the longest? Side A Side B Side C
- b. How much longer is Side B than Side A? _____ cm longer
- c. How much shorter is Side A than Side C? _____ cm shorter
- d. Sides B and D are the same length.
What is the length of Sides B and D together? _____ cm
- e. What is the total length of all four sides of this figure? _____ cm



Topic B

Measure and Estimate Length Using Different Measurement Tools

2.MD.1, 2.MD.3

Focus Standard:	2.MD.1	Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
	2.MD.3	Estimate lengths using units of inches, feet, centimeters, and meters.
Instructional Days:	2	
Coherence	-Links from: G1–M3	Ordering and Comparing Length Measurement as Numbers
	-Links to: G2–M7	Problem Solving with Length, Money, and Data
	G3–M2	Place Value and Problem Solving with Units of Measure

In Lesson 4, students begin to use 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.

A Teaching Sequence Towards Mastery of Measuring and Estimating Length Using Different Measurement Tools

Objective 1: Measure various objects using centimeter rulers and meter sticks.
(Lesson 4)

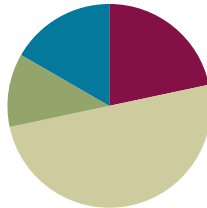
Objective 2: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks.
(Lesson 5)

Lesson 4

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

Suggested Lesson Structure

■ Fluency Practice	(13 minutes)
■ Application Problem	(7 minutes)
■ Concept Development	(30 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (13 minutes)

- Related Facts on a Ruler **2.OA.2** (4 minutes)
- Sprint: Related Facts **2.OA.2** (9 minutes)

Related Facts on a Ruler (4 minutes)

Materials: (S) 30 cm ruler created in Lesson 3

Note: This fluency activity utilizes the ruler made in Lesson 3 to fluently review related facts.

- T: Put your finger on 3 on the ruler you made yesterday. Raise your hand when you know 8 more than 3. Ready?
- S: 11.
- T: Give a number sentence starting with 3 that shows 8 more.
- S: $3 + 8 = 11$.
- T: Give a number sentence to show 3 more than 8.
- S: $8 + 3 = 11$.
- T: Put your finger on 11. Raise your hand when you know 3 less than 11.
- S: 8.
- T: What is the number sentence?
- S: $11 - 3 = 8$.



NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

To provide support for the quick pace of one-minute Sprints:

- Consider giving students who do not excel under pressure the chance to practice the Sprint at home the night before it is administered.
- Guide personal goal setting within a time frame (e.g., to finish more problems correctly on the second Sprint). Have students ask, "How did I improve?"
- Allow the class to finish Sprint A after the minute has ended to help prepare for Sprint B.

T: Give a number sentence to show 8 less than 11.

S: $11 - 8 = 3$.

Continue with the following possible sequence: 9, 2, 11; 4, 9, 13; 8, 5, 13; and 9, 6, 15.

Sprint: Related Facts (9 minutes)

Materials: (S) Related Facts Sprint

Application Problem (7 minutes)

Cameron wants to draw a canoe that is 16 centimeters long. He has 16 centimeter cubes, a centimeter ruler, and 16 paperclips of various sizes in his desk. Which measurement tool would you recommend for Cameron? Why? Write a sentence to explain your thinking.

I would tell Cameron to use a cm ruler because it's the easiest and quickest to use. Plus you can't use things that are different sizes.

Extension: What if Cameron was asked to paint a much larger, life-size canoe as scenery for the school play? Is there any other way he could measure it? (Students share responses orally.)

Note: This problem asks students to synthesize their understanding of choosing an appropriate measurement tool, one that is accurate and efficient. Since students are being asked to write, assign them partners such that each partnership has a strong writer who is comfortable with language and vocabulary. Students then share their responses in small groups. Highlight one or two exemplary responses after small group sharing. The extension of the problem sets the stage for the introduction of meter sticks and meter tape other measurement tools.

Concept Development (30 minutes)

Materials: (T) Meter stick, meter tape (S) Centimeter ruler made in Lesson 3, 1 textbook; meter stick, meter tape per pair

T: Let's redecorate the room. I want to measure the carpet to see how long our new one should be.

T: Can someone bring his ruler up from yesterday to measure the carpet?

S: (Measure the carpet with centimeter ruler.)

T: That took a very long time! Maybe we should have used this! (Hold up the meter stick.)

T: Look at these tools I have! (Lay a meter stick and meter tape on the ground.) Can I have two volunteers lay some rulers down on top of the **meter stick** and the meter tape, naming them as you place them, to measure their length in centimeters?

T: How many centimeters are in 1 **meter**?

S: It is 100 centimeters. → It's just a little longer than 3



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Assign students a measurement discovery buddy to clarify directions and processes. Buddies compare answers to check their work.

MP.5

centimeter rulers.

- T: This is another unit of measure called a meter. When we are measuring things that are more than 100 centimeters, we can measure in meters.
- T: We use a meter stick exactly the same way we use a ruler.
- T: (Call on a volunteer to measure the length of the rug with a meter stick.)
- T: I notice that the rug is not exactly 4 meters long. It's more than 4 meters but less than 5 meters. Is it closer to 4 or 5 meters?
- S: 4 meters.
- T: So, we can say it's about 4 meters long. (Record 4 m on the board.)
- T: We use the meter tape in exactly the same way. When would the meter tape be an appropriate measuring tool?
- S: When I am measuring my head. → When I am measuring something round. → When I am measuring something that is not straight.
- T: I want to build a bookshelf for our science books. Let's use the centimeter rulers we made yesterday to measure the height of our books to see how high the shelf should be. Turn to your neighbor and estimate the height of your science book.
- S: (Estimate.)
- T: Measure your science book from top to bottom. How high should my shelf be?
- S: (Share answers.)
- T: Now, we need to see how long the shelf should be to hold all the books. (Call students up table by table to stack their books in one pile.)
- T: Which is the best tool to measure our stack of books?
- S: The meter stick or the meter tape!
- T: (Call on a student volunteer to measure the stack of books.)
- T: The bookshelf will need to be 20 cm high and 92 cm long. Work with your partner to use your measurement tools to measure spaces around the room. Where will the bookshelf fit?
- S: (Work in pairs to find a place for the bookshelf.)
- T: (Call students back together and share places the bookshelf could go.)
- T: Now, you will have some time to continue planning for our redecoration. Measure objects around the room using an appropriate measuring tool. Record your measurements as you go. (Present Problem Set.)

MP.5

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

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

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Share with your partner. Which things did you measure in centimeters? Why? Which things did you measure in meters? Why?
- Did you or your partner disagree on any of the measurement tools you selected? Defend your choice.
- How do the size and shape of what we measure tell us which tool is most appropriate?
- What new (or significant) math vocabulary did we learn today? (Chart student responses. Prompt students to list vocabulary from the lesson such as *measure*, *measurement*, *length*, *height*, *length unit*, *measuring tool*, *meter tape*, ***meter***, ***meter stick***, etc.)

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 4 Problem Set 2•2

Name Maddie Date _____

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. <u>book</u>	<u>27cm</u>
b. <u>post-it</u>	<u>8cm</u>
c. <u>crayon</u>	<u>9cm</u>
d. <u>eraser</u>	<u>5cm</u>
e. <u>pencil sharpener</u>	<u>3cm</u>

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. <u>door width</u>	<u>1m</u>
b. <u>rug</u>	<u>2m</u>
c. <u>teacher's desk</u>	<u>1m</u>
d. <u>bulletin board</u>	<u>3m</u>

COMMON CORE Lesson 4: Measure various objects using centimeter rulers and meter sticks. 5/3/14 engage^{ny} 2.B.7

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 4 Problem Set 2•2

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

- Sofa
- Kitchen counter
- rug
- bed
- sliding door

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

All those items are too long to measure with a centimeter ruler. It would be much quicker to measure them with a meter stick.

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

You would have to use the meter stick 28 times to measure the distance from the cafeteria to the playground.

COMMON CORE Lesson 4: Measure various objects using centimeter rulers and meter sticks. 5/3/14 engage^{ny} 2.B.8

A

Correct _____

Add or subtract.

1	$8 + 3 =$		23	$15 - 6 =$	
2	$3 + 8 =$		24	$15 - 9 =$	
3	$11 - 3 =$		25	$8 + 7 =$	
4	$11 - 8 =$		26	$7 + 8 =$	
5	$7 + 4 =$		27	$15 - 7 =$	
6	$4 + 7 =$		28	$15 - 8 =$	
7	$11 - 4 =$		29	$9 + 4 =$	
8	$11 - 7 =$		30	$4 + 9 =$	
9	$9 + 3 =$		31	$13 - 4 =$	
10	$3 + 9 =$		32	$13 - 9 =$	
11	$12 - 3 =$		33	$8 + 6 =$	
12	$12 - 9 =$		34	$6 + 8 =$	
13	$8 + 5 =$		35	$14 - 6 =$	
14	$5 + 8 =$		36	$14 - 8 =$	
15	$13 - 5 =$		37	$7 + 6 =$	
16	$13 - 8 =$		38	$6 + 7 =$	
17	$7 + 5 =$		39	$13 - 6 =$	
18	$5 + 7 =$		40	$13 - 7 =$	
19	$12 - 5 =$		41	$9 + 7 =$	
20	$12 - 7 =$		42	$7 + 9 =$	
21	$9 + 6 =$		43	$16 - 7 =$	
22	$6 + 9 =$		44	$16 - 9 =$	

B

Improvement _____

Correct _____

Add or subtract.

1	$9 + 2 =$		23	$15 - 7 =$	
2	$2 + 9 =$		24	$15 - 8 =$	
3	$11 - 2 =$		25	$9 + 6 =$	
4	$11 - 9 =$		26	$6 + 9 =$	
5	$6 + 5 =$		27	$15 - 6 =$	
6	$5 + 6 =$		28	$15 - 9 =$	
7	$11 - 5 =$		29	$7 + 5 =$	
8	$11 - 6 =$		30	$5 + 7 =$	
9	$8 + 4 =$		31	$12 - 5 =$	
10	$4 + 8 =$		32	$12 - 7 =$	
11	$12 - 4 =$		33	$9 + 5 =$	
12	$12 - 8 =$		34	$5 + 9 =$	
13	$7 + 6 =$		35	$14 - 5 =$	
14	$6 + 7 =$		36	$14 - 9 =$	
15	$13 - 6 =$		37	$8 + 6 =$	
16	$13 - 7 =$		38	$6 + 8 =$	
17	$9 + 3 =$		39	$14 - 6 =$	
18	$3 + 9 =$		40	$14 - 8 =$	
19	$12 - 3 =$		41	$9 + 8 =$	
20	$12 - 9 =$		42	$8 + 9 =$	
21	$8 + 7 =$		43	$17 - 8 =$	
22	$7 + 8 =$		44	$17 - 9 =$	

Name _____

Date _____

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

Object Name	Length in Centimeters
a.	
b.	
c.	
d.	
e.	

2. Measure four 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.	
b.	
c.	
d.	

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

1. _____

2. _____

3. _____

4. _____

5. _____

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

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

Name _____

Date _____

1. Circle cm (centimeter) or m (meter) to show which measurement you would use to measure the length of each object.

Length of a train cm or m

Length of an envelope cm or m

Length of a house cm or m

2. Would it take more meters or more centimeters to measure the length of playground? Explain your answer.

Name _____

Date _____

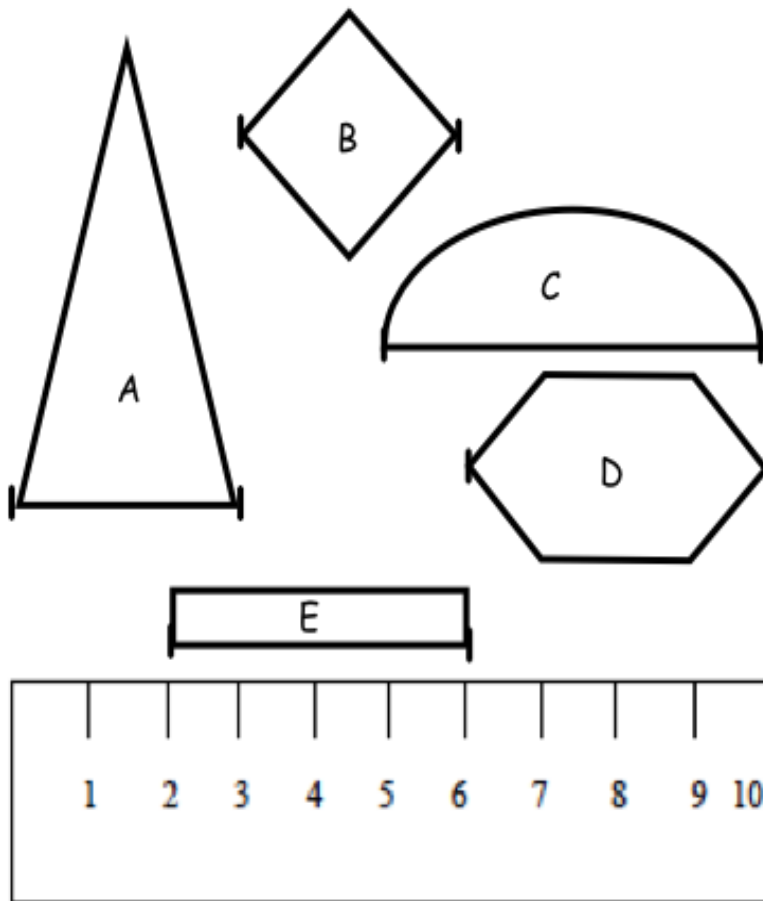
1. Circle cm (centimeter) or m (meter) to show which measurement you would use to measure the length of each object.

- a. Length of a marker cm or m
- b. Length of a school bus cm or m
- c. Length of a laptop computer cm or m
- d. Length of a highlighter marker cm or m
- e. Length of a football field cm or m
- f. Length of a parking lot cm or m
- g. Length of a cell phone cm or m
- h. Length of a lamp cm or m
- i. Length of a supermarket cm or m
- j. Length of a playground cm or m

2. Fill in the blanks with **cm** or **m**.

- a. The length of a swimming pool is 25 _____.
- b. The height of a house is 8 _____.
- c. Karen is 6 _____ shorter than her sister.
- d. Eric ran 65 _____ down the street.
- e. The length of a pencil box is 3 _____ longer than a pencil.

3. Use the centimeter ruler to find the length (from one mark to the next) of each object.



- a. Triangle A is ____ cm long. Square B is ____ cm long.
Semi-circle C is ____ cm long. Hexagon D is ____ cm long.
Rectangle E is ____ cm long.

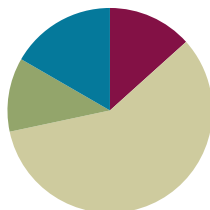
- b. Explain how the strategy to find the length of each shape above is different from how you would find the length if you used a centimeter cube.

Lesson 5

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

Suggested Lesson Structure

■ Fluency Practice	(8 minutes)
■ Application Problem	(7 minutes)
■ Concept Development	(35 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (8 minutes)

- Break Apart by Tens and Ones **2.NBT.1** (4 minutes)
- Take Out a Part **2.OA.2** (4 minutes)

Break Apart by Tens and Ones (4 minutes)

Note: These fluency activities review place value understanding from Module 1 and help develop skills needed for Module 3.

Materials: (S) Personal white board

T: If I say 64, you write 6 tens 4 ones. If I say 7 tens 2 ones, you write 72.

T: Turn your board over when you've written your answer. When I say, "Show me," hold it up.

T: 5 tens 2 ones. (Pause.) Show me.

S: (Hold up boards showing 52.)

T: 84. (Pause.) Show me.

S: (Show 8 tens 4 ones.)

Continue with the following possible sequence: 7 tens 3 ones, 79, 8 tens 9 ones, 9 tens 9 ones, 10 tens 2 ones, 10 tens 4 ones, 104, 10 tens 8 ones, 11 tens, and 11 tens 5 ones.

T: Partner B, quiz Partner A for one minute.

Take Out a Part (4 minutes)

Note: In this activity, students build fluency with decomposing a whole, which allows them to use the make a ten strategy with larger numbers (e.g., $80 + 50 = 80 + 20 + 30$).

T: Let's take out 2 tens from each number.

T: I say 5 tens. You say, $2 \text{ tens} + 3 \text{ tens} = 5 \text{ tens}$.

T: 5 tens.

S: $2 \text{ tens} + 3 \text{ tens} = 5 \text{ tens}$.

T: 7 tens.

S: $2 \text{ tens} + 5 \text{ tens} = 7 \text{ tens}$.

T: Let's take out 20 from each number.

T: I say 50. You say, $20 + 30 = 50$.

T: 50.

S: $20 + 30 = 50$.

T: 70.

S: $20 + 50 = 70$.

Continue with the following possible sequence: 83, 52, 97, 100, 105, 110, and 120.

T: Now, let's take out 40. If I say 60, you say $40 + 20 = 60$.

T: 50. Wait for the signal.

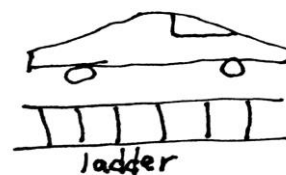
S: $40 + 10 = 50$.

Continue with the following possible sequence: 70, 75, 81, and 87.

Application Problem (7 minutes)

Jenna and Bobby are building a rope ladder for their treehouse. They would like the ladder to be about the length of a sports car. They want to use rope for the sides of the ladder and wood for the steps. Which measurement tools would you suggest that Jenna and Bobby use to measure the length of the rope and the length of the wooden steps for their ladder? Draw a picture and use words to explain your thinking.

Note: This problem asks students to choose the appropriate measurement tool by applying prior knowledge of length and making comparisons. Students work independently using personal white boards, and then compare their responses with a partner. The teacher listens in on conversations and invites a few students to share their responses with the whole class. The teacher may wish to return to this problem during the Debrief to estimate the amount of rope needed to build the ladder.



I would suggest a centimeter ruler for the rungs and a meter stick for the rope.

Concept Development (35 minutes)

Materials: (T) Meter stick (displayed horizontally for student reference), three-ring binder (S) 1 unused unsharpened pencil, 1 centimeter cube, centimeter ruler from Lesson 3, meter tape, 1 wedge eraser

T: Put your pinky on your centimeter cube. Would you say it's about the same width as the centimeter cube?

S: Yes.

T: How could you use your pinky to estimate length?

S: I can tell how many times my pinky would fit into the space. → I can put my pinky down as many times as I can and then count.

T: Let's try that. Use your pinky to estimate, about how long do you think the eraser is? Turn to your neighbor and share your estimate.

S: About 6 centimeters.

T: Let's measure to see if your estimates are correct.

S: (Use centimeter rulers to check estimates.)

T: The distance from the floor to the doorknob is about 1 meter (verify by modeling). How does this help you estimate the length of your desk?

S: My desk is about half the length from the floor to the doorknob, so it's about 50 centimeters long. → My desk is twice the length from the floor to the doorknob, so I think it's about 2 meters long.

T: Let's measure to see which estimate is closer to the real measurement.

S: (Use meter tapes to measure their desks.)

T: Measure your pencil. How long is it?

S: About 20 centimeters.

T: Can that help you estimate the length of your math book? Estimate the length of your math book, and then measure it with your centimeter ruler to see how close you got.

S: My math book is longer than the pencil, but not by much. → They are almost the same. → I think it's about 23 centimeters. → I think it's 30 centimeters.

T: Picture the meter stick in your mind. Estimate how many meters long the classroom board is.



NOTES ON MULTIPLE MEANS OF REPRESENTATION:

In this lesson, students will be learning multiple benchmark measurements. To help all students remember the benchmarks, these techniques may prove useful:

- Partner language with visuals by posting pictures of the benchmarks.
- Instruct students to create a reference chart to keep track of the benchmarks as they learn them. They can later use this chart as a reference.



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Use a chant to help students understand the conversion from meters to centimeters. Make gestures to accompany the chant.

T: When I say meter, you say 100 centimeters. (Open arms wide, about the length of a meter.)

T: Meter! (Open arms wide.)

S: 100 centimeters! (Open arms wide.)

This conversion is meant to support students' estimations of the length of their desks.

MP.2

MP.2

- S: It looks like the board is a few meters long. → I can fit more than one meter stick along the length of the board. → I would say it is 2 meters long. → To me, it's longer than 2 meters, but shorter than 3 meters.
- T: Let's check our estimates. (Call on a volunteer to measure the board for the class.)
- T: Now, look at this three-ring binder. What known measurement can we use to estimate the length?
- S: It looks about the same as my ruler, so 30 centimeters.
- T: So, let's check and see if it is 30 centimeters.
- S: (Volunteer measures the three-ring binder.)
- T: It is. Now that we know this is 30 centimeters, what other lengths can we estimate with this information?
- S: The length of my science book. → The length of the paper that goes inside the binder.
- T: All these measurements we use to estimate length are called mental **benchmarks**. The pencil is 20 centimeters. Your pinky is 1 centimeter. The three-ring binder is 30 centimeters. And, the length from the doorknob to the floor is 1 meter. You can use these benchmarks at any time by picturing them in your head to estimate the length of an object. Now, use your mental benchmarks to estimate length on your Problem Set. Check your estimates by measuring.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 5 Problem Set 2•2

Name Juan Date _____

First estimate the length of each line in centimeters using mental benchmarks. Then measure each line with a centimeter ruler to find the actual length.

1. _____

a. Estimate: 7 cm b. Actual length: 6 cm

2. _____

a. Estimate: 20 cm b. Actual length: 15 cm

3. _____

a. Estimate: 13 cm b. Actual length: 11 cm

4. _____

a. Estimate: 6 cm b. Actual length: 8 cm

COMMON CORE Lesson 5: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks. Date: 5/3/14 engage^{ny} 2.B.18

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NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 5 Problem Set 2•2

5. _____

a. Estimate: 6 cm b. Actual length: 5 cm

6. Circle the correct unit of measurement for each length estimate.

a. The height of a door is about 2 (centimeters/meters) tall.
What benchmark did you use to estimate? Floor to doorknob is 1 meter

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? Width of pinky is 1 cm and that is too short!

d. The length of a bed is about 2 (centimeters/meters) long.
What benchmark did you use to estimate? Floor to doorknob is 1 meter

e. The length of a dinner plate is about 20 (centimeters/meters) long.
What benchmark did you use to estimate? pencil

7. Use an unsharpened pencil to estimate the length of 3 things in your desk.

a. pencil box is about 25 cm long.

b. Crayon box is about 10 cm long.

c. this paper is about 30 cm long.

COMMON CORE Lesson 5: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks. Date: 5/18/14 engage^{ny} 2.B.19

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Student Debrief (10 minutes)

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

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Turn to your partner and compare your answers to Problems 1–5 in your Problem Set. Why is it possible to have different estimates? How can we check to see if our estimates are accurate?
- How many mental **benchmarks** can you name? (Draw students' attention to Problem 6 on their Problem Set. Chart student responses for future reference.)
- How do mental benchmarks help us? When is a good time to use them?
- (Return to the Application Problem.) Look at Problem 6(c) on your Problem Set. We said that the length of a car is about 4 meters. How can we use this information to estimate the amount of rope Jenna and Bobby will need to build their ladder?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

**NOTES ON
MULTIPLE MEANS
OF ACTION
AND EXPRESSION:**

Provide sufficient wait time to allow students to process the connection between mental benchmarks and length of objects. Point to or hold visuals while speaking.

Ask students to explain how and why they chose a specific mental benchmark when estimating length.

Name _____ Date _____

First, estimate the length of each line in centimeters using mental benchmarks.
Then, measure each line with a centimeter ruler to find the actual length.

1. _____

a. Estimate: _____ cm

b. Actual length: _____ cm

2. _____

a. Estimate: _____ cm

b. Actual length: _____ cm

3. _____

a. Estimate: _____ cm

b. Actual length: _____ cm

4. _____

a. Estimate: _____ cm

b. Actual length: _____ cm

5.

a. Estimate: _____ cm

b. Actual length: _____ cm

6. Circle the correct unit of measurement for each length estimate.

a. The height of a door is about 2 (centimeters/meters) tall.

What benchmark did you use to estimate? _____

b. The length of a pen is about 10 (centimeters/meters) long.

What benchmark did you use to estimate? _____

c. The length of a car is about 4 (centimeters/meters) long.

What benchmark did you use to estimate? _____

d. The length of a bed is about 2 (centimeters/meters) long.

What benchmark did you use to estimate? _____

e. The length of a dinner plate is about 20 (centimeters/meters) long.

What benchmark did you use to estimate? _____

7. Use an unsharpened pencil to estimate the length of 3 things in your desk.

a. _____ is about _____ cm long.

b. _____ is about _____ cm long.

c. _____ is about _____ cm long.

Name _____

Date _____

1. Circle the most reasonable estimate for each object.

- | | |
|---|----------------|
| a. Length of a push pin | 1 cm or 1 m |
| b. Length of a classroom door | 100 cm or 2 m |
| c. Length of a pair of student scissors | 17 cm or 42 cm |

2. Estimate the length of your desk. (Remember, the width of your pinky is about 1 cm.)

My desk is about _____ cm long.

3. How does knowing that an unsharpened pencil is about 20 cm long help you estimate the length of your arm from your elbow to your wrist?

Name _____

Date _____

1. Name five things in your home that you would measure in meters.
Estimate their length.

*Remember, the length from a doorknob to the floor is about 1 meter.

Item	Estimated Length
a.	
b.	
c.	
d.	
e.	

2. Choose the best length estimate for each object.

a. Whiteboard 3 m or 45 cm

b. Banana 14 cm or 30 cm

c. DVD 25 cm or 17 cm

d. Pen 16 cm or 1 m

e. Swimming pool 50m or 150 cm

3. The width of your pinky finger is about 1 cm.

Measure the length of the lines using your pinky finger. Write your estimate.

a. Line A _____

Line A is about _____ cm long.

b. Line B _____

Line B is about _____ cm long.

c. Line C _____

Line C is about _____ cm long.

d. Line D _____

Line D is about _____ cm long.

e. Line E _____

Line E is about _____ cm long.



Topic C

Measure and Compare Lengths Using Different Length Units

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

Focus Standard:	2.MD.1	Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
	2.MD.2	Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
	2.MD.4	Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.
Instructional Days:	2	
Coherence	-Links from:	GK–M3 Comparison of Length, Weight, Capacity, and Numbers to 10
		G1–M6 Place Value, Comparison, Addition and Subtraction to 100
	-Links to:	G3–M2 Place Value and Problem Solving with Units of Measure
		G3–M4 Multiplication and Area
		G3–M7 Geometry and Measurement Word Problems

In Topic C, students use different length units to measure and compare lengths. They practice applying their knowledge of centimeters and meters to choose an appropriate measurement tool in Lesson 6. Students 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 non-standard length units and can make inferences about the relative size of objects.

A Teaching Sequence Towards Mastery of Measuring and Comparing Lengths Using Different Length Units

Objective 1: Measure and compare lengths using centimeters and meters.
(Lesson 6)

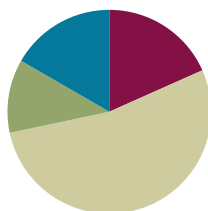
Objective 2: Measure and compare lengths using standard metric length units and non-standard length units; relate measurement to unit size.
(Lesson 7)

Lesson 6

Objective: Measure and compare lengths using centimeters and meters.

Suggested Lesson Structure

■ Fluency Practice	(11 minutes)
■ Application Problem	(7 minutes)
■ Concept Development	(32 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (11 minutes)

- Happy Counting **2.NBT.2** (2 minutes)
- Sprint: Find the Longer Length **2.NBT.4** (9 minutes)

Happy Counting (2 minutes)

Materials: (T) 2 meter sticks

Note: Students fluently count by tens crossing the hundred and relate it to metric units.

- T: Let's do some Happy Counting in centimeters. Watch me as I pinch the meter stick where the centimeters are while we count. When I get to 100 centimeters (1 meter), I will call a volunteer to hold another meter stick.
- T: Let's count by tens, starting at 70 centimeters. When we get to 100 centimeters, we say 1 meter, and then we will go back to counting by centimeters. Ready? (Pinch the meter stick to stop on a number, moving pinched fingers up and down to lead students in Happy Counting by tens on the meter stick.)
- S: 70 cm, 80 cm, 90 cm, 1 m, 110 cm, 120 cm. (Switch direction.) 110 cm, 1 m, 90 cm, 80 cm. (Switch direction.) 90 cm, 1 m, 110 cm, 120 cm.
- T: Now, let's say it with meters and centimeters. Let's start at 80 centimeters. Ready?
- S: 80 cm, 90 cm, 1 m, 1 m 10 cm, 1 m 20 cm, 1 m 30 cm, 1 m 40 cm. (Switch direction.) 1 m 30 cm, 1 m 20 cm. (Switch direction.) 1 m 30 cm, 1 m 40 cm, 1 m 50 cm, 1 m 60 cm, 1 m 70 cm, 1 m 80 cm, 1 m 90 cm, 2 m.

Sprint: Find the Longer Length (9 minutes)

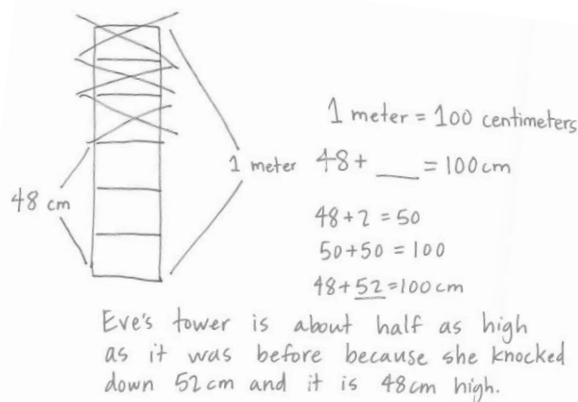
Materials: (S) Find the Longer Length Sprint

Note: Students prepare for comparing lengths in the lesson by identifying the longer length in a Sprint.

Application Problem (7 minutes)

Eve builds a block tower that reaches the height of her bedroom doorknob, which is 1 meter high. Her little sister knocks some blocks down. Eve measures her new tower, and it is 48 centimeters tall. How does Eve's new tower compare to when it was first built? Draw a picture on your personal board and use numbers or words to explain your thinking.

Note: In Lesson 5, students used mental benchmarks to estimate various lengths. This problem connects the concept of mental benchmarks to the language of comparisons. The question above is open-ended in nature, so student responses may vary from simple comparisons (e.g., it's smaller now) to exact calculations, or even to the observation that it is now about half the size of the original tower. This problem serves as a bridge to today's Concept Development, wherein students are asked to measure and compare various lengths to determine which is longer and which is shorter.



NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

Couple comparative vocabulary with illustrative gestures and questions such as the following:

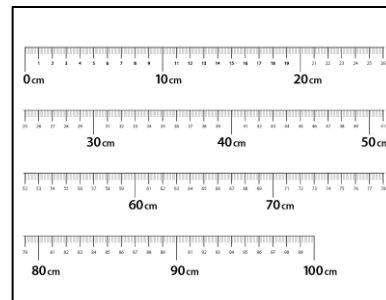
- Who is taller? Shorter? (Ask with students standing back to back.)
- How wide is this shoe? How long? Which shoe is longer? Which shoe is shorter?
- Point to visuals while speaking to highlight the corresponding vocabulary.

Concept Development (32 minutes)

Materials: (S) Personal white board, centimeter ruler, meter strip (Template), 2 sheets of paper per pair

Note: Meter strips can be made either in advance of the lesson or by students during the lesson.

- T: I want to know: How long is the paper? With your pencil, label this side A. (Point to the longer side.)
- S: (Write an A along the length of the paper.)
- T: Use your **meter strip** to measure Side A, then write the measurement.
- S: (Measure and record.)
- T: Label this side B. (Point.)
- S: (Write a B along the width of the paper.)
- T: How wide is the paper? Measure Side B and record the measurement.
- S: (Measure and record.)
- T: Which side is longer, Side A or Side B?
- S: Side A.



MP.2

- T: How can I find out how much longer? Figure out a way with your partner.
- S: Put two of them next to each other to see. → You could measure. → Measure and subtract.
- T: Go to your seat with your partner and find out: How much longer is Side A than Side B?

Students go to their seats with two pieces of paper and solve the problem. Allow two–three minutes for students to complete the task. Observe student strategies to choose who will share. Select two or three students who use different approaches to share with the class.

MP.2

- T: Who would like to share the strategy they used?
- S: I lined up the two pieces of paper and measured the one that was sticking out. → I measured both sides and counted on.
- T: What strategy could you use if you only had one piece of paper?
- S: Measure and add on! → Measure and subtract!
- T: (Model measuring the difference in length using both strategies.)

Repeat the process above using the meter strips to measure and compare the lengths of other objects around the room (e.g., desks and classroom board, the width of the door and the height of the door, the length of a bookcase and the height of a bookcase, student desk and teacher desk). Allow students to record their measurements and work on their personal white boards or in their math journals. Then, have students complete the Problem Set.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Measure and compare lengths using centimeters and meters.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

The language of comparison may be particularly challenging for English language learners. Scaffold understanding of Problem 5 in the Problem Set using these techniques:

- Break down the problem into small, workable chunks (e.g., “If Alice’s ribbon is 1 meter long, how many centimeters long is her ribbon?”)
- Reframe the comparing sentence (e.g., “How much *more* ribbon does Alice have than Carol?”)
- Teach students to ask themselves questions. “What type of problem is this? What do I know? What is unknown?”

These scaffolds also support Problem 6 on the Problem Set.

You may choose to use any combination of the questions below to lead the discussion.

- For Problems 1–3, discuss with your partner how you determined the difference in length of the lines you measured. What is interesting about Line F in Problem 3?
- How did finding the missing addend in Problem 4 help you to answer Problem 5?
- Explain to your partner how you solved Problem 6 or Problem 7. How did you show your thinking?
- When you were measuring the paper today, how did your strategy change the second time you solved the problem? Which strategy was more efficient and accurate?
- How would you convince me that there is a benefit to measuring with centimeters versus meters? How about a ruler versus a **meter strip**?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 6 Problem Set 2•2

Name Sima Date _____

Measure each set of lines in centimeters and write the length on the line. Complete the comparison sentences.

1. Line A _____
Line B _____
a. Line A measured about 15 cm. b. Line B measured about 5 cm.
c. Line A is about 10 cm longer than Line B. $15 - 5 = 10$

2. Line C _____
Line D _____
a. Line C measured about 8 cm. b. Line D measured about 9 cm.
c. Line C is about 1 cm shorter than Line D. $9 - 8 = 1$

3. Line E _____
Line F _____
Line G _____
a. Line E measured about 4 cm. b. Line F measured about 7 cm.
c. Line G measured about 8 cm. d. Lines E, F, and G are about 19 cm combined.
e. Line E is about 3 cm shorter than Line F. $7 - 4 = 3$ $4 + 7 + 8 = 19$
f. Line E is about 4 cm shorter than Line G. $8 - 4 = 4$ $4 + 5 + 10 = 19$
g. Line G is about 1 cm longer than Line F. $8 - 7 = 1$ $7 + 7 = 14$
h. Line F doubled is about 6 cm longer than Line G. $14 - 8 = 6$ $4 + 2 = 6$

COMMON CORE Lesson 6: Date: 5/3/14 Measure and compare lengths using centimeters and meters. engage^{ny} 2.C.9

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NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 6 Problem Set 2•2

4. Daniel measured the heights of some young trees in the orchard. He wants to know how many more centimeters are needed to have a height of 1 meter. Fill in the blanks.

90 cm + 10 cm = 1 m
80 cm + 20 cm = 1 m
85 cm + 15 cm = 1 m $85 + 5 = 90$ $90 + 10 = 100$
81 cm + 19 cm = 1 m $81 + 9 = 90$ $90 + 10 = 100$

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?

$76 + ? = 100$
 $76 + 4 = 80$ $80 + 20 = 100$ $4 + 20 = 24$
 $76 + 24 = 100$ Alice's ribbon is 24 cm longer than Carol's.

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

Cricket 52 cm
Grasshopper 19 cm
 $52 + 19 = 71$
The grasshopper jumped 71 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. $24 - 12 = 12$

Draw the rectangle and label the sides.

What is the total length of all four sides? 72 cm.
 $12 + 12 + 24 + 24 = 72$ $4 + 20 + 18 + 30 = 72$ $4 + 18 + 50 = 72$ $2 + 20 + 50 = 72$

COMMON CORE Lesson 6: Date: 5/3/14 Measure and compare lengths using centimeters and meters. engage^{ny} 2.C.10

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A

Correct _____

Circle the longer length.

1	1 cm	0 cm	23	110 cm	101 cm
2	11 cm	10 cm	24	110 cm	1 m
3	11 cm	12 cm	25	1 m	111 cm
4	22 cm	12 cm	26	101 cm	1 m
5	29 cm	30 cm	27	111 cm	101 cm
6	31 cm	13 cm	28	112 cm	102 cm
7	43 cm	33 cm	29	110 cm	115 cm
8	33 cm	23 cm	30	115 cm	105 cm
9	35 cm	53 cm	31	106 cm	116 cm
10	50 cm	35 cm	32	108 cm	98 cm
11	55 cm	45 cm	33	119 cm	99 cm
12	50 cm	55 cm	34	131 cm	133 cm
13	65 cm	56 cm	35	133 cm	113 cm
14	66 cm	56 cm	36	142 cm	124 cm
15	66 cm	86 cm	37	144 cm	114 cm
16	86 cm	68 m	38	154 cm	145 cm
17	68 cm	88 cm	39	155 cm	152 cm
18	89 cm	98 cm	40	198 cm	199 cm
19	99 cm	98 m	41	215 cm	225 cm
20	99 cm	1 m	42	252 cm	255 cm
21	1 m	101 cm	43	2 m	295 cm
22	1 m	90 cm	44	3 m	295 cm

B Improvement _____ # Correct _____

Circle the longer length.

1	0 cm	1 cm	23	111 cm	101 cm
2	10 cm	12 cm	24	101 cm	110 cm
3	12 cm	11 cm	25	1 m	110 cm
4	32 cm	13 cm	26	111 cm	1 m
5	39 cm	40 cm	27	113 cm	117 cm
6	41 cm	14 cm	28	112 cm	111 cm
7	44 cm	40 cm	29	115 cm	105 cm
8	44 cm	54 cm	30	106 cm	116 cm
9	55 cm	65 cm	31	107 cm	117 cm
10	60 cm	59 cm	32	118 cm	108 cm
11	65 cm	45 cm	33	119 cm	120 cm
12	70 cm	65 cm	34	132 cm	123 cm
13	75 cm	57 cm	35	133 cm	132 cm
14	77 cm	76 cm	36	143 cm	134 cm
15	87 cm	78 cm	37	144 cm	114 cm
16	79 cm	97 m	38	154 cm	145 cm
17	79 cm	88 cm	39	155 cm	152 cm
18	98 cm	97 cm	40	195 cm	199 cm
19	99 cm	1 m	41	225 cm	152 cm
20	99 cm	100 cm	42	252 cm	255 cm
21	101 cm	100 cm	43	2 m	295 cm
22	1 m	101 cm	44	3 m	295 cm

Name _____

Date _____

Measure each set of lines in centimeters, and write the length on the line. Complete the comparison sentences.

1. Line A _____

Line B _____

- a. Line A measured about _____ cm. b. Line B measured about _____ cm.
c. Line A is about _____ cm longer than Line B.

2. Line C _____

Line D _____

- a. Line C measured about _____ cm. b. Line D measured about _____ cm.
c. Line C is about _____ cm shorter than Line D.

3. Line E _____

Line F _____

Line G _____

- a. Line E measured about _____ cm. b. Line F measured about _____ cm.
c. Line G measured about _____ cm. d. Lines E, F, and G are about _____ cm combined.
e. Line E is about _____ cm shorter than Line F.
f. Line E is about _____ cm shorter than Line G.
g. Line G is about _____ cm longer than Line F.
h. Line F doubled is about _____ cm longer than Line G.

4. Daniel measured the heights of some young trees in the orchard. He wants to know how many more centimeters are needed to have a height of 1 meter. Fill in the blanks.

$$90 \text{ cm} + \underline{\hspace{2cm}} \text{ cm} = 1 \text{ m}$$

$$80 \text{ cm} + \underline{\hspace{2cm}} \text{ cm} = 1 \text{ m}$$

$$85 \text{ cm} + \underline{\hspace{2cm}} \text{ cm} = 1 \text{ m}$$

$$81 \text{ cm} + \underline{\hspace{2cm}} \text{ cm} = 1 \text{ m}$$

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?

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

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

Draw the rectangle and label the sides.

What is the total length of all four sides? cm

Name _____

Date _____

Measure the length of each line and compare.

Line M _____

Line N _____

Line O _____

1. Line M is about _____ cm longer than Line O.
2. Line N is about _____ cm shorter than Line M.
3. Line N doubled would be about _____ cm (longer/shorter) than Line M.

Name _____

Date _____

Measure each set of lines in centimeters, and write the length on the line. Complete the comparison sentences.

1. Line A _____
Line B _____

- a. Line A is about _____ cm longer than line B.
b. Line A and B are about _____ cm combined.

2. Line X _____
Line Y _____
Line Z _____

- a. Line X measured about _____ cm.
b. Line Y measured about _____ cm.
c. Line Z measured about _____ cm.
d. Lines X, Y, and Z are about _____ cm combined.
e. Line Z is about _____ cm shorter than Line X.
f. Line X is about _____ cm shorter than Line Y.
g. Line Y is about _____ cm longer than Line Z.
h. Line X doubled is about _____ cm longer than line Y.

3. Line J is 60 cm long. Line K is 85 cm long. Line L is 1 m long.

- a. Line J is _____ cm shorter than line K.
b. Line L is _____ cm longer than line K.
c. Line J doubled is _____ cm more than line L.
d. Lines J, K, and L combined are _____ cm.

4. Katie measured the seat height of four different chairs in her house. Here are her results:

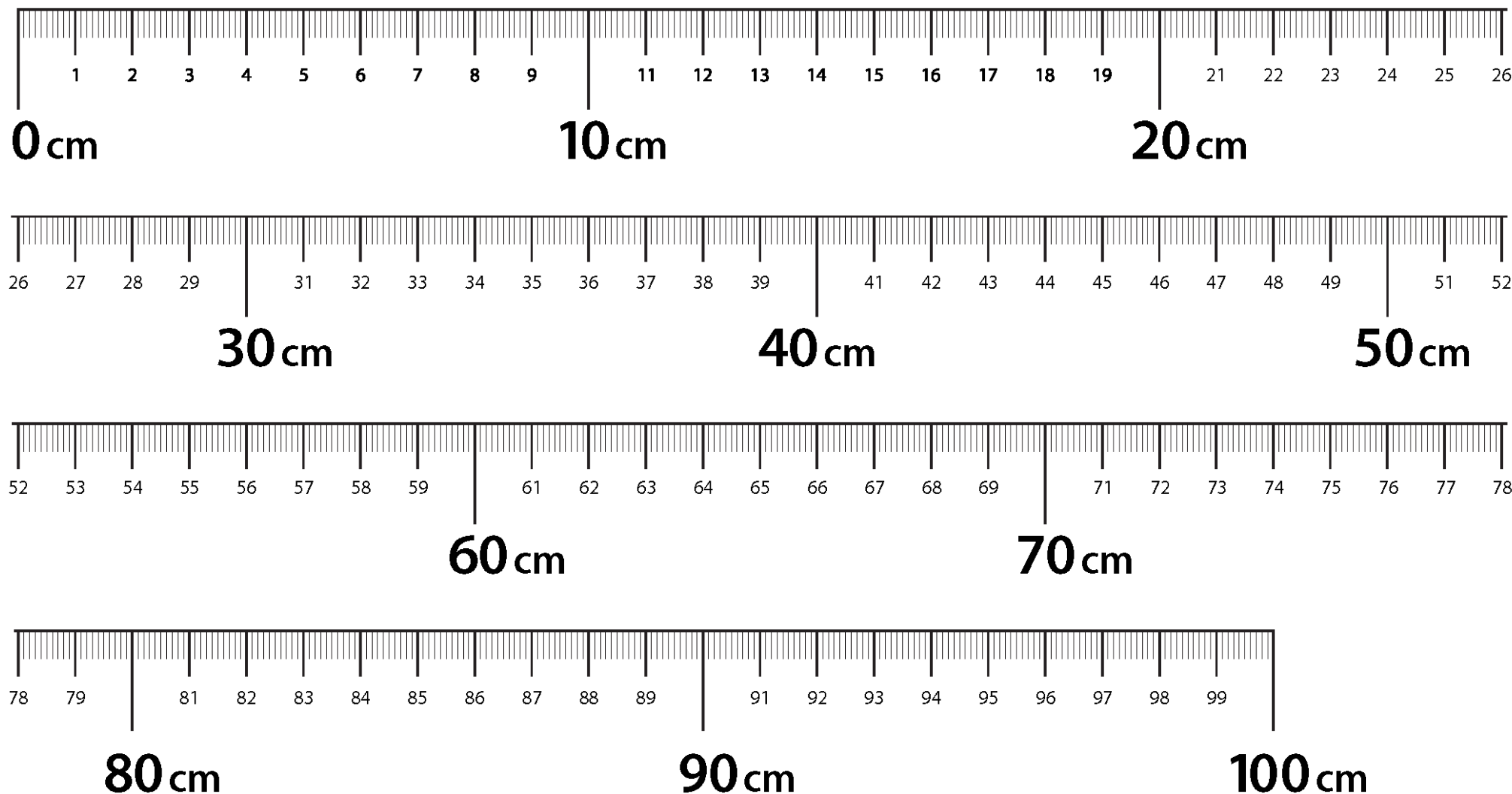
Loveseat height: 51 cm

Dining room chair height: 55 cm

Highchair height: 97 cm

Counter stool height: 65 cm

- How much shorter is the dining room chair than the counter stool? _____ cm
 - How much taller is the highchair than the loveseat? _____ cm
 - What is the difference between the height of tallest chair and the height of the shortest chair? _____ cm
 - How much taller is a meter stick than the counter stool? _____ cm
 - How much taller is a meter stick than the loveseat? _____ cm
5. Max ran 15 meters this morning. This afternoon, he ran 48 meters.
- How many more meters did he run in the afternoon?
 - How many meters did Max run in all?
6. The length of the tabletop is 2 meters long. If the tablecloth on the table is 256 centimeters, how much longer is the tablecloth than the tabletop?



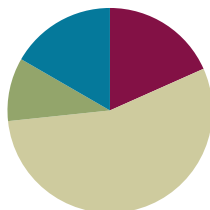
meter strip

Lesson 7

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

Suggested Lesson Structure

■ Fluency Practice	(11 minutes)
■ Application Problem	(6 minutes)
■ Concept Development	(33 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (11 minutes)

- Which Is Shorter? **2.MD.4** (2 minutes)
- Sprint: Subtraction **2.NBT.5** (9 minutes)

Which Is Shorter? (2 minutes)

Note: Students prepare for comparing lengths by identifying the shorter length and providing the number sentence to find the difference.

- T: I am going to say two lengths. Tell me which length is shorter. Ready? 6 centimeters and 10 centimeters.
- S: 6 centimeters.
- T: Give the number sentence to find how much shorter.
- S: $10\text{ cm} - 6\text{ cm} = 4\text{ cm}$.

Continue with the following possible sequence: 12 cm and 22 cm, 16 cm and 20 cm, 20 cm and 13 cm, 20 cm and 9 cm, 9 cm and 19 cm, 24 cm and 14 cm, 12 cm and 24 cm, 23 cm and 15 cm, and 18 cm and 29 cm.

Sprint: Subtraction (9 minutes)

Materials: (S) Subtraction Sprint

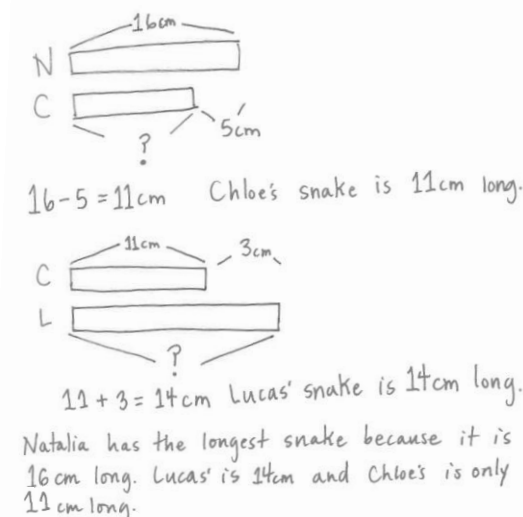
Note: Students practice their simple subtraction skills in preparation for the lesson content.

Application Problem (6 minutes)

Natalia, Chloe, and Lucas are making clay snakes. Natalia's snake is 16 centimeters long. Chloe's snake is 5 centimeters shorter than Natalia's. How long is Chloe's snake? Draw a picture and use numbers to explain your thinking.

Lucas's snake is 3 centimeters longer than Chloe's snake. Who has the longest snake: Natalia, Lucas, or Chloe? Add to your picture and use numbers to explain your thinking.

Note: This multiple-step problem presents a challenge for students to extend their understanding of measuring and comparing. Students are asked to connect addition and subtraction concepts to comparison language and to draw a conclusion.



Concept Development (33 minutes)

Materials: (S) Personal white board, 1 30 centimeter ruler (various types, e.g., wood, plastic, tape, etc.), 1 baggie per pair (containing 1 straw, 1 new crayon, 1 wedge eraser, 1 square sticky note, 30 paper clips)

Note: Prepare half of the baggies with small paper clips and half the baggies with large paper clips. Use only one size paper clip per table so partners don't see that they are different sizes.

- T: Measure your straw with your paper clips.
S: (Measure.)
T: How long is the straw?
S: 6 paper clips long. → About 5 paper clips long.
T: (Record measurements on the board.)
T: Why do you think the measurements are different?
Turn and talk.
S: Maybe they didn't start at the beginning of the straw.
→ They measured wrong.
T: Take out your crayon and measure with your paper clips. Share your measurement with your partner.



NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Extend thinking by connecting to real world experiences. Ask students, "What are some other items you might use to measure your straw?" Students will identify objects that are easy to use as a measure: erasers, fingers, crayons, etc., either by using mark and move forward or by laying multiple copies.

Students continue to measure the other items in their baggies. After each item, discuss and record the unit measure (in paper clips) of each item. Notice that measurements are different, but do not explain why.

T: Let's switch baggies with our neighbors and measure again.

Tables now switch bags and measure all items in the baggie using the other size paper clip. Record

measurements on the board. Have students discuss the difference between the measurements made using the large paper clips and those using the small paper clips.

T: Do you know why your measurements were different?

S: We had different size paper clips!

T: Why does the size of my paper clip matter?

S: You can fit more small paper clips than big paper clips along the side of the item.

T: What does that tell you about measurement and unit size?

S: If it's a small unit size, you get a bigger measurement number.

T: Let's measure again using small and big paper clips mixed together.

S: (Use varying amounts of small and big paper clips to measure their straws.)

T: What were your results? (Record results.)

T: Why are all these measurements different?

S: We all had different sizes. → Some people had lots of big paper clips.

T: So, if I wanted to order a table and I told you I want it to be 80 paper clips long, what might happen?

S: They wouldn't know which one you want. → You could get a big table or a tiny table.

T: (Pass out different types of centimeter rulers, e.g., tape measures, wooden rulers, plastic rulers. Have students re-measure each object in their baggies. Record the measurements on the board in centimeters.)

T: What do you notice about the measurement of the object when you use a centimeter ruler?

S: The measurements for each object are the same even if the ruler looks different.

T: What is the same about all the rulers?

S: They are the same, except one is wood and one is plastic. → The rulers all have centimeters. → The centimeters are all the same size.

T: Why is it more efficient to measure with a centimeter instead of paper clips?

S: Because everyone knows how big a centimeter is. → All centimeters are the same.



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Inverse relationships require thoughtful consideration because they seem to challenge logic and reasoning.

Post sentence frames for English language learners for reference during the Debrief:

"The _____ the unit, the _____ number of units in a given measurement."

Invite students to brainstorm real-life examples of inverse relationships. (e.g., The longer you sleep in the morning, the less time you have to get ready for school.)

MP.3

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

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

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Turn to your partner and compare your answers to Problems 1 and 2. Which math strategies did you use to determine which line was longer or shorter?
- Look at Problem 5. Turn and talk to your partner about why Christina's answer is incorrect.
- Do you think that paper clips are a reliable measurement tool? Is a ruler a better measurement tool? Why?
- What did you notice about the relationship between the unit of length (e.g., paper clips, centimeters) and the number of units needed to measure the lines? Use comparative words (*bigger, smaller, greater, fewer*) in your response.
- Let's think back to our Application Problem. Would it have been possible to accurately compare the lengths of the clay snakes with a non-standard length unit? What challenges can you predict?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 7 Problem Set 2•2

Name Stephanie Date _____

Measure each set of lines with one small paper clip, using mark and move forward. Measure each set of lines in centimeters using a ruler.

1. Line A _____

Line B _____

a. Line A is about 3 paper clips long. b. Line A is about 4 cm long.

c. Line B is about 2 paper clips long. d. Line B is about 6 cm long.

e. Line B is about 1 paper clips shorter than Line A.

f. Line A is about 3 cm longer than Line B.

2. _____ Line L

_____ Line M

a. Line L is about 3 paper clips long. b. Line L is about 4 cm long.

c. Line M is about 1 paper clips long. d. Line M is about 3 cm long.

e. Line L is about 2 paper clips longer than Line M.

f. Line M doubled is about 3 cm shorter than Line L.

3. Draw a line that is 18 cm long and another line below it that is 12 cm long. Label the 18-cm line R and the 12-cm line S.

R _____

S _____

a. Line R measured about 6 paper clips.

b. Line S measured about 4 paper clips.

COMMON CORE Lesson 7: Measure and compare lengths using standard metric length units and non-standard length units; relate measurement to unit size. 5/22/14 engage^{ny} 2.C.22

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 7 Problem Set 2•2

4. Draw a line that is 6 cm long and another line below it that is 15 cm long. Label the 6-cm line C and the 15-cm line D.

C _____

D _____

a. Line C is about 2 paper clips long.

b. Line D is about 5 paper clips long.

c. Line D is about 9 cm longer than Line C. $15 - 6 = 9$

d. Line C is about 3 paper clips shorter than Line D. $5 - 2 = 3$

e. Lines C and D are about 7 paper clips long.

f. Lines C and D are about 21 centimeters long. $15 + 6 = 21$

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

Line F _____

Line G _____

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 incorrect because the quarters are bigger than the pennies so it doesn't matter that it takes more pennies.

COMMON CORE Lesson 7: Measure and compare lengths using standard metric length units and non-standard length units; relate measurement to unit size. 5/22/14 engage^{ny} 2.C.23

A

Correct _____

Subtract.

1	$3 - 1 =$		23	$8 - 7 =$	
2	$13 - 1 =$		24	$18 - 7 =$	
3	$23 - 1 =$		25	$58 - 7 =$	
4	$53 - 1 =$		26	$62 - 2 =$	
5	$4 - 2 =$		27	$9 - 8 =$	
6	$14 - 2 =$		28	$19 - 8 =$	
7	$24 - 2 =$		29	$29 - 8 =$	
8	$64 - 2 =$		30	$69 - 8 =$	
9	$4 - 3 =$		31	$7 - 3 =$	
10	$14 - 3 =$		32	$17 - 3 =$	
11	$24 - 3 =$		33	$77 - 3 =$	
12	$74 - 3 =$		34	$59 - 9 =$	
13	$6 - 4 =$		35	$9 - 7 =$	
14	$16 - 4 =$		36	$19 - 7 =$	
15	$26 - 4 =$		37	$89 - 7 =$	
16	$96 - 4 =$		38	$99 - 5 =$	
17	$7 - 5 =$		39	$78 - 6 =$	
18	$17 - 5 =$		40	$58 - 5 =$	
19	$27 - 5 =$		41	$39 - 7 =$	
20	$47 - 5 =$		42	$28 - 6 =$	
21	$43 - 3 =$		43	$49 - 4 =$	
22	$87 - 7 =$		44	$67 - 4 =$	

Name _____ Date _____

Measure each set of lines with one small paper clip, using mark and move forward.

Measure each set of lines in centimeters using a ruler.

1. Line A _____

Line B _____

- a. Line A is about _____ paper clips long.
- b. Line A is about _____ cm long.
- c. Line B is about _____ paper clips long.
- d. Line B is about _____ cm long.
- e. Line B is about _____ paper clips shorter than Line A.
- f. Line A is about _____ cm longer than Line B.

2. _____ Line L

_____ Line M

- a. Line L is about _____ paper clips long.
- b. Line L is about _____ cm long.
- c. Line M is about _____ paper clips long.
- d. Line M is about _____ cm long.
- e. Line L is about _____ paper clips longer than Line M.
- f. Line M doubled is about _____ cm shorter than Line L.

3. Draw a line that is 18 cm long and another line below it that is 12 cm long.
Label the 18 cm line R and the 12 cm line S.

- a. Line R measured about _____ paper clips.
- b. Line S measured about _____ paper clips.

4. Draw a line that is 6 cm long and another line below it that is 15 cm long.

Label the 6 cm line *C* and the 15 cm line *D*.

- a. Line *C* is about _____ paper clips long.
 - b. Line *D* is about _____ paper clips long.
 - c. Line *D* is about _____ cm longer than Line *C*.
 - d. Line *C* is about _____ paper clips shorter than Line *D*.
 - e. Lines *C* and *D* together are about _____ paper clips long.
 - f. Lines *C* and *D* together are about _____ centimeters long.
5. Christina measured Line *F* with quarters and Line *G* with pennies.

Line *F*



Line *G*



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.

Name _____

Date _____

Measure the lines with small paper clips and then with a centimeter ruler. Then, answer the questions below.

Line 1 _____

Line 2 _____

Line 3 _____

a. Line 1 is about _____ paper clips long.

b. Line 1 is about _____ cm long.

c. Line 2 is about _____ paper clips long.

d. Line 2 is about _____ cm long.

e. Line 3 is about _____ paper clips long.

f. Line 3 is about _____ cm long.

Explain why each measurement has more centimeters than paper clips.

Name _____ Date _____

Use a centimeter ruler and paper clips to measure and compare lengths.

1. _____ Line Z

- a. Line Z is about _____ paper clips long. b. Line Z is about _____ cm long.
c. Line Z doubled would measure about _____ paper clips or about _____ cm long.

2. _____ Line A

_____ Line B

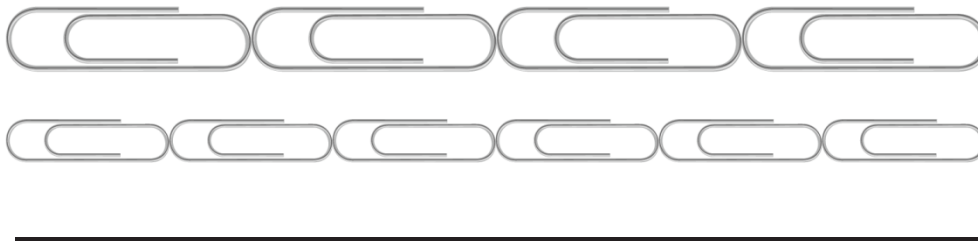
- a. Line A is about _____ paper clips long. b. Line A is about _____ cm long.
c. Line B is about _____ paper clips long. d. Line B is about _____ cm long.
e. Line A is about _____ paper clips longer than Line B.
f. Line B doubled is about _____ cm shorter than Line A.

3. Draw a line that is 9 cm long and another line below it that is 12cm long.

Label the 9 cm line F and the 12 cm line G.

- a. Line F is about _____ paper clips long.
b. Line G is about _____ paper clips long.
c. Line G is about _____ cm longer than Line F.
d. Line F is about _____ paper clips shorter than Line G.
e. Lines F and G are about _____ paper clips long.
f. Lines F and G are about _____ centimeters long.

4. Line X is 1 meter. Line Y is 89 centimeters.
- Line X is _____ centimeters.
 - Which line is longer? Line X Line Y c. How much longer? _____ cm
5. Line P is 2 meters. Line Q is 300 centimeters.
- Line P is _____ centimeters.
 - Line Q is _____ meters.
 - Which line is longer? Line P Line Q
 - How much longer? _____
6. Jordan measured the length of a line with large paper clips. His friend measured the length of the same line with small paper clips.



- About how many paper clips did Jordan use? _____ large paper clips
- About how many small paper clips did his friend use? _____ small paper clips
- Why did Jordan's friend need more paper clips to measure the same line as Jordan?



Topic D

Relate Addition and Subtraction to Length

2.MD.5, 2.MD.6, 2.MD.1, 2.MD.3, 2.MD.4

Focus Standard:	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:	GK–M3	Comparison of Length, Weight, Capacity, and Numbers to 10
	G1–M3	Ordering and Comparing Length Measurements as Numbers
	G1–M6	Place Value, Comparison, Addition and Subtraction to 100
	G2–M7	Problem Solving with Length, Money, and Data
	-Links to:	G3–M2 Place Value and Problem Solving with Units of Measure
		G3–M4 Multiplication and Area
		G3–M7 Geometry and Measurement Word Problems

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**).

Students had their first experience creating and using a ruler as a number line in Topic A. Now, in Lesson 8, students solve addition and subtraction word problems using the ruler as a number line. This concept is reinforced and practiced throughout the module in fluency activities that involve using the meter strip for counting on and counting back and is incorporated into the accompanying Problem Sets. In Lesson 9, students progress from concrete to abstract by creating tape diagrams to represent and compare lengths. Lesson 10 culminates with students solving two-step word problems involving measurement using like units.

A Teaching Sequence Towards Mastery of Relating Addition and Subtraction to Length

Objective 1: Solve addition and subtraction word problems using the ruler as a number line.
(Lesson 8)

Objective 2: Measure lengths of string using measurement tools, and use tape diagrams to represent and compare lengths.
(Lesson 9)

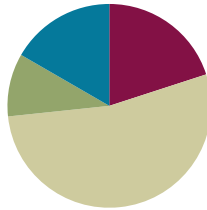
Objective 3: Apply conceptual understanding of measurement by solving two-step word problems.
(Lesson 10)

Lesson 8

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

Suggested Lesson Structure

■ Fluency Practice	(12 minutes)
■ Application Problem	(6 minutes)
■ Concept Development	(32 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (12 minutes)

- How Many More to Make a Meter? **2.MD.4** (3 minutes)
- Sprint: Making a Meter **2.MD.4** (9 minutes)

How Many More to Make a Meter? (3 minutes)

Note: This activity extends upon the make a ten strategy within the metric system in preparation for the Sprint. It also reinforces that 1 meter is composed of 100 centimeters.

- T: For every number of centimeters I say, you say the number needed to make a meter. If I say 70 centimeters, you say 30 centimeters. Ready?
- T: 70 centimeters.
- S: 30 centimeters.
- T: Number sentence.
- S: $70\text{ cm} + 30\text{ cm} = 1\text{ m}$.
- T: 40 centimeters.
- S: 60 centimeters.
- T: Number sentence.
- S: $40\text{ cm} + 60\text{ cm} = 1\text{ m}$.

Continue with the following possible sequence: 20 cm, 90 cm, 10 cm, 9 cm, 11 cm, 50 cm, 49 cm, and 51 cm.

Sprint: Making a Meter (9 minutes)

Materials: (S) Making a Meter Sprint

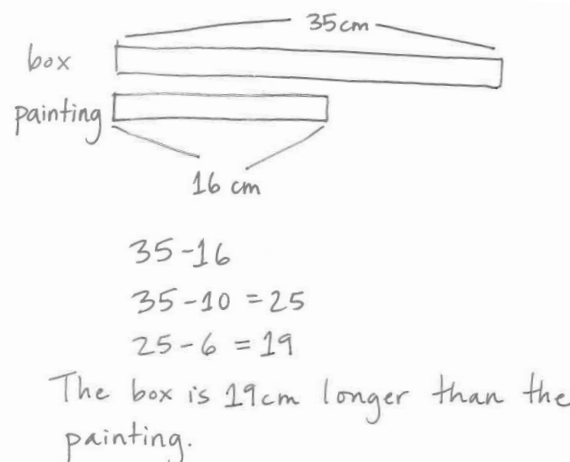
Note: Students use the make a ten strategy to compose 1 meter.

Application Problem (6 minutes)

For Valentine's Day, Suzie is mailing a painting to her Nana. The painting is 16 centimeters long. The gift box is 35 centimeters long. How much longer is the gift box than the painting? Draw a picture to show your work.

Extension: What would happen if Suzie's meter strip was torn and started at 1 centimeter instead of zero? Would she still be able to measure? (Students orally defend their reasoning.)

Note: The problem allows for practice of *compare with difference unknown* word problems. The question sets the stage for today's objective as students use their prior knowledge of movement on a number line (meter strip) to defend their reasoning as they think about Suzie's torn meter strip.



Concept Development (32 minutes)

Materials: (T) 1 piece of 12" × 18" construction paper, torn meter strip (Lesson 6 Template) (S) Meter strip (Lesson 6 Template), 1 piece of 12" × 18" construction paper, personal white board

T: I am throwing a party and want to decorate my house. I will start with my front door and put some ribbon around its edges. How can we figure out how long the ribbon should be?

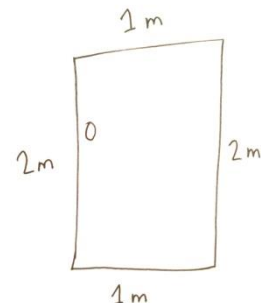
S: Figure out the length around the door using benchmarks like the height of the knob. → Measure around the door with a meter stick and make the ribbon the same length.

T: That is what I did. I used a meter stick to find the measurements. (Draw the door and label each side. The top is 1 meter, the left side is 2 meters, the bottom is 1 meter, and the right side is 2 meters.) How long does the ribbon need to be to go all the way around my door? Share with a partner.

S: 6 m. → I added all four sides and got 6 meters. → I added $2 + 2 + 1 + 1 = 6$.

T: I also want to string lights up one side of the steps leading to my front door. Help me figure out the length of the string of lights if they line the edges of the steps.

T: There are two steps. (Draw and label the diagram as shown above.) How many centimeters of lights do I need to line the entire length of both steps? Put your finger on 0 on your meter strip. Slide your finger up to 18 centimeters.



- T: To add 22 centimeters, we can think of this meter strip like a **number line**. To make a ten, what part of 22 should we add to 18 first?
- S: 2 centimeters.
- T: Yes! Slide your finger up 2 more. Where are we on the number line?
- S: We are at 20 centimeters.
- T: How many more centimeters do we need to slide our finger on the number line?
- S: 20 centimeters.
- T: Where will our finger stop?
- S: At 40 centimeters.
- T: Where will we be on the meter strip when we add the second stair? How do you know?
- S: We'll be at 80 centimeters, because you need to add $18 + 22$ again. → We'll be at 80 centimeters. You just have to double 40 centimeters.
- T: I have a string of lights that is 1 meter long. Is it long enough to reach the top of the steps?
- S: Yes, because a meter is longer than 80 centimeters.
→ Yes, because 1 meter is 100 centimeters and you only need 80 centimeters. → $100\text{ cm} - 80\text{ cm} = 20\text{ cm}$ left over.
- T: I also want to hang a party sign with this piece of string. I want to know the length of the string, but I tore my meter strip, and now it starts at 4 centimeters. (Show torn meter strip.) Can I still use it to measure?
- S: Yes. Count the number of length units. → Line the object up and measure from 4 centimeters to the end of the object, then subtract 4 centimeters.
- T: Yes! (Guide students to tear their meter strip at 4 centimeters.) Let's try that. Line up your string with the torn meter strip. Where does the string end?
- S: At 29 centimeters.
- T: Now, let's take away 4 centimeters from 29 centimeters. What is the length of the string?
- S: The string is 25 centimeters long.
- T: Yes! I also ordered a cake which is the same size as this piece of construction paper. The table I want to put it on is the same size as your desks. Can you figure out the length of the cake and the desk to see how much extra room there will be?
- T: With your partner, measure the length of the cake and desk and then find the difference. Record your answers on your personal white boards.



NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

Get students up and moving by using a number line floor mat to illustrate the idea of moving the zero point.

- Invite a student to begin at 4 and jump 25 length units. Students can count on chorally, starting at 4. Encourage them to add 1 to make 5, then count up by tens.
- Ask, "Do you notice a relationship between 0, 4, 25, 29?"

MP.2

Students measure and return to the carpet to share their answers.

- T: What strategy did you and your partner use to measure the lengths with the torn meter strip?
- S: We started at the beginning of our meter strip and counted on. → We lined up the meter strip with

the lengths and subtracted 4 centimeters from where the object stopped.

- T: What is the difference between the length of the table and the length of the cake? (For this example, assume the cake is 45 centimeters and the desk is 60 centimeters.) Give a complete number sentence.
- S: $60 \text{ cm} - 45 \text{ cm} = 15 \text{ cm}$. $\rightarrow 45 \text{ cm} + 15 \text{ cm} = 60 \text{ cm}$.
- T: So, we know we have 15 centimeters next to the cake. I'm going to put the cake at the bottom of the table. Let's repeat the process to see how much space we will have above it. Measure the width of the cake and table and find the difference.

If necessary, repeat the above process with a few more examples:

- Students measure an envelope and an invitation (index card) to see if the envelopes are the right size.
- Students measure 80 centimeters of streamer to see if it will fit across the width of the door, the width of the door being about a meter.

Otherwise, invite students to begin the Problem Set.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

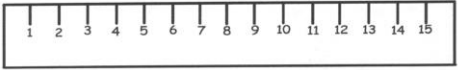
Lesson Objective: Solve addition and subtraction word problems using the ruler as a number line.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 8 Problem Set 2•2

Name Justin Date _____

1. 

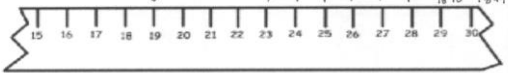
a. Line A is 8 cm long. $6 + 4 = 10$ $10 + 4 = 14$ $4 + 4 = 8$

b. Line B is 9 cm long. $2 + 9 = 11$

c. Together, Lines A and B measure 17 cm. $8 + 9 = 17$ $7 + 10 = 17$

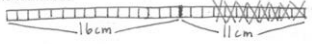
d. Line A is 1 cm (longer/shorter) than Line B. $9 - 8 = 1$

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. The cricket stopped on 19 cm.



$23 + 5 = 28$
 $28 - 9 = 19$
 $18 + 1 = 19$

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?



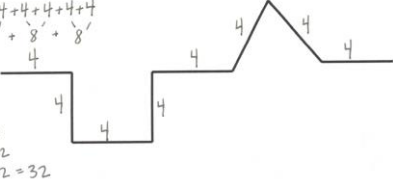
$16 + 11 = 27$
 $27 - 8 = 19$
 $17 + 2 = 19$

The train is 19 centimeter cubes long now.

COMMON CORE Lesson 8: Solve addition and subtraction word problems using the ruler as a number line. 5/3/14 engage^{ny} 2.D.9

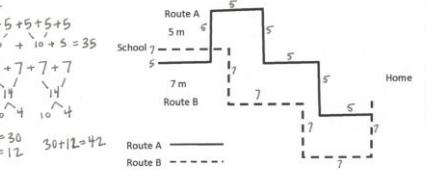
NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 8 Problem Set 2•2

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



$16 + 16 = 32$
 $4 + 12 = 32$

5. Ben took two different ways home from school to see which way was the quickest. All streets on Route A are the same length. All streets on Route B are the same length.



Route A: $5 + 5 + 5 + 5 + 5 = 25$
 $10 + 10 + 10 + 5 = 35$

Route B: $7 + 7 + 7 + 7 + 7 + 7 + 7 = 49$
 $10 + 10 + 10 = 30$
 $4 + 4 + 4 = 12$
 $30 + 12 = 42$

a. How many meters is Route A? 35 m

b. How many meters is Route B? 42 m

c. What is the difference between Route A and Route B? 7 m

d. Which route should Ben take if he wants to get home quickly? Route A

COMMON CORE Lesson 8: Solve addition and subtraction word problems using the ruler as a number line. 5/3/14 engage^{ny} 2.D.10

misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- Explain to your partner how you solved Problem 1. What similarities or differences were there in your solution methods?
- What strategies did you use to solve Problem 2 and Problem 3? Invite students to compare their drawings for Problem 3.
- How can you solve a problem with a ruler that does not start at zero?
- How is a ruler similar to a **number line**?
- Look at Problem 5. What math strategies did you need to know in order to solve this problem? (Counting on, skip counting, adding, and subtracting.)
- How did we use addition and subtraction today?



NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Invite students to come forward and model differing solution methods for Problem 5(c) on the class board.

Did anyone arrive at the same solution but in a different way? Can you explain how you solved it?

What would happen if I subtracted 7 meters from 5 meters? Could I subtract first and *then* add?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

A

Correct _____

Find the missing length to make 1 meter.

1	10 cm + _____ = 100 cm	23	_____ + 62 cm = 1 m
2	30 cm + _____ = 100 cm	24	_____ + 72 cm = 1 m
3	50 cm + _____ = 100 cm	25	_____ + 92 cm = 1 m
4	70 cm + _____ = 100 cm	26	_____ + 29 cm = 1 m
5	90 cm + _____ = 100 cm	27	_____ + 39 cm = 1 m
6	80 cm + _____ = 100 cm	28	_____ + 59 cm = 1 m
7	60 cm + _____ = 100 cm	29	_____ + 89 cm = 1 m
8	40 cm + _____ = 100 cm	30	_____ + 88 cm = 1 m
9	20 cm + _____ = 100 cm	31	_____ + 68 cm = 1 m
10	21 cm + _____ = 100 cm	32	_____ + 18 cm = 1 m
11	23 cm + _____ = 100 cm	33	_____ + 15 cm = 1 m
12	25 cm + _____ = 100 cm	34	_____ + 55 cm = 1 m
13	27 cm + _____ = 100 cm	35	44 cm + _____ = 1 m
14	37 cm + _____ = 100 cm	36	55 cm + _____ = 1 m
15	38 cm + _____ = 100 cm	37	88 cm + _____ = 1 m
16	39 cm + _____ = 100 cm	38	1 m = _____ + 33 cm
17	49 cm + _____ = 100 cm	39	1 m = _____ + 66 cm
18	50 cm + _____ = 100 cm	40	1 m = _____ + 99 cm
19	52 cm + _____ = 100 cm	41	1 m - 11 cm = _____
20	56 cm + _____ = 100 cm	42	1 m - 15 cm = _____
21	58 cm + _____ = 100 cm	43	1 m - 17 cm = _____
22	62 cm + _____ = 100 cm	44	1 m - 19 cm = _____

B

Correct _____

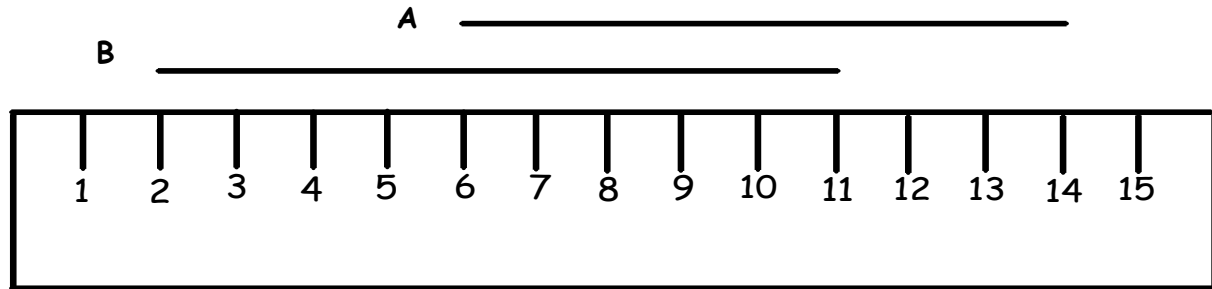
Find the missing length to make 1 meter.

1	1 cm + _____ = 100 cm	23	_____ + 72 cm = 1 m
2	10 cm + _____ = 100 cm	24	_____ + 82 cm = 1 m
3	20 cm + _____ = 100 cm	25	_____ + 28 cm = 1 m
4	40 cm + _____ = 100 cm	26	_____ + 38 cm = 1 m
5	60 cm + _____ = 100 cm	27	_____ + 48 cm = 1 m
6	80 cm + _____ = 100 cm	28	_____ + 45 cm = 1 m
7	90 cm + _____ = 100 cm	29	_____ + 43 cm = 1 m
8	70 cm + _____ = 100 cm	30	_____ + 34 cm = 1 m
9	50 cm + _____ = 100 cm	31	_____ + 24 cm = 1 m
10	30 cm + _____ = 100 cm	32	_____ + 14 cm = 1 m
11	31 cm + _____ = 100 cm	33	_____ + 12 cm = 1 m
12	33 cm + _____ = 100 cm	34	_____ + 10 cm = 1 m
13	35 cm + _____ = 100 cm	35	11 cm + _____ = 1 m
14	37 cm + _____ = 100 cm	36	33 cm + _____ = 1 m
15	39 cm + _____ = 100 cm	37	55 cm + _____ = 1 m
16	49 cm + _____ = 100 cm	38	1 m = _____ + 22 cm
17	59 cm + _____ = 100 cm	39	1 m = _____ + 88 cm
18	60 cm + _____ = 100 cm	40	1 m = _____ + 99 cm
19	62 cm + _____ = 100 cm	41	1 m - 1 cm = _____
20	66 cm + _____ = 100 cm	42	1 m - 5 cm = _____
21	68 cm + _____ = 100 cm	43	1 m - 7 cm = _____
22	72 cm + _____ = 100 cm	44	1 m - 17 cm = _____

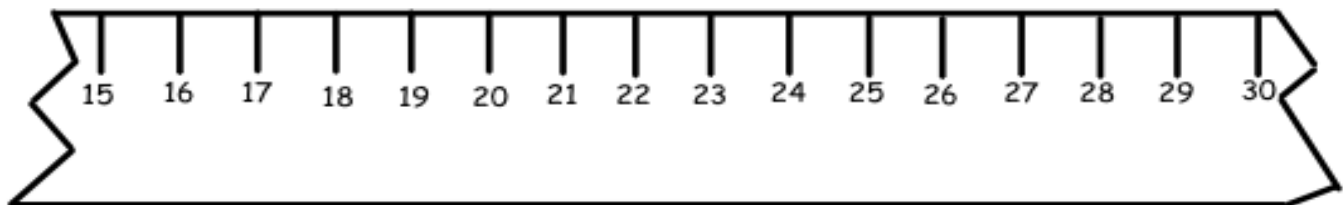
Name _____

Date _____

1.

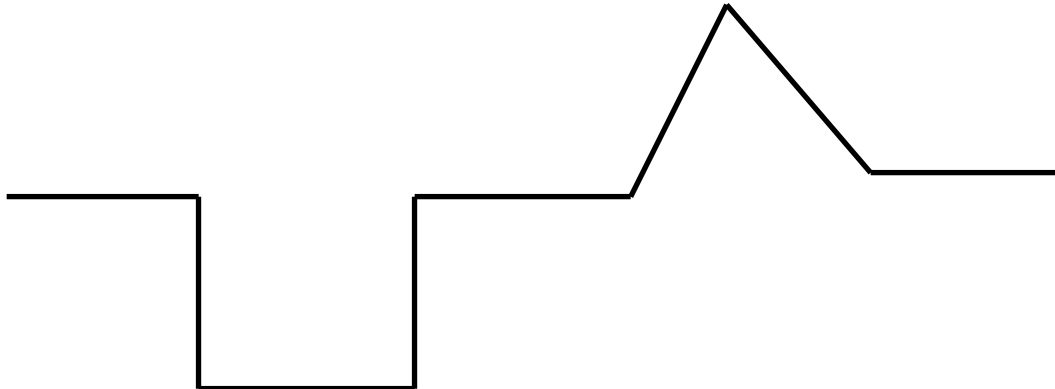


- Line A is _____ cm long.
 - Line B is _____ cm long.
 - Together, Lines A and B measure _____ cm.
 - Line A is _____ cm (longer/shorter) than Line B.
2. A cricket jumped 5 centimeters forward and 9 centimeters back, then stopped. If the cricket started at 23 on the ruler, where did the cricket stop? Show your work on the broken centimeter ruler.

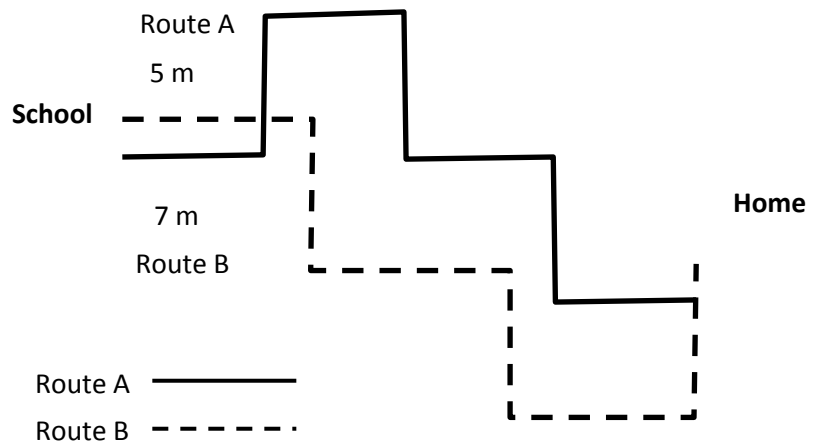


3. Marty made a train of red and yellow centimeter cubes that measured 16 centimeters in length. He added 11 more yellow cubes and removed 8 red cubes. What is the length of the train now?

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



5. Ben took two different ways home from school to see which way was the quickest. All streets on Route A are the same length. All streets on Route B are the same length.

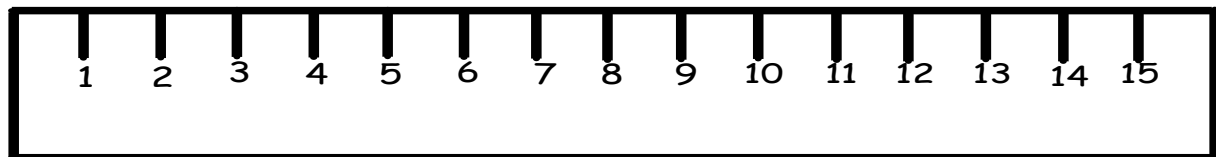


- How many meters is Route A? _____ m
- How many meters is Route B? _____ m
- What is the difference between Route A and Route B? _____ m
- Which route should Ben take if he wants to get home quickly? _____

Name _____

Date _____

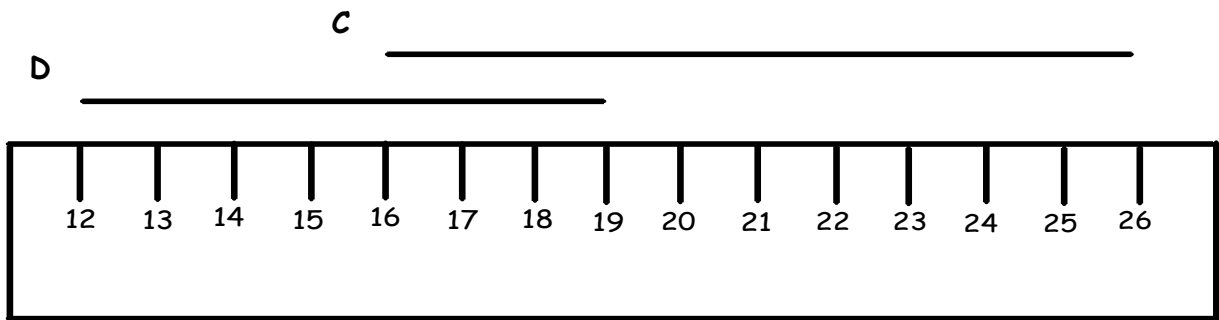
1. Use the ruler below to draw one line that begins at 2 cm and ends at 12 cm. Label that line R. Draw another line that begins at 5 cm and ends at 11 cm. Label that line S.
 - a. Add 3 cm to Line R and 4 cm to Line S.
 - b. How long is Line R now? _____ cm
 - c. How long is Line S now? _____ cm
 - d. The new Line S is _____ cm (shorter/longer) than the new Line R.



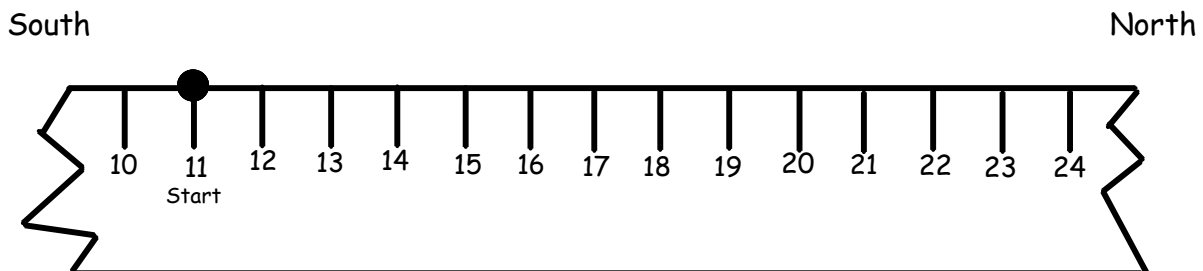
Name _____

Date _____

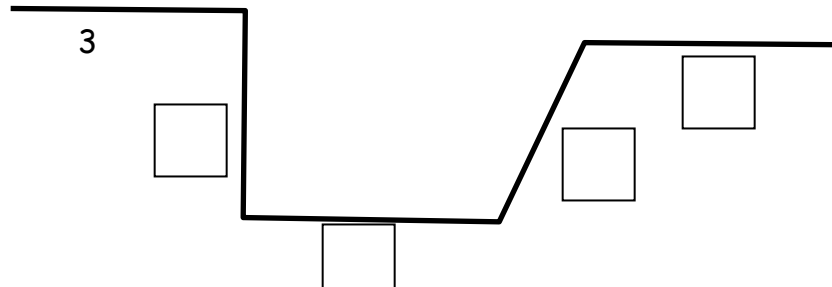
1. a. Line C is _____ cm.
- b. Line D is _____ cm.
- c. Lines C and D are _____ cm.
- d. Line C is _____ cm (longer/shorter) than Line D.



2. A cardinal flew 12 meters north and then turned around and flew 5 meters south. His starting point is marked on the ruler. Where is the cardinal now? Show your work on the broken ruler.



3. All of the parts of the path below are equal length units.



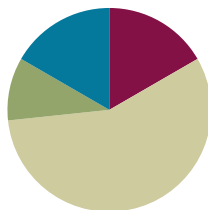
- Fill in the empty boxes with the lengths of each side.
 - The path is _____ length units long.
 - How many more parts would you need to add for the path to be 21 length units long? _____ parts
4. The length of a picture is 67 centimeters. The width of the picture is 48 centimeters. How many more centimeters is the length than the width?

Lesson 9

Objective: Measure lengths of string using measurement tools, and use tape diagrams to represent and compare lengths.

Suggested Lesson Structure

■ Fluency Practice	(10 minutes)
■ Application Problem	(6 minutes)
■ Concept Development	(34 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (10 minutes)

- Meter Strip Addition: Adding Multiples of 10 to Numbers **2.NBT.5** (6 minutes)
- Happy Counting by Centimeters **2.NBT.2** (4 minutes)

Meter Strip Addition: Adding Multiples of 10 to Numbers (6 minutes)

Materials: (S) Meter strip (Lesson 6 Template) (as pictured)

Note: Students apply knowledge of using the ruler as a number line to fluently add multiples of 10. The meter strip solidifies the process for visual and tactile learners, and creates the groundwork for students to make tape diagrams in the lesson.

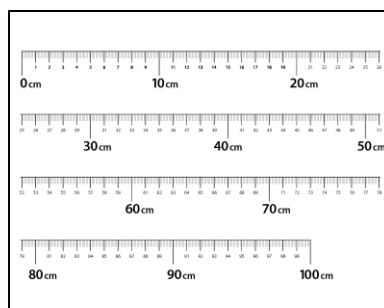
T: (Each student has a meter strip.) Put your finger on 0 to start. I'll say the whole measurement. Slide up to that number. Add 10 centimeters and tell me how many centimeters your finger is from 0.

T: Let's try one. Fingers at 0 centimeters! (Pause.) 30 centimeters.

S: (Slide their fingers to 30.)

T: Remember to add 10. (Pause.) How far is your finger from 0?

S: 40 centimeters.



Continue with the following possible sequence: 45 cm, 51 cm, 63 cm, 76 cm, 87 cm, and 98 cm. As students show mastery, advance to adding 20 centimeters.

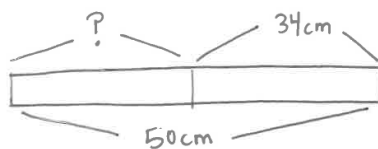
Happy Counting by Centimeters (4 minutes)

Note: Students practice counting by 10 centimeters and exchanging centimeters for meters. This activity relates to Say Ten counting, where ones are exchanged for tens. It can be demonstrated on a Rekenrek, with each bead representing 10 centimeters.

- T: Let's count by 10 centimeters, starting at 80 centimeters. When we get to 100 centimeters, we say 1 meter, and then we will count by meters and centimeters. Ready? (Rhythmically point up until a change is desired. Show a closed hand, then point down. Continue, mixing it up.)
- S: 80 cm, 90 cm, 1m, 1m 10 cm, 1 m 20 cm, 1 m 30 cm, 1 m 40 cm, 1 m 50 cm. (Switch direction.) 1 m 40 cm, 1 m 30 cm, 1 m 20 cm. (Switch direction.) 1 m 30 cm, 1 m 40 cm, 1 m 50 cm, 1 m 60 cm, 1 m 70 cm, 1 m 80 cm, 1 m 90 cm, 2 m. (Switch direction.) 1 m 90 cm. (Switch direction.) 2 m, 2 m 10 cm, 2 m 20 cm. (Switch direction.) 2 m 10 cm, 2 m, 1 m 90 cm.
- T: Excellent! Try it for 30 seconds with your partner starting at 80 centimeters. Partner B, you are the teacher today.

Application Problem (6 minutes)

Mei's frog leaped several centimeters. Then, it leaped 34 centimeters. In all, it leaped 50 centimeters. How far did Mei's frog leap at first? Draw a picture and write a number sentence to explain your thinking.



$$34 + \underline{\quad} = 50$$

$$34 + 16 = 50$$

Mei's frog jumped 16cm at first.

Note: This *add to with start unknown* situation may be challenging for students. After students share their solutions, the teacher may wish to model problem solving using a tape diagram. This is in anticipation of today's Concept Development, wherein students represent length using tape diagrams.

Concept Development (34 minutes)

Materials: (T) 2 lengths of string in two different colors (3 meters red and 5 meters blue), meter stick, masking tape (S) 1 meter strip, 50 cm piece of string, personal white board

Note: Students take the string and meter strip home to complete the Homework.

- T: (Before class begins, use masking tape to make two tape paths on the floor. Make one path that measures 3 meters squiggly, and one path that measures 5 meters zigzagged. Convene students on the carpet,



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

To support English language learners, treat the students' first language as a resource. When drawing tape diagrams, students need to understand comparative language in order to represent and compare various lengths. The students' first language can be used to foster understanding. An example in Spanish is given below:

- In Spanish, shorter = *mas corto*.
- In Spanish, longer = *mas largo*.

perhaps seated in a U-shape.)

T: Make an estimate, how long is the zigzag path?

S: (Share estimates.)

T: Make an estimate, how long is the squiggly path?

S: (Share estimates.)

T: Which path do you think is longer?

S: (Share thoughts.)

T: I have some string here. How do you think this string could help me to check our estimates?

S: Take some string and put it straight on each path. → Hold it down with one hand and lay it down along the tape.

T: (Use the red string to measure the squiggly path and the blue string to measure the zigzag path.)

T: Now, I compare the lengths of the paths by measuring these strings. Because the strings are so long, let's tape them on the floor and see how long they are.

T: (Lay the red and blue strings parallel on the floor and horizontal to the students.)

T: Use a benchmark to estimate the length of each string. Share your estimates with your neighbor.

T: What measurement tool could we use to check the estimates?

S: A meter tape. → A meter stick.

T: (Call two volunteers to measure.)

S: The red string is 3 meters. The blue string is 5 meters.

T: I don't have enough space on the board to tape these long strings. What could I do instead?

S: Draw a picture. → Write the numbers.

T: (Draw a horizontal rectangular bar to represent the length of the red string.) This represents the red string. Tell me when to stop to show the blue string. (Start at the left end of the red bar and move to the right, making a second bar underneath the first.)

S: Stop!

T: Why should I stop here?

S: Because the second bar should be longer than the first bar.

T: Let's write the measurements of each string above.

T: (Label both bars.) What expression could you use to describe the total length of these strings?

S: $3 + 5$.

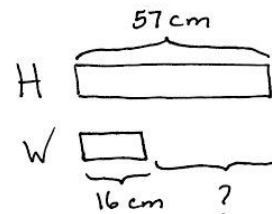
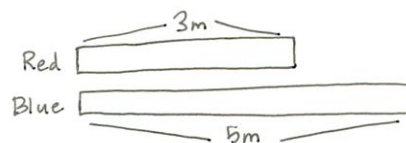
T: What expression could I use to describe the difference in length between these two strings?

S: $5 - 3$.

T: Remember, this is called a tape diagram. It is helpful because we can draw a small picture to represent any length.

T: Let's practice making a tape diagram.

T: What is the measurement around my wrist? (Demonstrate wrapping the string around your wrist and pinching the end point, then lay the string along a meter stick to determine the length.)



MP.5

MP.5

- S: 16 centimeters.
- T: Let's compare the length around my wrist to the length around my head. What's the length around my head? (Repeat the demonstration process, and record the length on the board.)
- S: 57 centimeters.
- T: Draw along with me as I draw the first bar on the board to represent my head measurement. We'll label this 57 centimeters.
- S: (Draw.)
- T: Right below that, draw the second bar to show my wrist measurement. Should the bar be longer or shorter?
- S: Shorter. (Draw and label the second bar 16 centimeters.)
- T: Look at your diagram. Talk with your neighbor: What is this open space between the end of the first and second bars?
- S: It's how much longer 57 centimeters is than 16 centimeters. → It's the difference between 16 centimeters and 57 centimeters. → It's the difference between the measurement of your wrist and your head.
- T: How can we find the difference between 16 centimeters and 57 centimeters?
- S: $57 - 16 = \underline{\quad}$. → $16 + \underline{\quad} = 57$.

Check students' tape diagrams. Have them compare the measurement around their thigh and the length of their arm, and the length around their neck and the length around their head.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 9 Problem Set 2•2

Name Tamara Date _____

1. Complete the chart by first estimating the measurement around a classmate's body part. Then find the actual measurement with a meter tape.

Student Name	Body Part Measured	Estimated Measurement in Centimeters	Actual Measurement in Centimeters
Jason	Neck	15cm	30cm
Leora	Wrist	10cm	16cm
Sydney	Head	45cm	56cm

a. Which was longer, your estimate or the actual measurement around your classmate's head? The actual measurement was bigger.

b. Draw a tape diagram to compare two actual lengths from your chart.

Jason's Neck 30cm $16 + 14 = 30$
 Leora's wrist 16cm $?$

Jason's neck is 14cm bigger than Leora's wrist.

2. Use a string to measure all three paths.

Path 1

Path 2

Path 3

a. Which path is the longest? Path 1

COMMON CORE Lesson 9: Measure lengths of string using measurement tools and use tape diagrams to represent and compare lengths. 5/3/14 engage^{ny} 2.D.20

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 9 Problem Set 2•2

b. Which path in the shortest? Path 3

c. Draw a tape diagram to compare two of the lengths.

Path 2 14cm
 Path 3 13cm 1cm

Path 2 is 1 centimeter longer than Path 3.

3. Estimate the length of the path below in centimeters.

a. The path is about 17 cm long.

Use your piece of string to measure the length of the path. Then measure the string with your ruler.

b. The actual length of the path is 22 cm.

c. Draw a tape diagram to compare your estimate and the actual length of the path.

Estimate 17cm $17 + 5 = 22$
 Actual 22cm

The actual length of the path is 5cm longer than my estimate.

COMMON CORE Lesson 9: Measure lengths of string using measurement tools and use tape diagrams to represent and compare lengths. 5/3/14 engage^{ny} 2.D.21

Student Debrief (10 minutes)

Lesson Objective: Measure lengths of string using measurement tools, and use tape diagrams to represent and compare lengths.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- What estimation strategies did you use for Problem 1? How were they similar to or different from your partner's strategies? (Chart benchmark strategies).
- Look at Problems 2 and 3. What steps did you take to draw an accurate tape diagram? How do your drawings compare to your partner's?
- Add to the Application Problem: Anthony's frog leaped 28 centimeters. Have students draw with a partner a tape diagram to compare the distances that the two frogs leapt. Invite students to share their solution strategies.
- How did you show your thinking today?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

**NOTES ON
MULTIPLE MEANS
OF ACTION AND
EXPRESSION:**

As students return to the Application Problem, adjust the difficulty level of the extension:

Choose challenging problem types, such as, "How would your tape diagram change if Mei's frog leaped x centimeters more than Anthony's?"

Invite students to write their own comparison word problem with an accompanying tape diagram.

Name _____

Date _____

1. Complete the chart by first estimating the measurement around a classmate's body part, and then finding the actual measurement with a meter strip.

Student Name	Body Part Measured	Estimated Measurement in Centimeters	Actual Measurement in Centimeters
	Neck		
	Wrist		
	Head		

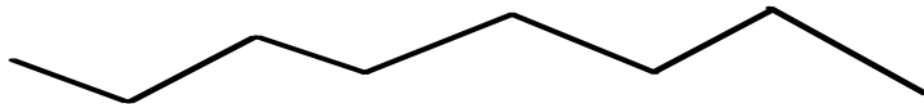
- a. Which was longer, your estimate or the actual measurement around your classmate's head? _____
- b. Draw a tape diagram to compare two actual lengths from your chart.

2. Use a string to measure all three paths.

Path 1



Path 2

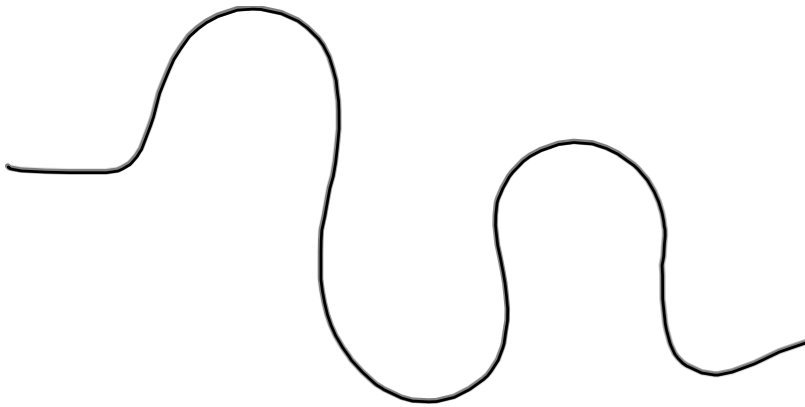


Path 3



- a. Which path is the longest? _____

- b. Which path is the shortest? _____
- c. Draw a tape diagram to compare two of the lengths.
3. Estimate the length of the path below in centimeters.



- a. The path is about _____ cm long.

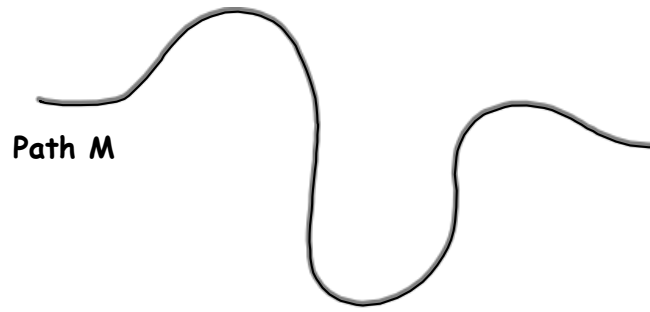
Use your piece of string to measure the length of the path. Then, measure the string with your meter strip.

- b. The actual length of the path is _____ cm.
- c. Draw a tape diagram to compare your estimate and the actual length of the path.

Name _____

Date _____

1. Use your string to measure the two paths. Write the length in centimeters.



Path M is _____ cm long.

Path N is _____ cm long.

2. Mandy measured the paths and said both paths are the same length.

Is Mandy correct? Yes or no? _____

Explain why or why not.

3. Draw a tape diagram to compare the two lengths.

Name _____

Date _____

1. Complete the chart by first estimating the measurement around three objects in your house, and then finding the actual measurement with your meter strip.

Object Name	Estimated Measurement in Centimeters	Actual Measurement in Centimeters

- a. What is the difference between the longest and shortest measurements?
_____ cm

- b. Draw a tape diagram comparing the two of the estimated measurements.

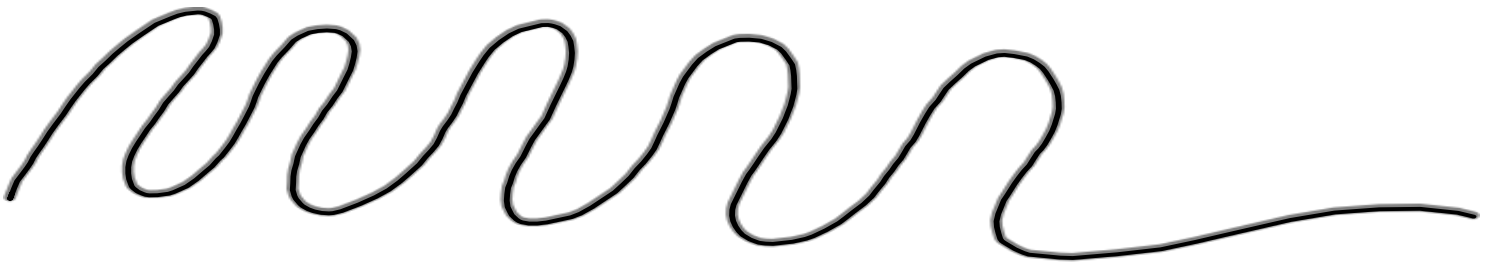
- c. Draw a tape diagram to compare two of the actual measurements.

2. Measure the two paths below with your meter strip and string.

Path A 

Path B 

- Path A is ____ cm long.
 - Path B is ____ cm long.
 - Together, Paths A and B measure ____ cm.
 - Path A is ____ cm (shorter/longer) than Path B.
3. Kim is using a ribbon to decorate a table for a party. Measure the ribbon she is using to decorate.



- The ribbon is ____ cm long.

Kim needs 1 meter of ribbon.

- How much more ribbon does Kim need than what she has? ____ cm

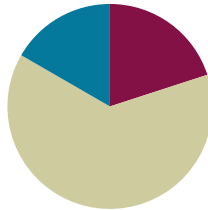
4. Shawn and Steven had a contest to see who could jump farther. Shawn jumped 75 centimeters. Steven jumped 23 more centimeters than Shawn.
- a. How far did Steven jump? _____ centimeters
 - b. Who won the jumping contest? _____
 - c. Draw a tape diagram to compare the lengths that Shawn and Steven jumped.

Lesson 10

Objective: Apply conceptual understanding of measurement by solving two-step word problems.

Suggested Lesson Structure

■ Fluency Practice	(12 minutes)
■ Concept Development	(38 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (12 minutes)

- Meter Strip Subtraction: Subtracting Multiples of 10 from Numbers **2.NBT.5** (6 minutes)
- Take from Ten **2.OA.2** (3 minutes)
- Relate Subtraction to Addition **2.OA.2** (3 minutes)

Meter Strip Subtraction: Subtracting Multiples of 10 from Numbers (6 minutes)

Materials: (S) Meter strips (Lesson 6 Template) (as pictured)

Note: Students fluently subtract multiples of 10 while using the ruler as a number line.

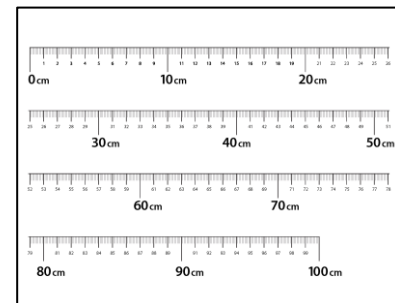
T: Put your finger on 0 to start. I'll say the whole measurement. Slide up to that number. Then, take away 10 centimeters and tell me how many centimeters your finger is from 0.

T: Fingers at 0 centimeters! (Pause.) 30 centimeters.

S: (Slide their fingers to 30.)

T: Remember to take 10. (Pause.) How far is your finger from 0?

S: 20 centimeters.



Continue with the following possible sequence: 45 cm, 52 cm, 64 cm, 74 cm, 82 cm, 91 cm, and 99 cm. As your students show mastery, advance to subtracting 20 centimeters.

Take from Ten (3 minutes)

Note: Students revisit this activity from Module 1 in preparation for more practice of subtraction in Module 3. Draw a number bond for the first example to model student thinking to solve.

T: For every number sentence I say, you will give a subtraction number sentence that takes from the ten first. When I say $12 - 3$, you say $12 - 2 - 1$. Ready?

T: $12 - 3$.

S: $12 - 2 - 1$.

T: Answer.

S: 9.

(Draw on board)

$$\begin{array}{r} 12 - 3 = \underline{\quad} \\ \wedge \\ 2 \quad 1 \end{array}$$

Continue with the following possible sequence: $12 - 4$, $12 - 5$, $14 - 5$, $14 - 6$, $14 - 7$, $15 - 7$, $15 - 8$, $15 - 9$, $16 - 9$, and $16 - 8$.

Relate Subtraction to Addition (3 minutes)

Note: This activity challenges students to mentally subtract the ones and add the difference to 10. Draw a number bond for the first example to support student answers. (Students may answer verbally or on their personal white boards.)

T: $2 - 1$.

S: 1.

T: When I say $12 - 1$, you say $10 + 1$. Ready? $12 - 1$.

S: $10 + 1$.

T: $3 - 1$.

S: 2.

T: $13 - 1$.

S: $10 + 2$.

T: Answer.

S: 12.

(Draw on board)

$$\begin{array}{r} 12 - 1 = \underline{\quad} \\ \wedge \\ 10 \quad 2 \end{array}$$

Continue with the following possible sequence: $14 - 1$, $15 - 1$, $16 - 1$, $17 - 1$, $17 - 2$, $17 - 4$, $16 - 4$, $15 - 4$, $15 - 2$, and $14 - 2$.



**NOTES ON
MULTIPLE MEANS
OF REPRESENTATION:**

Students who are struggling with pictorial representations may need to use concrete models (e.g., unifix cubes) to demonstrate conceptual understanding of addition and subtraction. Incremented bars can be added to the tape diagram as a transition from base ten blocks to a pictorial model, as well.

Concept Development (38 minutes)

Materials: (S) Personal white board

Post the two problems on the board. Under each problem make two sections labeled Step 1 and Step 2. Cover the second problem until that portion of the Concept Development.

Problem 1

Mr. Peterson decorated with 15 meters of ribbon in the morning. He decorated with 8 more meters in the afternoon than in the morning. How many meters of ribbon did Mr. Peterson use to decorate in the morning and afternoon in all?

T: Let's read Problem 1 together.

S/T: (Read Problem 1 chorally.)

T: (Draw a bar on the board under Step 1 and label it M for morning.)

T: How many meters of ribbon did Mr. Peterson use to decorate in the morning?

S: 15 meters.

T: (Label the bar 15 m.) When did he decorate again?

S: In the afternoon.

T: Did he use more or less ribbon in the afternoon?

S: More!

T: How many more meters?

S: 8 more meters.

T: Tell me when to stop drawing. (Start to draw a second bar under the first bar to represent the afternoon meters.)

S: Stop!

T: (Label this bar A for afternoon.) What is this measurement here, the difference between his ribbon in the morning and afternoon?

S: 8 meters.

T: (Label 8 m.) What are we trying to find?

S: How many meters of ribbon he used in the morning and afternoon.

T: Where do we put our question mark?

T: In the second bar. → In the bar labeled A.

T: Look at the tape diagram. In Step 1, are we looking for a missing part or the whole?

S: The whole.

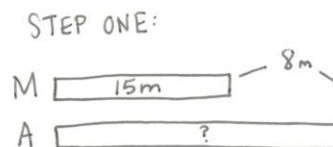
T: Raise your hand when you know the length of ribbon used in the afternoon. Give the number sentence, starting with 15.

S: $15 + 8 = 23$.

T: What do we still need to find out?

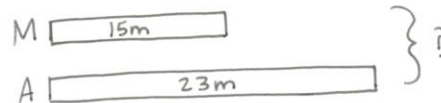
S: How many meters did he use in the morning *and* in the afternoon.

T: This is Step 2. (Redraw the same model with the 23 meters recorded and the question mark to the right as shown in Step 2 above.)



$$\begin{array}{r} 15 + 8 = 23 \\ \overset{5}{\underset{3}{\uparrow}} \end{array}$$

STEP TWO:



$$\begin{array}{r} 15 + 23 = 38 \\ \overset{10}{\underset{5}{\uparrow}} \end{array}$$

Mr. Peterson used 38m of ribbon in all.

- T: How many meters in the morning and afternoon did Mr. Peterson use to decorate? Turn and talk.
- S: 38 because 15 and 23 makes 38. $\rightarrow 10 + 20 = 30$, and $5 + 3 = 8$, $30 + 8 = 38$.
- T: (Record different solution strategies. Cross out the question mark and write 38 to show the solution.) You just solved Step 2.
- T: Remember, we also have to write our answer in a word sentence. How many meters of ribbon did Mr. Peterson use in all?
- S: He used 38 meters of ribbon in all.
- T: (Record the statement.)

Problem 2

The red colored pencil is 17 centimeters long. The green colored pencil is 9 centimeters shorter than the red colored pencil. What is the total length of both pencils?

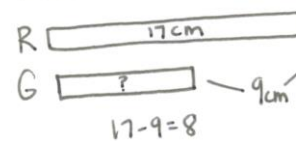
Lead the students through a similar process to that of Problem 1. Have them work the problem with you.

Step 1: Model and label the length of the red pencil, the difference in the lengths of the pencils, and the question mark. Find the length of the green pencil. Write your number sentence.

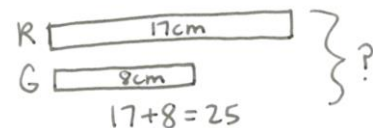
Step 2: Redraw the model with 8 centimeters labeled in the lower bar and the unknown marked to the right with a question mark and bracket. Find the total of both lengths. Write your number sentence and statement of the solution.

Once having completed both problems, have students compare Problems 1 and 2.

STEP ONE:



STEP TWO:



The total length of both pencils is 25cm.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Apply conceptual understanding of measurement by solving two-step word problems.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

While students are completing the Problem Set, check frequently for understanding by saying, "Show me," with concrete models or tape diagrams. Modify two-step word problems so that they only involve single-digit addends. Assign struggling students to a buddy to clarify processes.

be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

MP.3

- How was your drawing for Problem 2, Step 1, similar to the model drawn for Problem 1, Step 1?
- With your partner, compare your tape diagrams for Problem 2, Step 2. How did you label them? Where did you place your addends? How did you show the change (smaller, taller)? Where did you draw brackets?
- Look at Problem 3. How did you change your tape diagram in Step 2 to find the total length of the leather strips?
- What must you do when drawing tape diagrams and comparing lengths in order to be accurate?
- How could we arrive at the same answer to today's problems but in a different way? What other math strategies can you connect with this (e.g., part-whole, number bond figures)?
- How do tape diagrams help you to solve problems with more than one step?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 10 Problem Set 2•2

Name Andrea Date _____

Use the RDW process to solve. Draw a tape diagram for each step. Problem 1 has been started for you.

1. Maura's ribbon is 26 cm long. Colleen's ribbon is 14 cm shorter than Maura's ribbon. What is the total length of both ribbons?

Step 1: Find the length of Colleen's ribbon.

26 cm
14 cm shorter
 $26 - 14 = 12$
Colleen's ribbon is 12 cm.

Step 2: Find the length of both ribbons.

26 cm
12 cm
14 cm shorter
 $26 + 12 = 38$
The length of both ribbons together is 38 cm.

2. Jesse's doll is 30 cm tall. Sarah's doll is 9 cm shorter than Jesse's doll. What is the total length of both dolls?

Step 1: Find the length of Sarah's doll.

30 cm
9 cm shorter
 $30 - 9 = 21$
Sarah's doll is 21 cm tall.

Step 2: Find the length of both dolls.

30 cm
21 cm
 $30 + 21 = 51$
Both dolls are 51 cm together.

COMMON CORE Lesson 10: Apply conceptual understanding of measurement by solving two-step word problems. 5/23/14 engage^{ny} 2.D.3.3

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 10 Problem Set 2•2

3. Steven has a black leather strip that is 13 centimeters long. He cut off 5 centimeters. His teacher gave him a brown leather strip that is 16 centimeters long. What is the total length of both strips?

Step 1: Find the length of black leather strip after being cut.

Black 13 cm
5 cm shorter
 $13 - 5 = 8$
The black strip is 8 cm long.

Step 2: Find the length of the black and brown leather strips together.

Brown 16 cm
Black 8 cm
 $16 + 8 = 24$
Both strips together are 24 cm long.

4. Pam and Mark measured the distance around each other's wrists. Pam's wrist measured 10 cm. Mark's wrist measured 3 cm more than Pam's. What might be the total length around their wrists (all four wrists)?

Step 1: Find the distance around both Mark's wrists. Both Mark's wrists are 13 cm.

P 10 cm
M 3 cm longer
 $10 + 3 = 13$
 $13 + 13 = 26$
 $10 + 10 = 20$
 $20 + 26 = 46$

Step 2: Find the total measurement of all four wrists.

P 10 cm
M 13 cm
 $10 + 10 = 20$
 $13 + 13 = 26$
 $20 + 26 = 46$
The total measurement of all four wrists is 46 cm.

COMMON CORE Lesson 10: Apply conceptual understanding of measurement by solving two-step word problems. 5/23/14 engage^{ny} 2.D.3.4

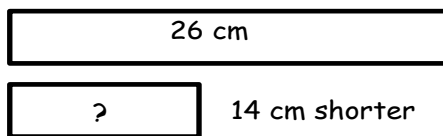
Name _____

Date _____

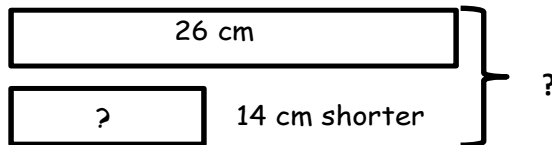
Use the RDW process to solve. Draw a tape diagram for each step. Problem 1 has been started for you.

1. Maura's ribbon is 26 cm long. Colleen's ribbon is 14 cm shorter than Maura's ribbon. What is the total length of both the ribbons?

Step 1: Find the length of Colleen's ribbon.



Step 2: Find the length of both ribbons.



2. Jesse's doll is 30 cm tall. Sarah's doll is 9 cm shorter than Jessie's doll. What is the total length of both dolls?

Step 1: Find the length of Sarah's doll.

Step 2: Find the length of both dolls.

3. Steven has a black leather strip that is 13 centimeters long. He cut off 5 centimeters. His teacher gave him a brown leather strip that is 16 centimeters long. What is the total length of both strips?

Step 1: Find the length of black leather strip after being cut.

Step 2: Find the length of the black and brown leather strips together.

4. Pam and Mark measured the distance around each other's wrists. Pam's wrist measured 10 cm. Mark's wrist measured 3 cm more than Pam's. What is the total length around all four of their wrists?

Step 1: Find the distance around both Mark's wrists.

Step 2: Find the total measurement of all four wrists.

Name _____ Date _____

The length of a crayon is 9 centimeters. A pencil is 11 centimeters longer than the crayon. What is the total length of both the crayon and the pencil?

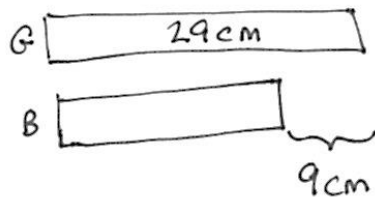
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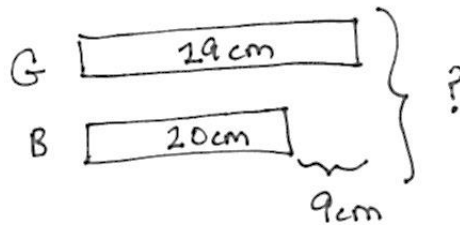
Use the RDW process to solve. Draw a tape diagram for each step. Problem 1 has been started for you.

1. There is 29 cm of green ribbon. A blue ribbon is 9 cm shorter than the green ribbon. How long is the blue ribbon?

Step 1: Find the length of blue ribbon.



Step 2: Find the length of both the blue and green ribbons.



2. Joanna and Lisa drew lines. Joanna's line is 41 cm long. Lisa's line is 19 cm longer than Joanna's. How long are Joanna's and Lisa's lines?

Step 1: Find the length of Lisa's line.

Step 2: Find the total length of their lines.

Name _____ Date _____

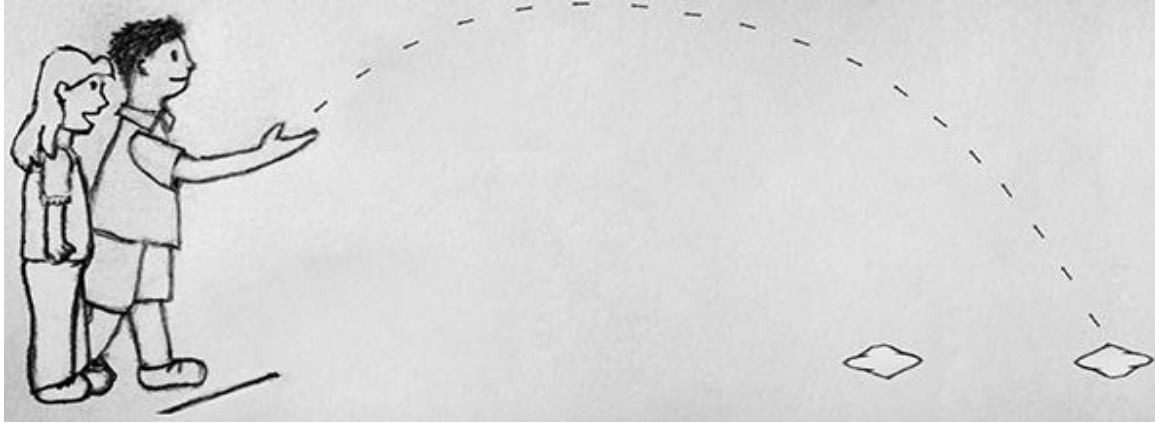
Note: Students need a centimeter ruler and 6 small paper clips to complete the assessment.

1. Use your ruler to find the length of the pencil and the crayon.



- a. How long is the crayon? _____ centimeters
- b. How long is the pencil? _____ centimeters
- c. Which is longer? pencil crayon
- d. How much longer? _____ centimeters

2. Samantha and Bill are having a bean bag throwing contest and need to measure each of their throws.



- a. Circle the most appropriate tool to measure their throws.

ruler

paper clips

meter stick

centimeter cubes

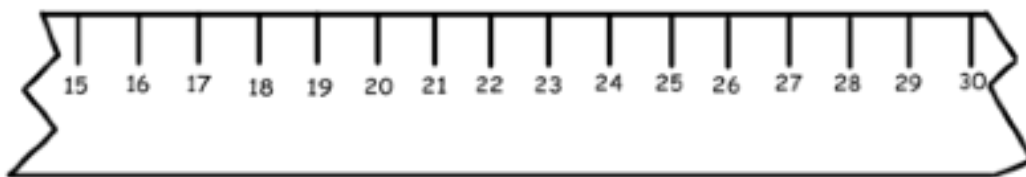
- b. Explain your choice using pictures or words.

- c. Bill throws his bean bag 5 meters, which is 2 meters farther than Samantha threw her bean bag. How far did Samantha throw her bean bag? Draw a diagram or picture to show the length of their throws.

- d. Sarah threw her bean bag 3 meters farther than Bill. Who won the contest? How do you know?

3. Use the broken centimeter ruler to solve the problem.

A grasshopper jumped 7 centimeters forward and 4 centimeters back and then stopped. If the grasshopper started at 18, where did the grasshopper stop? Show your work.



4.

Vanessa's Ribbons



- a. Measure the length of Ribbon A with your centimeter ruler and your paper clip. Write the measurements on the lines below.

_____ centimeters

_____ paper clips

- b. Explain why the number of centimeters is larger than the number of paper clips. Use pictures or words.

- c. Estimate the length of Ribbon B in paper clips.

_____ paper clips

- d. How much longer is Ribbon A than Ribbon B? Give your answer in centimeters.

- e. Vanessa is using the ribbons to wrap a gift. If she tapes the ribbons together with no overlap, how many centimeters of ribbon does she have altogether?

- f. If Vanessa needs 20 centimeters of ribbon, how much more does she need?

End-of-Module Assessment Task Standards Addressed

Topics A–D

Measure and estimate lengths in standard units.

- 2.MD.1** Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
- 2.MD.2** Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
- 2.MD.3** Estimate lengths using units of inches, feet, centimeters, and meters.
- 2.MD.4** Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Relate addition and subtraction to length.

- 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 diagrams 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.

Evaluating Student Learning Outcomes

A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop *on their way to proficiency*. In this chart, this progress is presented from left (Step 1) to right (Step 4). The learning goal for each student is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the student can do now, and what they need to work on next.

A Progression Toward Mastery

Assessment Task Item	STEP 1 Little evidence of reasoning without a correct answer. (1 Point)	STEP 2 Evidence of some reasoning without a correct answer. (2 Points)	STEP 3 Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer. (3 Points)	STEP 4 Evidence of solid reasoning with a correct answer. (4 Points)
1 2.MD.1 2.MD.4	The student gets one of the four parts correct.	The student gets two of the four parts correct.	The student gets three of the four parts correct.	The student correctly: <ul style="list-style-type: none"> Measures the crayon as 9 cm. Measures the pencil as 11 cm. Determines that the pencil is longer. Determines the difference in length between the pencil and crayon is 2 cm.
2 2.MD.1 2.MD.5	The student gets one of the four parts correct.	The student gets two of the four parts correct.	The student gets three of the four parts correct.	The student correctly: <ul style="list-style-type: none"> Identifies meter stick as the tool for measurement. Gives appropriate reasoning for selecting the meter stick. Student accurately represents the comparison of the throws with a picture and answers that Samantha threw her bean bag 3 meters. Correctly identifies Sarah as the winner.
3 2.MD.6	<ul style="list-style-type: none"> The student shows no movement on the ruler. The student is 	<ul style="list-style-type: none"> The student shows only one movement on the ruler. Student correctly 	<ul style="list-style-type: none"> The student shows only one movement on the ruler. Correctly identifies 	The student correctly: <ul style="list-style-type: none"> Uses centimeter ruler as a number line, showing



A Progression Toward Mastery

	unable to answer the question correctly.	adds 7 but does not subtract 4.	the grasshopper stopped at 21 cm.	movement forward and backward as adding and subtracting. <ul style="list-style-type: none"> Correctly identifies the grasshopper stopped at 21 cm.
4 2.MD.1 2.MD.2 2.MD.3 2.MD.4 2.MD.5	The student gets one part correct.	The student gets two to three of the six parts correct.	The student gets four to five of the six parts correct.	The student: <ul style="list-style-type: none"> Correctly measures length of Ribbon A in both centimeters and paper clips. Provides an accurate explanation of why there is a larger number of centimeters. Provides an appropriate estimate for Ribbon B in paper clips. Identifies that Ribbon A is 5 cm longer than Ribbon B. Determines total length of both ribbons taped together. Correctly identifies 4 cm more ribbon are needed.

Name Joshua

Date _____

1. Use your ruler to find the length of the pencil and the crayon.



a. How long is the crayon? 9 centimeters

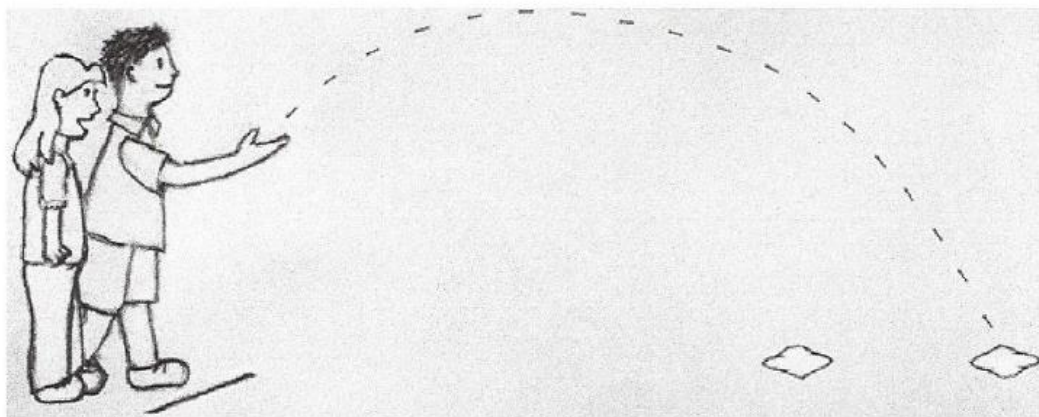
b. How long is the pencil? 11 centimeters

c. Which is longer? pencil crayon

d. How much longer? 2 centimeters

$$\begin{array}{r} 11 - 9 = 2 \\ \begin{array}{r} 10 \quad \overset{\wedge}{1} \\ 10 - 9 = 1 \\ 1 + 1 = 2 \end{array} \end{array}$$

2. Samantha and Bill are having a bean bag throwing contest and need to measure each of their throws.



- a. Circle the most appropriate tool to measure their throws.

ruler

paper clips

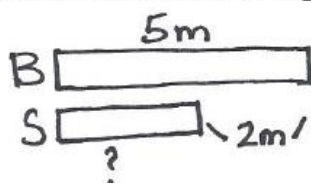
meter stick

centimeter cubes

- b. Explain your choice using pictures or words.

Samantha and Bill threw their bean bags far so a meter stick is most appropriate since it has the longest length-unit.

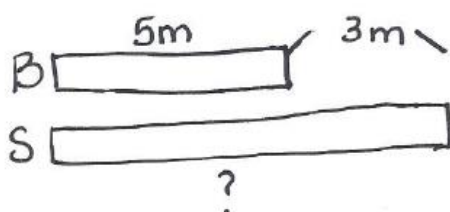
- c. Bill throws his bean bag 5 meters, which was 2 meters farther than Samantha threw her bean bag. How far did Samantha throw her bean bag? Draw a diagram or picture to show the length of their throws.



$$5 - 2 = 3$$

Samantha threw her bean bag 3 meters.

- d. Sarah threw her bean bag 3 meters farther than Bill. Who won the contest? How do you know?



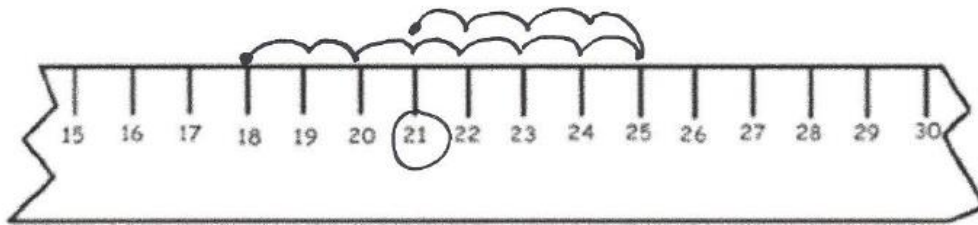
$$5 + 3 = 8$$

Sarah won the contest because she threw her bean bag 8m which is farther than anyone else.

3. Use the broken centimeter ruler to solve the problem.

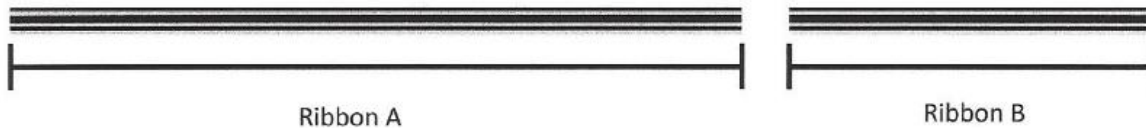
A grasshopper jumped 7 centimeters forward and 4 centimeters back and then stopped. If the grasshopper started at 18, where did the grasshopper stop? Show your work.

$$18 + 7 = 25 \quad 25 - 4 = 21 \quad \text{The grasshopper stopped at 21 cm.}$$



- 4.

Vanessa's Ribbons



- a. Measure the length of Ribbon A with your centimeter ruler and your paper clip. Write the measurements on the lines below.

10 centimeters

3 paper clips

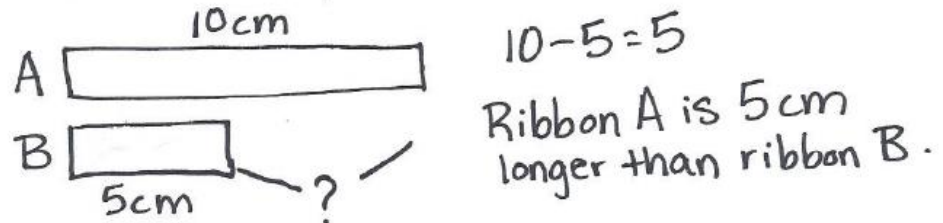
- b. Explain why the number of centimeters is larger than the number of paper clips. Use pictures or words.

Centimeters have shorter length units than paper clips, so more centimeters are needed to measure than paper clips.

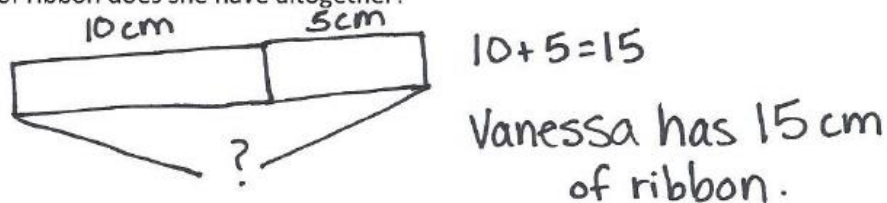
- c. Estimate the length of Ribbon B in paper clips.

2 paper clips

- d. How much longer is Ribbon A than Ribbon B? Give your answer in centimeters.



- e. Vanessa is using the ribbons to wrap a gift. If she tapes the ribbons together with no overlap, how many centimeters of ribbon does she have altogether?



- f. If Vanessa needs 20 centimeters of ribbon, how much more does she need?

$$20 - 16 = 4 \text{ cm}$$

Vanessa needs 4 cm of ribbon.