Grade 2 • Module 2

Addition and Subtraction of Length Units

OVERVIEW

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

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

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

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

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

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

Notes on Pacing for Differentiation

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

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

Focus Grade Level Standards

Number and Operations

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

2.2E locate the position of a given whole number on an open number line;

2.2F name the whole number that corresponds to a specific point on a number line.

Geometry and Measurement

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

2.9A find the length of objects using concrete models for standard units of length;

2.9B describe the inverse relationship between the size of the unit and the number of units needed to equal the length of an object;

2.9C represent whole numbers as distances from any given location on a number line;

2.9D determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes;

2.9E determine a solution to a problem involving length, including estimating lengths.

Foundational Standards

The student is expected to:

1.7A use measuring tools to measure the length of objects to reinforce the continuous nature of linear measurement;

1.7B illustrate that the length of an object is the number of same-size units of length that, when laid end-to-end with no gaps or overlaps, reach from one end of the object to the other;

1.7D describe a length to the nearest whole unit using a number and a unit.

Focus Mathematical Process Standards

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

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas;

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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

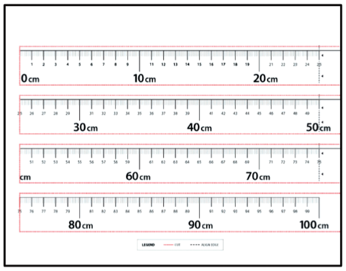
Overview of Module Topics and Lesson Objectives

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

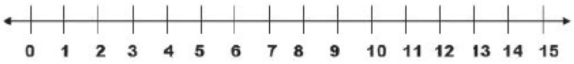
Terminology

New or Recently Introduced Terms

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



Meter Strip



Number Line

Familiar Terms and Symbols[2]

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

Suggested Tools and Representations

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

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

Scaffolds

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

Assessment Summary

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

Topic A

Understand Concepts About the Ruler

2.9A, 2.9D, 2.9B

Focus Standards:	2.9A 2.9D	Find the length of objects using concrete models for standard units of length. Determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or 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 and 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 Toward 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)

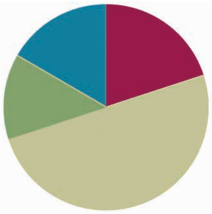
Objective 3: **Apply concepts to create unit rulers and measure lengths using unit rulers.**
(Lesson 3)

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 **2.2C** (2 minutes)
- Two More **2.4A** (1 minute)
- Sprint: Before, Between, After **2.2C** (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, and 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 sequence: 6, 8, 9, 18, 38, 58, 78, 79, 19, 29, and 39.

Sprint: Before, Between, After (9 minutes)

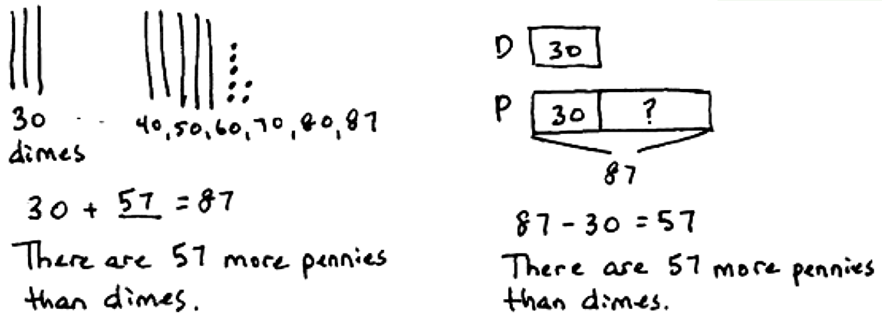
Materials: (S) Before, Between, After Sprint

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

> **NOTES ON MULTIPLE MEANS OF EXPRESSION:**
>
> To avoid inhibiting children's natural drawings during the RDW process, be careful not to communicate that the strip diagram is the best or "right" way. If a drawing makes sense, it is right. Regularly guide students through the modeling of a problem with the strip so that this important model gradually enters their tool kit.

Application Problem (8 minutes)

Vincent counts 30 dimes and 87 pennies in a bowl.
How many more pennies than dimes are in the bowl?



Note: This *compare with difference unknown* problem presents an opportunity to work through the common misconception that *more* means add. After drawing the two tapes, ask guiding questions such as, "Does Vincent have more dimes or pennies?" "Does Vincent have 30 pennies?" (Yes!) "Tell me where to draw a line to show 30 pennies." "This part of the strip represents 30 pennies. What does this other part of the pennies strip represent?" (The part that is more than the dimes.) This will help students recognize that they are comparing, not combining, the quantities.

This problem has an interesting complexity because, though there are more of them, the pennies are worth less. Ask students, "Could you buy more with Vincent's pennies or with his dimes? How do you know?"

Concept Development (30 minutes)

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

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 between the cubes.)

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 the cubes. Demonstrate in the center of the circle so students can see the alignment.)

> **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.

T: Let's count the cubes my way and your way. (Count the cubes chorally with 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 halfway 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 bag. (Alternative items to measure are scissors, each other's pencils, and erasers.)

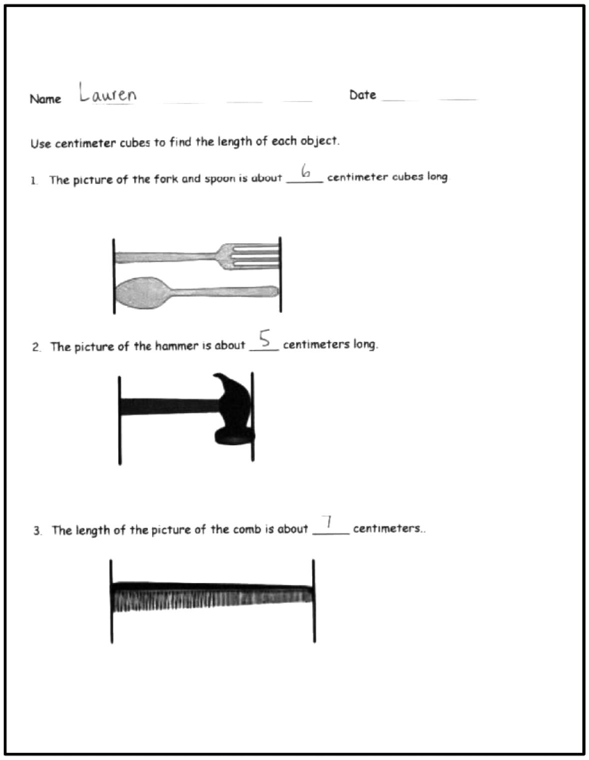
S: (Share estimates with their partner, and then begin measuring their crayons.)

T: Let's practice some more measuring on our Problem Set.

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 MPS(C), 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 purposeful sequencing of the Problem Set guide the selections so that problems continue to be scaffolded. Balance word problems with other problem types to ensure a range of practice. Consider assigning incomplete problems for homework or at another time during the day.

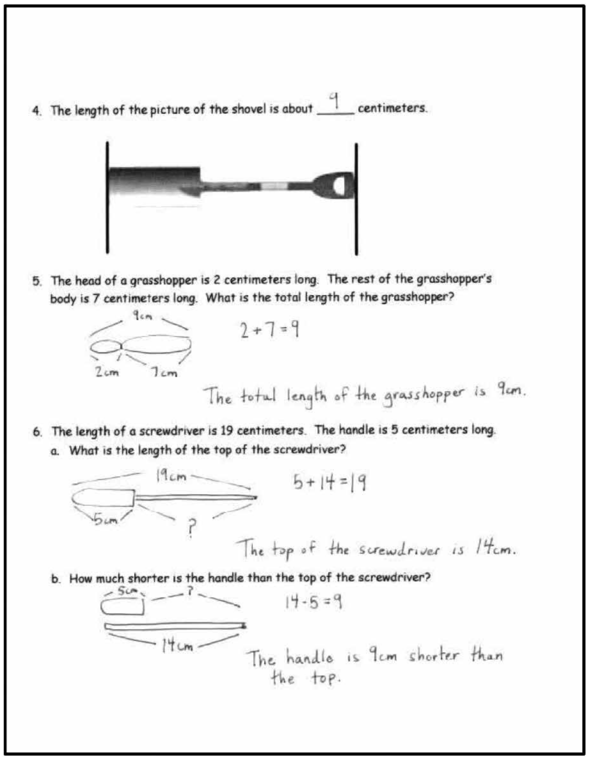

Name Lauren Date

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.


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?

9 cm, 2 cm, 7 cm

2 + 7 = 9

The total length of the grasshopper is 9cm.

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

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

19 cm, 5 cm, ?

5 + 14 = 19

The top of the screwdriver is 14cm.

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

5 cm, ?, 14 cm

14 - 5 = 9

The handle is 9cm shorter than the top.

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.

Any combination of the questions below may be used to lead the discussion.

- 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 partner? (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 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

Number Correct: ________

Before, Between, After

1.	1, 2, ____	
2.	11, 12, ____	
3.	21, 22, ____	
4.	71, 72, ____	
5.	3, 4, ____	
6.	3, ____, 5	
7.	13, ____, 15	
8.	23, ____, 25	
9.	83, ____, 85	
10.	7, 8, ____	
11.	7, ____, 9	
12.	____, 8, 9	
13.	____, 18, 19	
14.	____, 28, 29	
15.	____, 58, 59	
16.	12, 13, ____	
17.	45, 46, ____	
18.	12, ____, 14	
19.	36, ____, 38	
20.	____, 19, 20	
21.	____, 89, 90	
22.	98, 99, ____	

23.	99, ____, 101	
24.	19, 20, ____	
25.	119, 120, ____	
26.	35, ____, 37	
27.	135, ____, 137	
28.	____, 24, 25	
29.	____, 124, 125	
30.	142, 143, ____	
31.	138, ____, 140	
32.	____, 149, 150	
33.	148, ____, 150	
34.	____, 149, 150	
35.	____, 163, 164	
36.	187, ____, 189	
37.	____, 170, 171	
38.	178, 179, ____	
39.	192, ____, 194	
40.	____, 190, 191	
41.	197, ____, 199	
42.	168, 169, ____	
43.	199, ____, 201	
44.	____, 160, 161	

B

Number Correct: ________

Improvement: ________

Before, Between, After

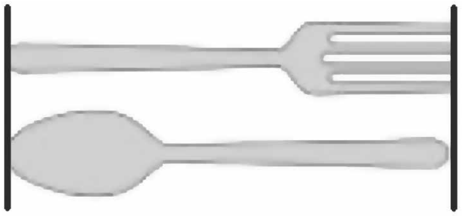
1.	0, 1, ____	
2.	10, 11, ____	
3.	20, 21, ____	
4.	70, 71, ____	
5.	2, 3, ____	
6.	2, ____, 4	
7.	12, ____, 14	
8.	22, ____ 24	
9.	82, ____, 84	
10.	6, 7, ____	
11.	6, ____, 8	
12.	____, 7, 8	
13.	____, 17, 18	
14.	____, 27, 28	
15.	____, 57, 58	
16.	11, 12, ____	
17.	44, 45, ____	
18.	11, ____, 13	
19.	35, ____, 37	
20.	____, 19, 20	
21.	____, 79, 80	
22.	98, 99, ____	

23.	99, ____, 101	
24.	29, 30, ____	
25.	129, 130, ____	
26.	34, ____, 36	
27.	134, ____, 136	
28.	____, 23, 24	
29.	____, 123, 124	
30.	141, 142, ____	
31.	128, ____, 130	
32.	____, 149, 150	
33.	148, ____, 150	
34.	____, 149, 150	
35.	____, 173, 174	
36.	167, ____, 169	
37.	____, 160, 161	
38.	188, 189, ____	
39.	193, ____, 195	
40.	____, 170, 171	
41.	196, ____, 198	
42.	178, 179, ____	
43.	199, ____, 201	
44.	____, 180, 181	

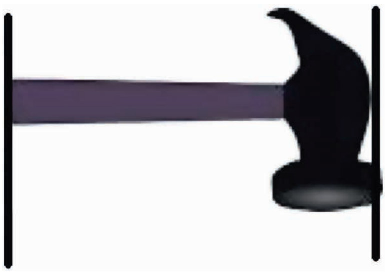
Name ________________________________ Date ________________

Use centimeter cubes to find the length of each object.

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

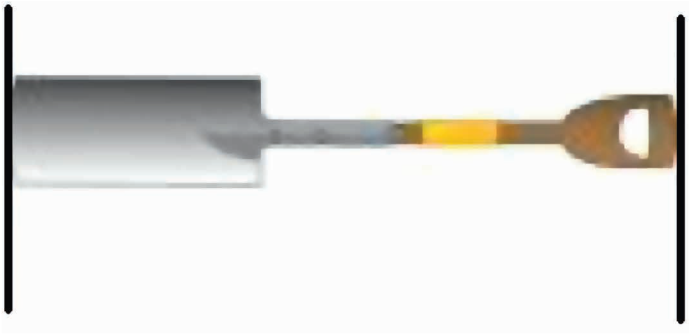


2. The picture of the hammer is about __________ centimeters long.



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.

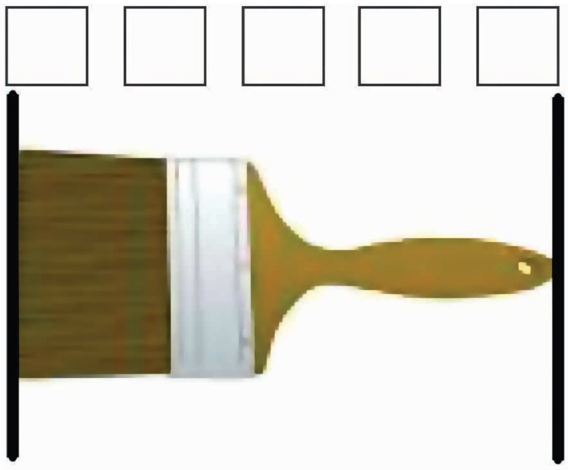
   a. What is the length of the top of the screwdriver?

   b. 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.

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



Is her answer correct? Explain why or why not.

____

____

____

____

Name ______________________________ Date ______________

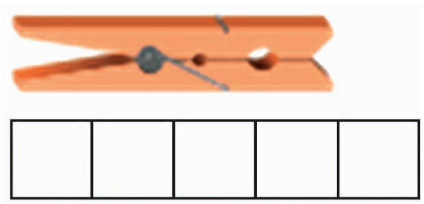
Count each centimeter cube to find the length of each object.

1. 

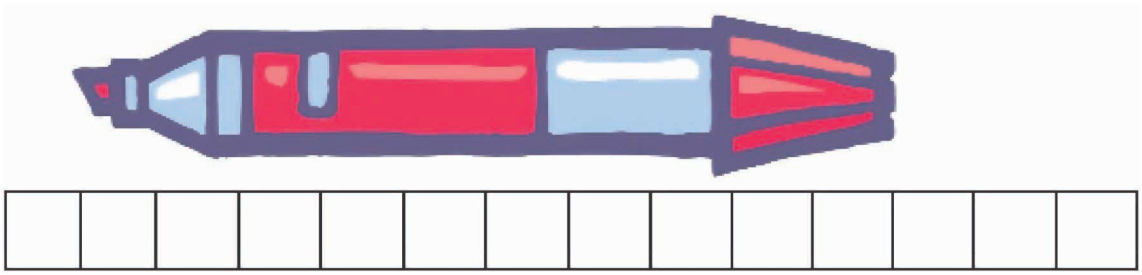
The crayon is _________ centimeter cubes long.

2. 

The pencil is _________ centimeter cubes long.

3. 

The clothespin is ________ centimeter cubes long.

4. 

The length of the marker is _______ centimeter cubes.

5. Richard has 43 centimeter cubes. Henry has 30 centimeter cubes. What is the length of their cubes altogether?

6. The length of Marisa's loaf of bread is 54 centimeters. She cut off and ate 7 centimeters of bread. What is the length of what she has left?

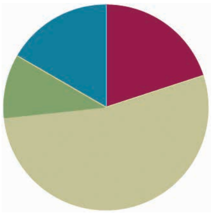
7. The length of Jimmy's math book is 17 centimeter cubes. His reading book is 12 centimeter cubes longer. What is the length of his reading book?

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)

- Renaming the Say Ten Way **2.2A** (2 minutes)
- Say Ten to the Next Ten **2.2A** (4 minutes)
- Making the Next Ten to Add **2.4A** (6 minutes)

Renaming the Say Ten Way (2 minutes)

Note: Renaming the Say Ten way 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: 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 to the Next Ten (4 minutes)

Note: This activity helps students see the connection between renaming 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 ten to add within 20. This foundational fluency is a review of Lesson 3 from Module 1.

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 = ______
/\
1 2

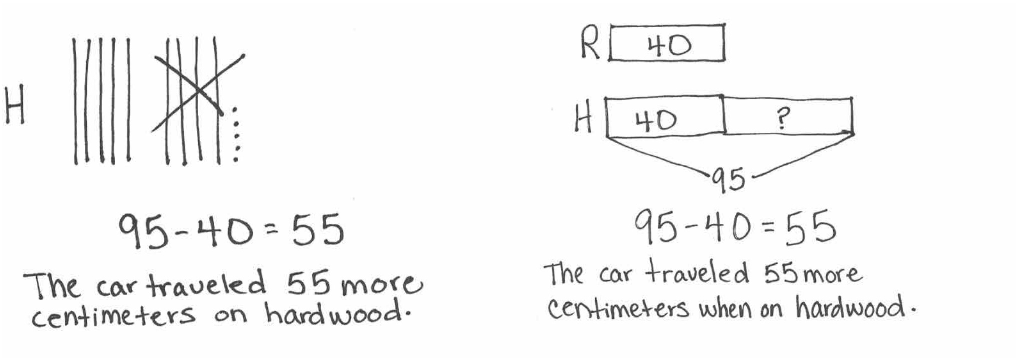
9 + 3 = 10 + 2

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)

With one push, Brian's toy car traveled 40 centimeters across the rug. When pushed across a hardwood floor, it traveled 95 centimeters. How many more centimeters did the car travel on the hardwood floor than across the rug?



Note: This *compare with difference unknown* problem gives students further practice with comparing quantities. A new complexity is to compare length measurements rather than numbers of discrete objects.

Concept Development (32 minutes)

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

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.

NOTES ON DIFFERENTIATING THE APPLICATION PROBLEM:

The 9 Application Problems of Module 2 are all comparison situations.

- Lessons 1 and 2: *compare with difference unknown*
- Lessons 3 and 4: *compare with bigger unknown*
- Lessons 5 and 6: *compare with smaller unknown*
- Lesson 7: *compare with smaller unknown* using *more than*
- Lesson 8: *compare with bigger unknown* using *less than*
- Lesson 9: *compare with bigger unknown* using *shorter than*

The challenging situation types in Lessons 7, 8, and 9 might be frustrating if students have not been successful in Lessons 1–6. Consider editing the situations in Lessons 7–9 to instead repeat those of Lessons 1–6, returning to the more challenging problem types in either Module 3 or 4 after students have gained more confidence with the simpler comparison situations.

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 base ten thousands block 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 paper clip, the length was just a little less than 3 centimeters. I can say my paper clip 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 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: 3 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 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.

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.

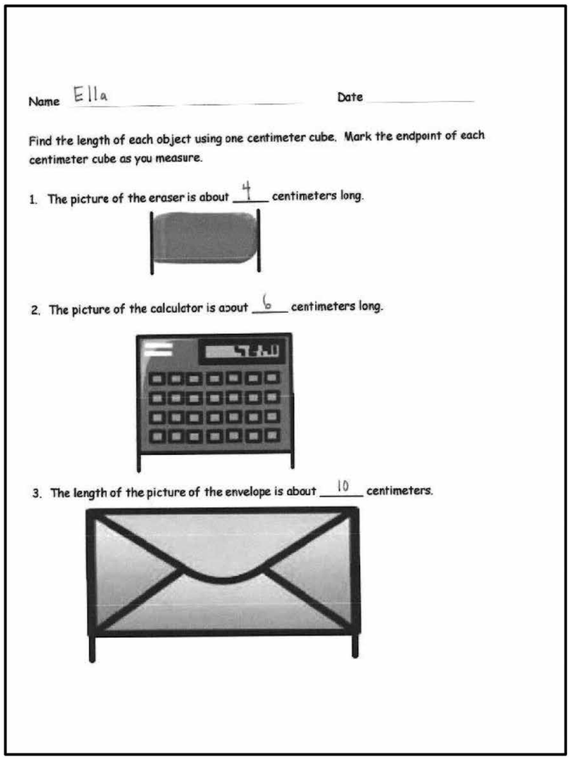
NOTES ON MULTIPLE MEANS OF REPRESENTATION:

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.


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.

Student Debrief (10 minutes)

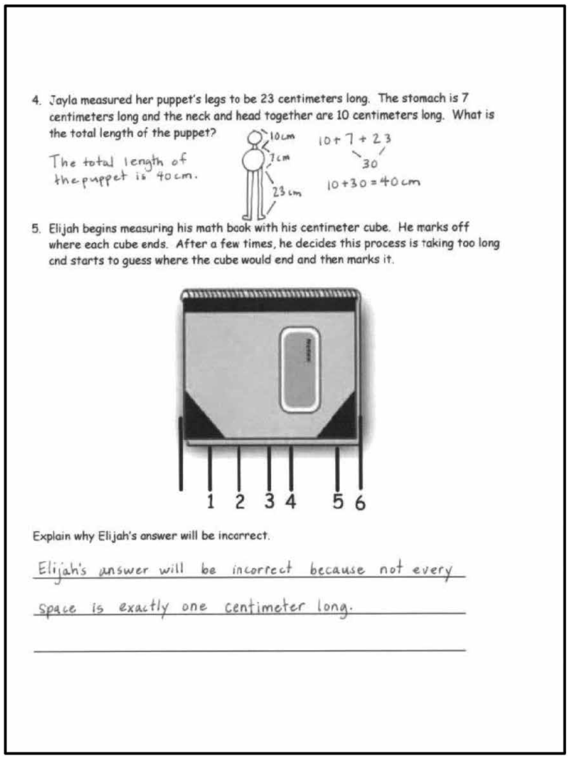
Lesson Objective: Use iteration with one physical unit to measure.

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.

Any combination of the questions below may be used to lead the discussion.

- Compare your answers to Problems 1–3 with a 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?


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 cm, 7 cm, 23 cm

10 + 7 + 23

30

10 + 30 = 40 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.

1 2 3 4 5 6

Explain why Elijah's answer will be incorrect.

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

Exit Ticket (3 minutes)

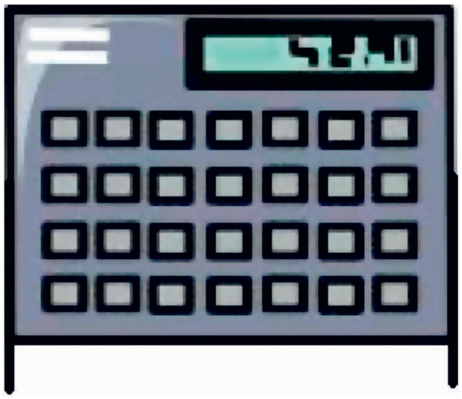
After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Name ________________________________ Date ______________

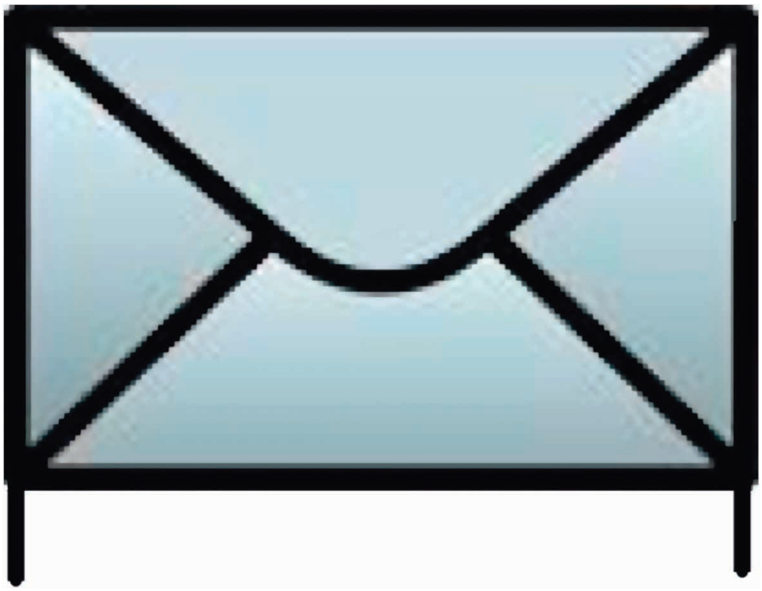
Find the length of each object using one centimeter cube. Mark the endpoint of each centimeter cube as you measure.

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

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

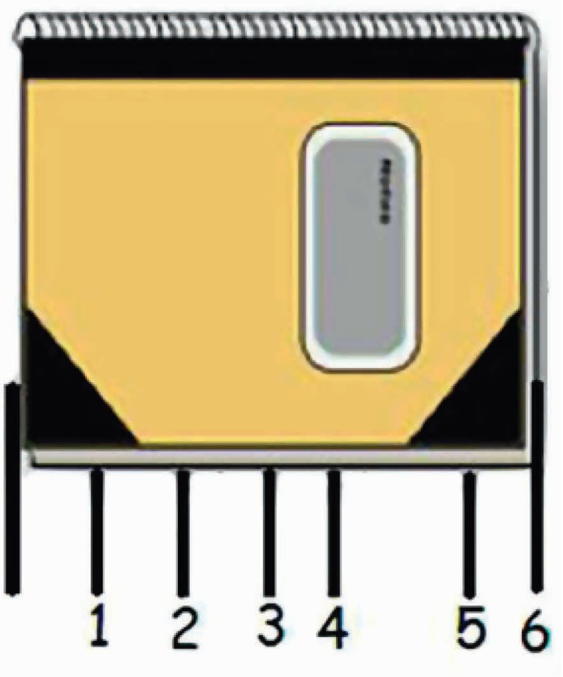


3. The length of the picture of the envelope is about __________ centimeters.



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.



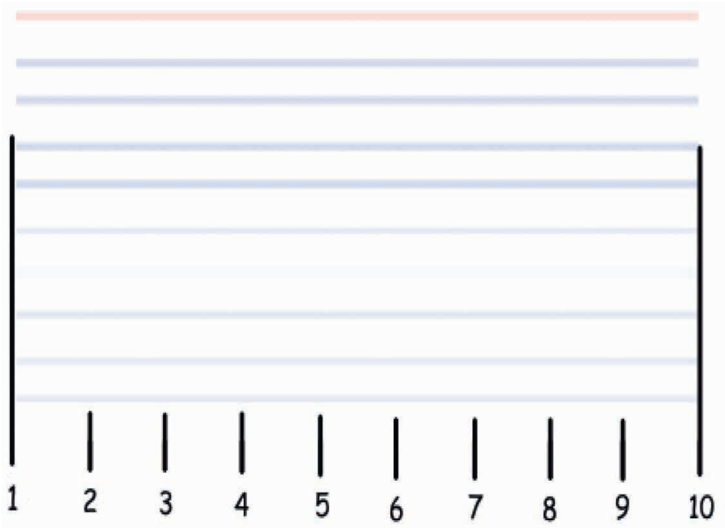
Explain why Elijah's answer will be incorrect.

____

____

Name ____________________________ Date ______________

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?

____

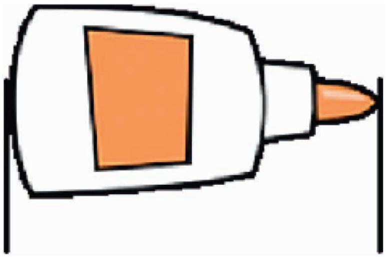
____

____

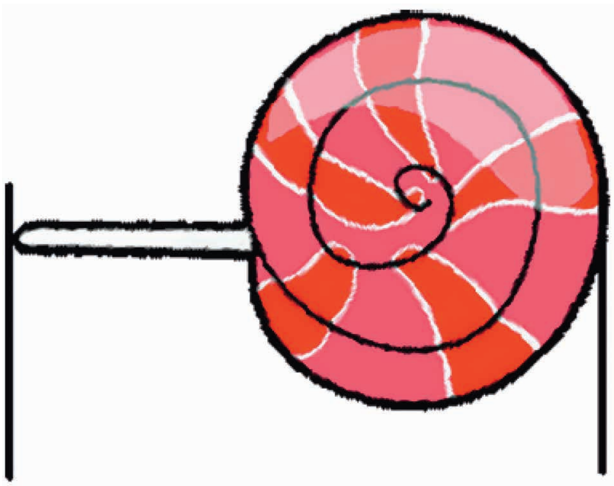
Name ________________________________ Date _______________

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.



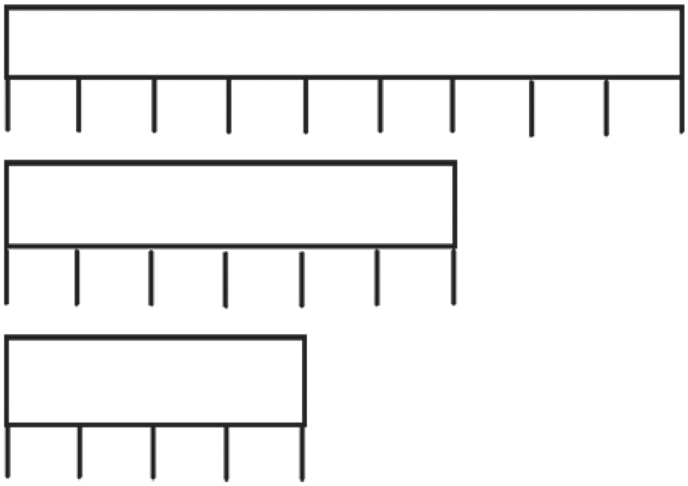
3. The picture of the scissors is about ________ centimeters long.

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.

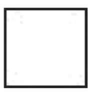
c. How long is the yellow ribbon? ___________ centimeters long.

d. Which ribbon is the longest? Red Blue Yellow

e. Which ribbon is the shortest? Red Blue Yellow

f. The total length of the ribbons is _____ centimeters.

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

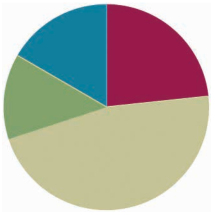


Lesson 3

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 **2.2C** (2 minutes)
- Making Ten by Identifying the Missing Part **2.4B** (3 minutes)
- Sprint: Making Ten **2.4B** (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, and 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.

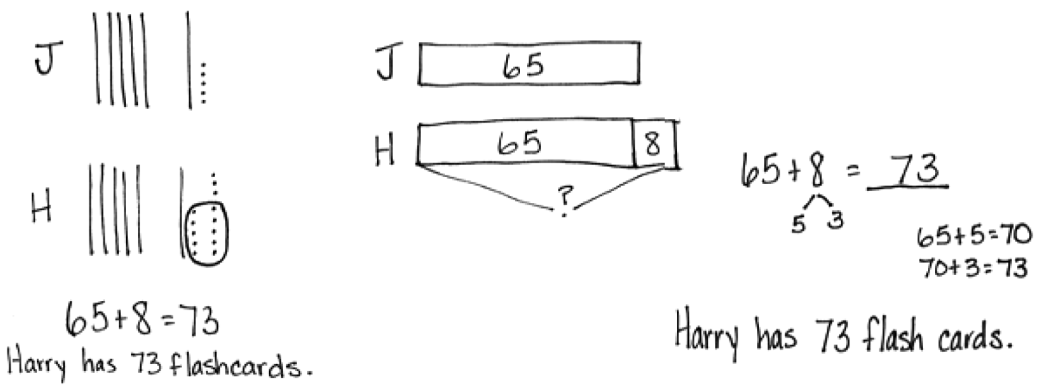
Sprint: Making Ten (9 minutes)

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)

Jamie has 65 flash cards. Harry has 8 more cards than Jamie. How many flash cards does Harry have?



Note: This problem type, compare with bigger unknown, challenges students to make sense of the situation and determine the operation to solve. It follows the two previous compare with difference unknown Application Problems to alert students to read and understand the situation instead of relying on key words that tell the operation. This problem exemplifies the error in using more than as a key word to subtract, since in this situation students solve by adding the parts. The problem could be represented using one strip, but since students are just beginning to do comparison problems at this level of sophistication with larger numbers, it may be wise to draw one strip to represent each boy's cards emphasizing the fact of the comparison.

Concept Development (28 minutes)

Materials: (S) 1 30 cm × 5 cm strip of tagboard 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 tagboard 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 tagboard.

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 tagboard?

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 tagboard, centimeter cube, and pencil. Let's do a few centimeters together. (Turn tagboard 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.

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 piece of wax-covered yarn to represent each of the hash marks for blind or visually impaired students, enabling them to feel the length units on their rulers.

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?

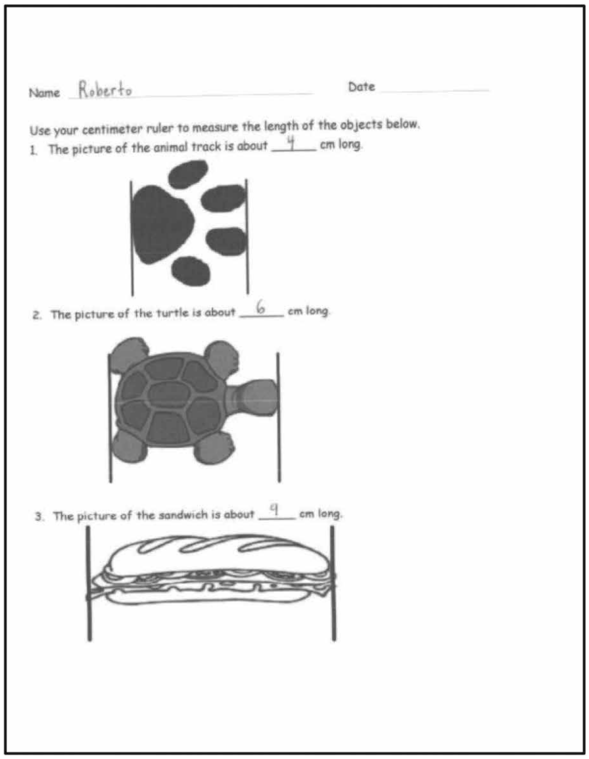
Guide students through measuring an index card and at least two more objects, such as a pencil and a pencil box. Direct students to write their measurements in the abbreviated form for centimeters (cm). As they show mastery, send them to their seats to complete the Problem Set. If students need more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


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.

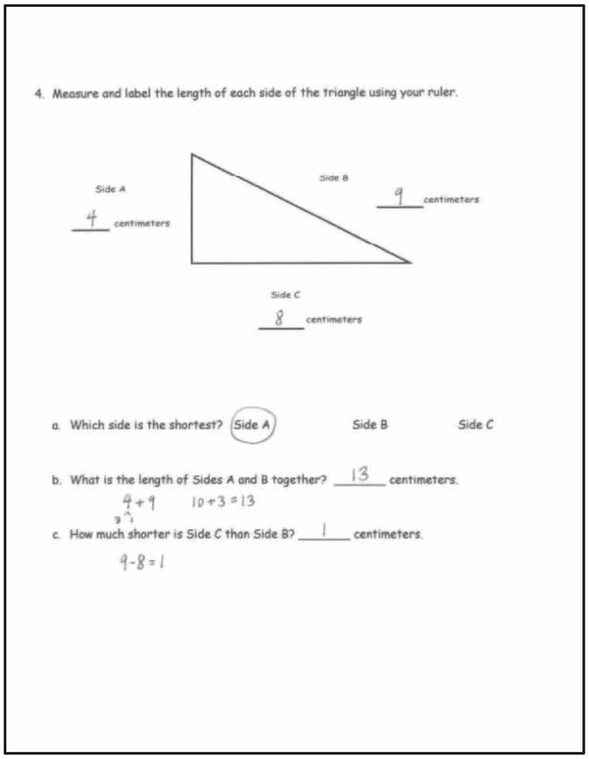
3. The picture of the sandwich is about 9 cm long.

Student Debrief (10 minutes)

Lesson Objective: Apply concepts to create unit rulers and 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 misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.


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

Side A 4 centimeters

Side B 9 centimeters

Side C 8 centimeters

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 10+3=13

c. How much shorter is Side C than Side B? 1 centimeters.

9-8=1

Any combination of the questions below may be used 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**?
- What are some objects that are longer than our centimeter rulers? How can we measure objects that are longer than our rulers?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

A

Number Correct: ________

Making Ten

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	

B

Number Correct: ________

Improvement: ________

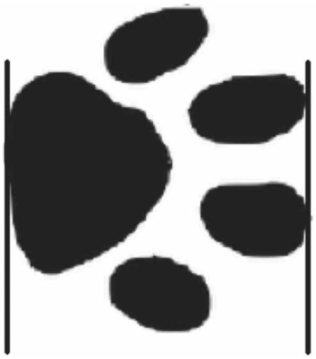
Making Ten

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	

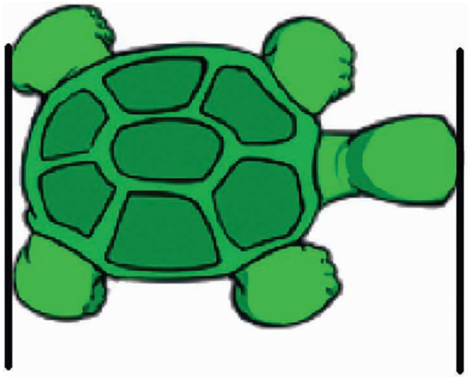
Name ________________________________ Date ______________

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

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

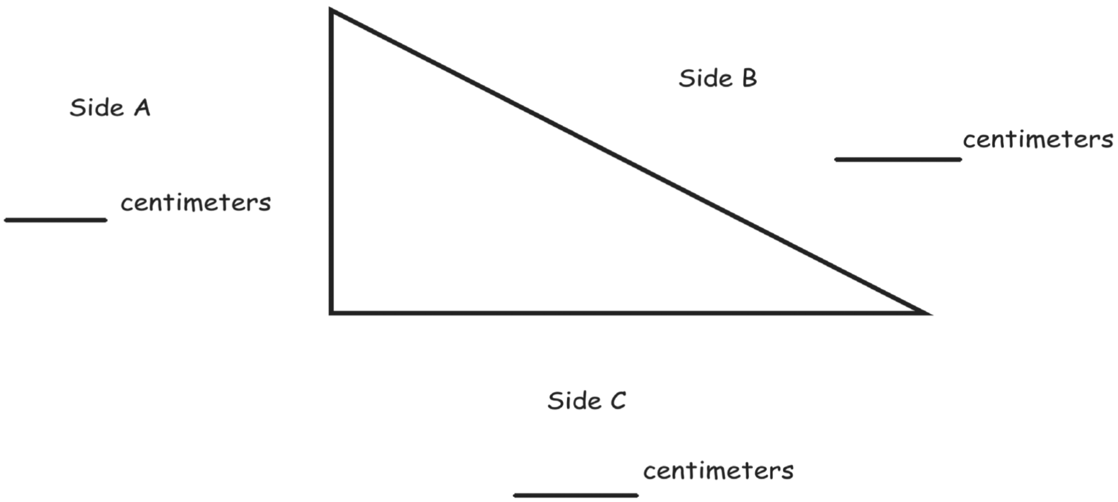


2. The picture of the turtle is about __________ cm long.



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

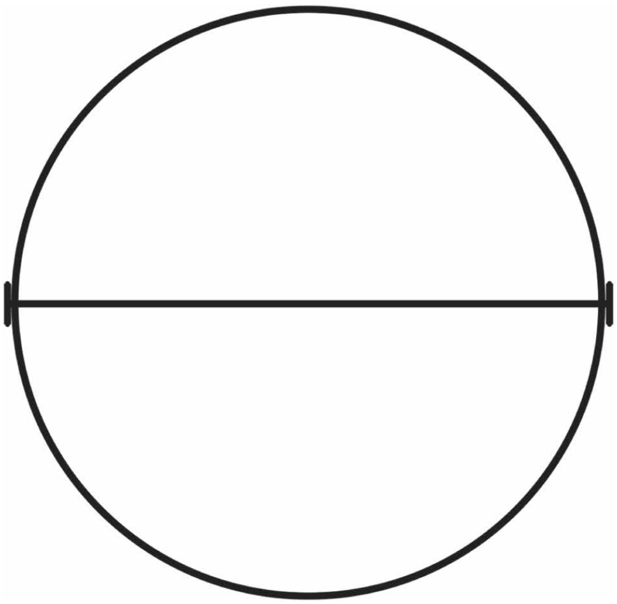
   b. Line B is _____ cm long.

      Line B

   c. Line C is ______ cm long.

      Line C

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

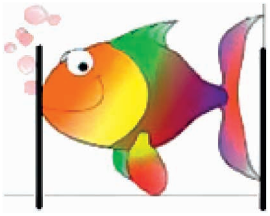


The length across the circle is ________ cm.

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.

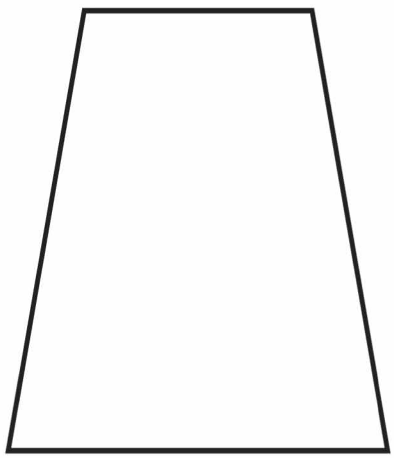
4. Measure the lengths of Sides A, B, and C. Write each length on the line.

Side A

_____ cm

Side B

_____ cm



Side D

Side C

_____ cm

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

2.9A, 2.9D, 2.9E

Focus Standards:		2.9A	Find the length of objects using concrete models for standard units of length.
		2.9D	Determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes.
		2.9E	Determine a solution to a problem involving length, including estimating lengths.
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.

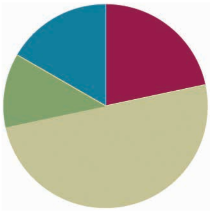
A Teaching Sequence Toward Mastery of Measuring and Estimating Length Using Different Measurement Tools	
Objective 1:	**Measure various objects using centimeter rulers and meter sticks.** **(Lesson 4)**
Objective 2:	**Develop estimation strategies by applying prior knowledge of length and using mental 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 **2.4A** (4 minutes)
- Sprint: Related Facts **2.4A** (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.
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.

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.

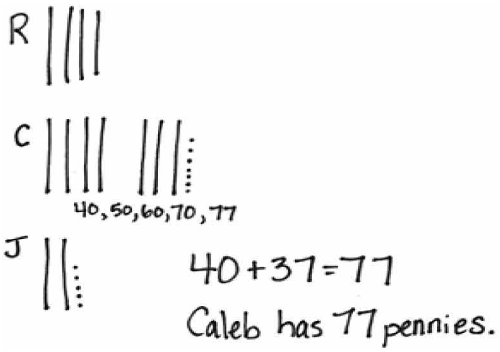
Sprint: Related Facts (9 minutes)

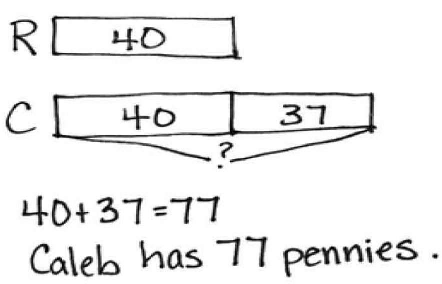
Materials: (S) Related Facts Sprint

Note: The Sprint helps students use related facts as a tool to build mastery of sums and differences within 20.

Application Problem (7 minutes)

Caleb has 37 more pennies than Richard. Richard has 40 pennies. Joe has 25 pennies. How many pennies does Caleb have?





Note: This problem has the added complexity of extraneous information, Joe's pennies. Ask, "Do I need to draw Joe's pennies?" Depending on the needs of students, this can be omitted in order to focus on the *compare with bigger unknown* problem where *more than* is used to compare two quantities, and addition is used to solve.

Concept Development (30 minutes)

Materials: (T) Meter stick, meter tape (S) Centimeter ruler made in Lesson 3, 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?

> **NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**
>
> Assign students a measurement discovery buddy to clarify directions and processes. Buddies compare answers to check their work.

T: How many centimeters are in 1 **meter**?
S: It is 100 centimeters. → It's just a little longer than 3 centimeter rulers.
T: This is another measurement unit 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.)

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.

Any combination of the questions below may be used 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***, and ***meter stick***.)

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

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

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

Object Name	Length in meters
a. door width	1 m
b. rug	2 m
c. teacher's desk	1 m
d. bulletin board	3 m

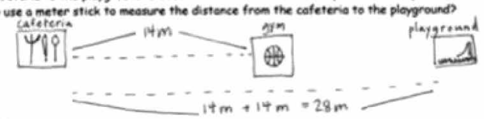
3. List 5 things in your house that you would measure with a meter stick or meter tape.

a. sofa
b. kitchen counter
c. rug
d. bed
e. 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?



14 m + 14 m = 28 m

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

A

Number Correct: ________

Related Facts

1.	8 + 3 =	
2.	3 + 8 =	
3.	11 - 3 =	
4.	11 - 8 =	
5.	7 + 4 =	
6.	4 + 7 =	
7.	11 - 4 =	
8.	11 - 7 =	
9.	9 + 3 =	
10.	3 + 9 =	
11.	12 - 3 =	
12.	12 - 9 =	
13.	8 + 5 =	
14.	5 + 8 =	
15.	13 - 5 =	
16.	13 - 8 =	
17.	7 + 5 =	
18.	5 + 7 =	
19.	12 - 5 =	
20.	12 - 7 =	
21.	9 + 6 =	
22.	6 + 9 =	

23.	15 - 6 =	
24.	15 - 9 =	
25.	8 + 7 =	
26.	7 + 8 =	
27.	15 - 7 =	
28.	15 - 8 =	
29.	9 + 4 =	
30.	4 + 9 =	
31.	13 - 4 =	
32.	13 - 9 =	
33.	8 + 6 =	
34.	6 + 8 =	
35.	14 - 6 =	
36.	14 - 8 =	
37.	7 + 6 =	
38.	6 + 7 =	
39.	13 - 6 =	
40.	13 - 7 =	
41.	9 + 7 =	
42.	7 + 9 =	
43.	16 - 7 =	
44.	16 - 9 =	

B

Number Correct: ________

Improvement: ________

Related Facts

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.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

   e. ______________________________

   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.

   a. Length of a train cm or m

   b. Length of an envelope cm or m

   c. Length of a house cm or m

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

____

____

____

____

Name ______________________________ Date ______________

1. Circle cm (centimeter) or m (meter) to show which unit 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 ____________.

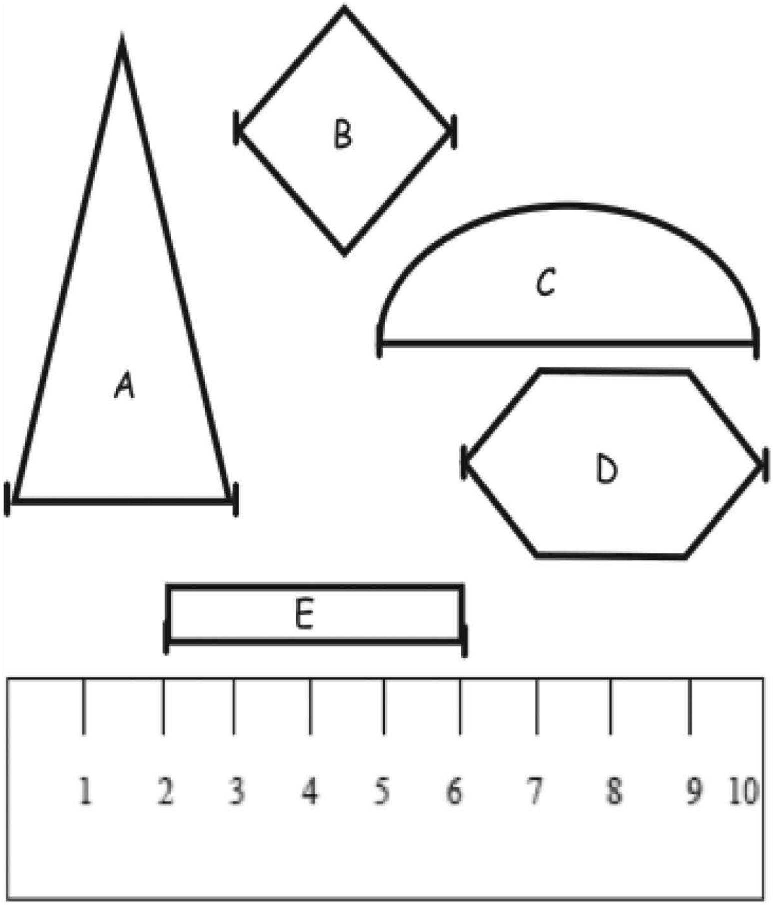
    b. The height of a house is 8 _________.

    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. Rhombus B is ____ cm long.

Semicircle 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.

____

____

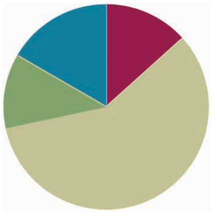
____

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 **2.2A** (4 minutes)
- Take Out a Part **2.4A** (4 minutes)

Break Apart by Tens and Ones (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews place value understanding from Module 1 and helps develop skills needed for Module 3.

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 board 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 tens + 3 tens = 5 tens.
T: 5 tens.
S: 2 tens + 3 tens = 5 tens.
T: 7 tens.
S: 2 tens + 5 tens = 7 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.

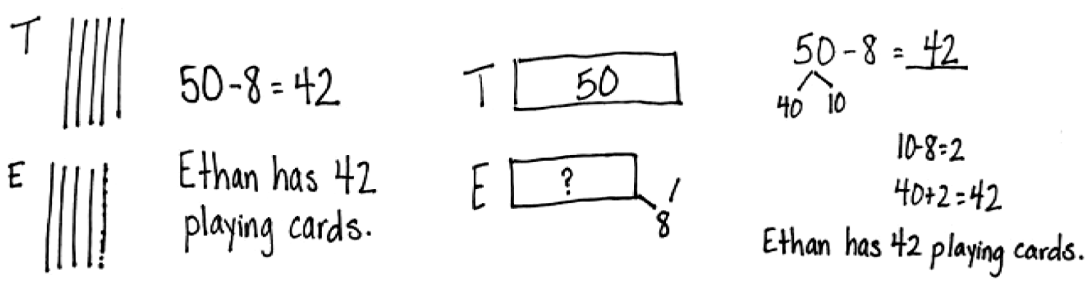
Continue with the following possible sequence: 83, 52, 97, 100, 105, 110, and 120.

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)

Ethan has 8 fewer playing cards than Tristan. Tristan has 50 playing cards. How many playing cards does Ethan have?



Note: This *compare with smaller unknown* problem uses the word *fewer*, which probably will suggest subtraction to students. The numbers were purposely chosen so students have the opportunity to use the take from ten strategy to solve.

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.

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 about 20 centimeters. Your pinky is about 1 centimeter. The three-ring binder is about 30 centimeters. And, the length from the doorknob to the floor is about 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.

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.

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.

Note: Do not allow students to use their rulers to complete the Problem Set initially. Have them estimate the lengths first, and then, pull out their rulers and measure all the line segments at the very end. Otherwise, many students will measure, and then do the estimate.

Student Debrief (10 minutes)

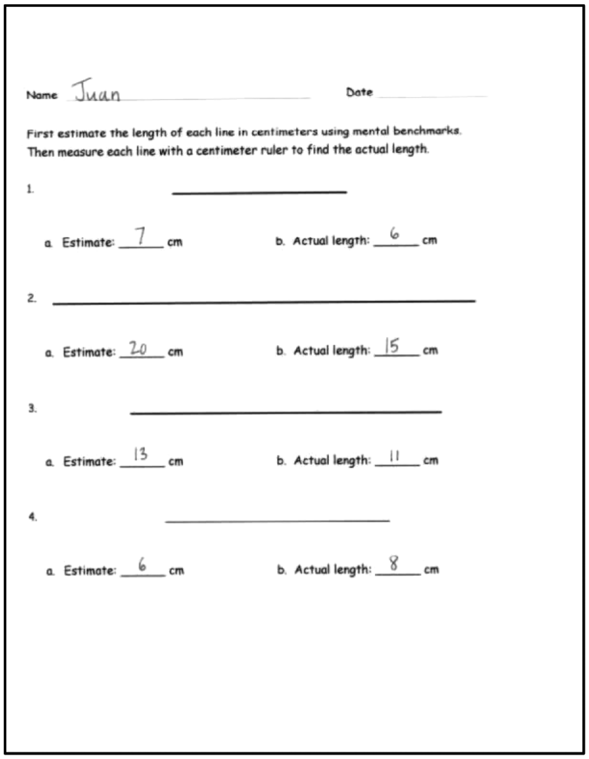
Lesson Objective: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks.

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.

Any combination of the questions below may be used 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?



Name: Juan Date

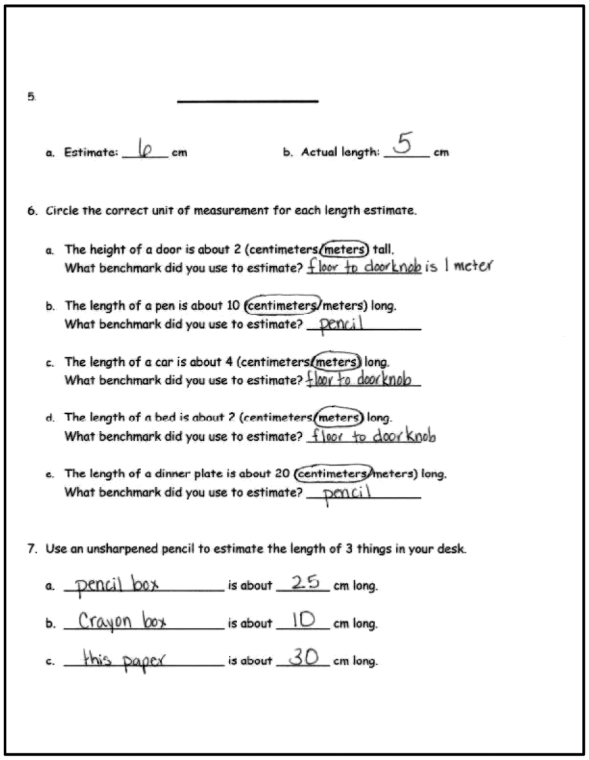
First estimate the length of each line in centimeters using mental benchmarks. Then measure each line with a centimeter ruler to find the actual length.

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



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? floor to doorknob

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

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.

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

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	50 m	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

2.9A, 2.9B, 2.9D

Focus Standards:	2.9A	Find the length of objects using concrete models for standard units of length.
	2.9B	Describe the inverse relationship between the size of the unit and the number of units needed to equal the length of an object.
	2.9D	Determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes.
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.

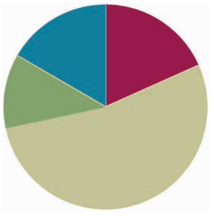
A Teaching Sequence Toward Mastery of Measuring and Comparing Lengths Using Different Length Units	
Objective 1:	**Measure and compare lengths using centimeters and meters.** **(Lesson 6)**
Objective 2:	**Measure and compare lengths using standard metric length units and non-standard length units; relate 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 **2.2C** (2 minutes)
- Sprint: Find the Longer Length **2.2C, 2.2D, 2.2E** (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.

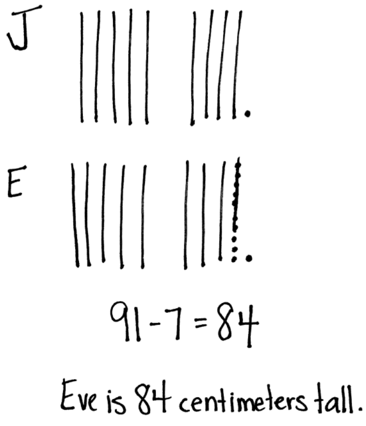
Sprint: Find the Longer Length (9 minutes)

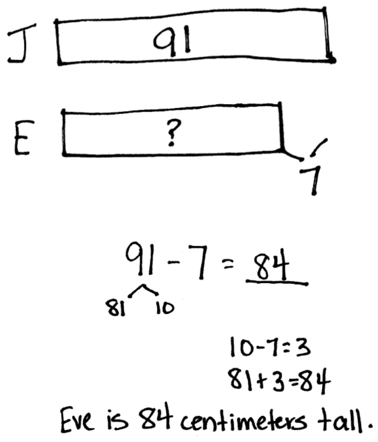
Materials: (S) Find the Longer Length Sprint

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

Application Problem (7 minutes)

Eve is 7 centimeters shorter than Joey. Joey is 91 centimeters tall. How tall is Eve?





In today's lesson, students measure and compare lengths in centimeters and meters. This *compare with smaller unknown* problem is similar to the problem in Lesson 5, but here measurement units are used with *shorter than* rather than *less than* or *fewer than*.

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, and 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.

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.

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 to 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.

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 board or in their math journal. 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.

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.

Student Debrief (10 minutes)

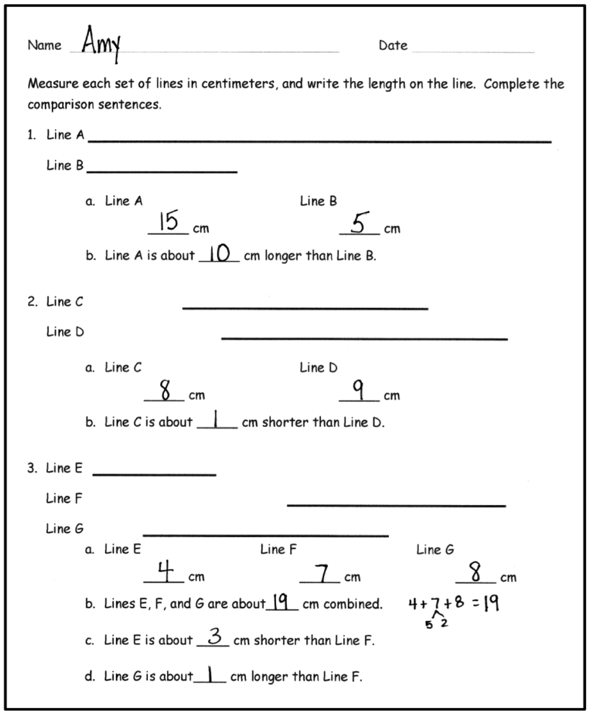
Lesson Objective: Measure and compare lengths using centimeters and meters.

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.

Any combination of the questions below may be used 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**?



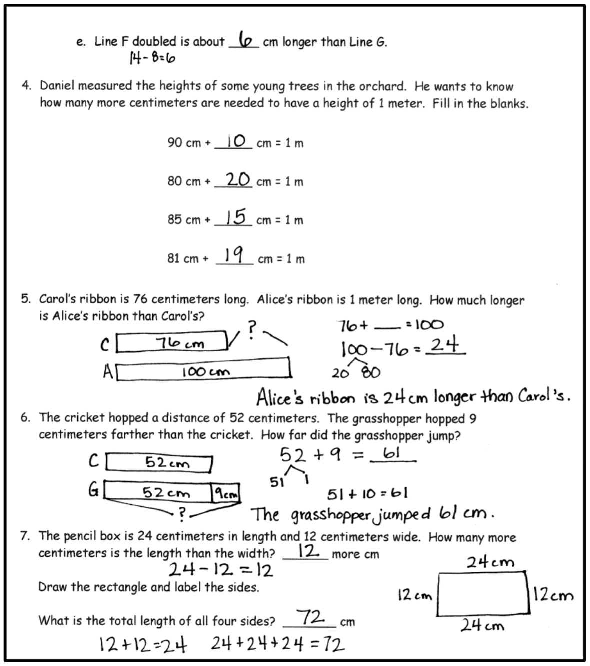
Name Amy Date

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 15 cm Line B 5 cm
   b. Line A is about 10 cm longer than Line B.
2. Line C
   Line D
   a. Line C 8 cm Line D 9 cm
   b. Line C is about 1 cm shorter than Line D.
3. Line E
   Line F
   Line G
   a. Line E 4 cm Line F 7 cm Line G 8 cm
   b. Lines E, F, and G are about 19 cm combined. 4 + 7 + 8 = 19
   c. Line E is about 3 cm shorter than Line F.
   d. Line G is about 1 cm longer than Line F.

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.



e. Line F doubled is about 6 cm longer than Line G.
14 - 8 = 6

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

   81 cm + 19 cm = 1 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?
   C 76 cm ?
   A 100 cm
   76 + ___ = 100
   100 − 76 = 24
   20 80
   Alice's ribbon is 24 cm longer than Carol's.
6. The cricket hopped a distance of 52 centimeters. The grasshopper hopped 9 centimeters farther than the cricket. How far did the grasshopper jump?
   C 52 cm
   G 52 cm 9 cm
   ?
   52 + 9 = 61
   51 1
   51 + 10 = 61
   The grasshopper jumped 61 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.
   24 cm 12 cm 12 cm 24 cm
   What is the total length of all four sides? 72 cm
   12 + 12 = 24 24 + 24 + 24 = 72

A

Number Correct: ________

Circle the longer length.

1.	1 cm	0 cm
2.	11 cm	10 cm
3.	11 cm	12 cm
4.	22 cm	12 cm
5.	29 cm	30 cm
6.	31 cm	13 cm
7.	43 cm	33 cm
8.	33 cm	23 cm
9.	35 cm	53 cm
10.	50 cm	35 cm
11.	55 cm	45 cm
12.	50 cm	55 cm
13.	65 cm	56 cm
14.	66 cm	56 cm
15.	66 cm	86 cm
16.	86 cm	68 m
17.	68 cm	88 cm
18.	89 cm	98 cm
19.	99 cm	98 m
20.	99 cm	1 m
21.	1 m	101 cm
22.	1 m	90 cm

23.	110 cm	101 cm
24.	110 cm	1 m
25.	1 m	111 cm
26.	101 cm	1 m
27.	111 cm	101 cm
28.	112 cm	102 cm
29.	110 cm	115 cm
30.	115 cm	105 cm
31.	106 cm	116 cm
32.	108 cm	98 cm
33.	119 cm	99 cm
34.	131 cm	133 cm
35.	133 cm	113 cm
36.	142 cm	124 cm
37.	144 cm	114 cm
38.	154 cm	145 cm
39.	155 cm	152 cm
40.	198 cm	199 cm
41.	215 cm	225 cm
42.	252 cm	255 cm
43.	2 m	295 cm
44.	3 m	295 cm

B

Number Correct: ________

Improvement: ________

Circle the longer length.

1.	0 cm	1 cm
2.	10 cm	12 cm
3.	12 cm	11 cm
4.	32 cm	13 cm
5.	39 cm	40 cm
6.	41 cm	14 cm
7.	44 cm	40 cm
8.	44 cm	54 cm
9.	55 cm	65 cm
10.	60 cm	59 cm
11.	65 cm	45 cm
12.	70 cm	65 cm
13.	75 cm	57 cm
14.	77 cm	76 cm
15.	87 cm	78 cm
16.	79 cm	97 m
17.	79 cm	88 cm
18.	98 cm	97 cm
19.	99 cm	1 m
20.	99 cm	100 cm
21.	101 cm	100 cm
22.	1 m	101 cm

23.	111 cm	101 cm
24.	101 cm	110 cm
25.	1 m	110 cm
26.	111 cm	1 m
27.	113 cm	117 cm
28.	112 cm	111 cm
29.	115 cm	105 cm
30.	106 cm	116 cm
31.	107 cm	117 cm
32.	118 cm	108 cm
33.	119 cm	120 cm
34.	132 cm	123 cm
35.	133 cm	132 cm
36.	143 cm	134 cm
37.	144 cm	114 cm
38.	154 cm	145 cm
39.	155 cm	152 cm
40.	195 cm	199 cm
41.	225 cm	152 cm
42.	252 cm	255 cm
43.	2 m	295 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 ______ cm   Line B ______ cm

   b. Line A is about __________ cm longer than Line B.

2. Line C

   Line D

   a. Line C ______ cm   Line D ______ cm

   b. Line C is about __________ cm shorter than Line D.

3. Line E

Line F

Line G

a. Line E ______ cm   Line F ______ cm   Line G ______ cm

b. Lines E, F, and G are about _________ cm combined.

c Line E is about _________ cm shorter than Line F.

d. Line G is about_________ cm longer than Line F.

e. 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.

a. 90 cm + ______ cm = 1 m

b. 80 cm + ______ cm = 1 m

c. 85 cm + ______ cm = 1 m

d. 81 cm + ______ cm = 1 m

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

6. The cricket hopped a distance of 52 centimeters. The grasshopper hopped 9 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 ______ cm   Line Y ______ cm   Line Z ______ cm

   b. Lines X, Y, and Z are about ________ cm combined.

   c. Line Z is about ________ cm shorter than Line X.

   d. Line X is about ________ cm shorter than Line Y.

   e. Line Y is about ________ cm longer than Line Z.

   f. 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

   a. How much shorter is the dining room chair than the counter stool? _________ cm

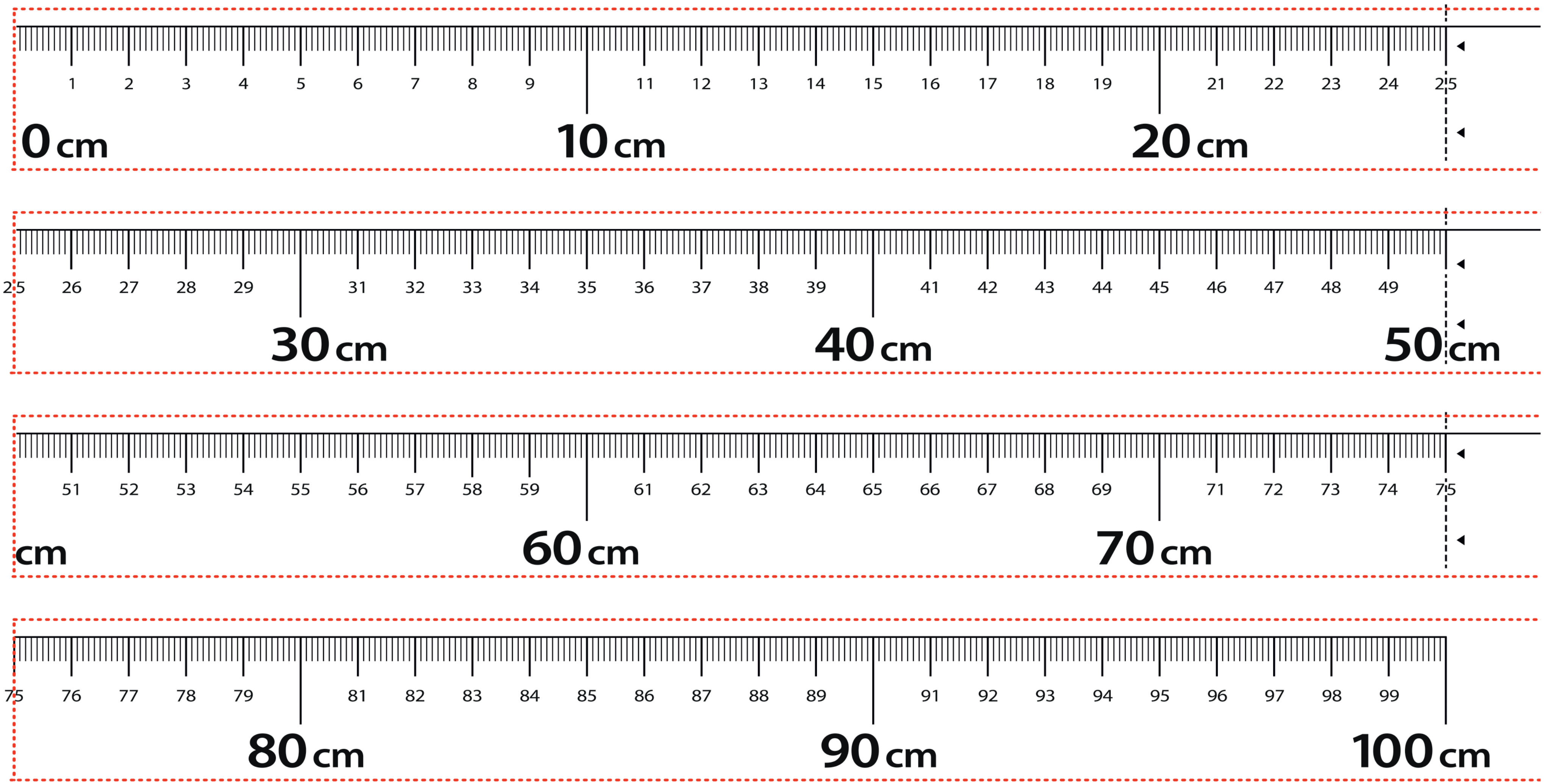
   b. How much taller is a meter stick than the counter stool? _________ cm

   c. How much taller is a meter stick than the loveseat? _________ cm

5. Max ran 15 meters this morning. This afternoon, he ran 48 meters.

   a. How many more meters did he run in the afternoon?

   b. How many meters did Max run in all?



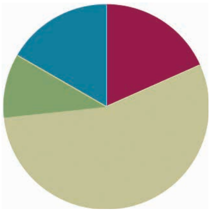
LEGEND ------ CUT ---- ALIGN EDGE

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? **2.9A** (2 minutes)
- Sprint: Subtraction **2.4A, 2.4B** (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 or 10 centimeters?

S: 6 centimeters.

T: Give the number sentence to find how much shorter.

S: 10 cm – 6 cm = 4 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.

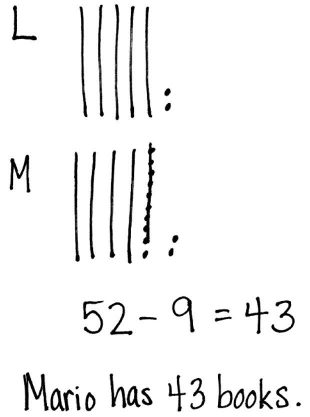
Sprint: Subtraction (9 minutes)

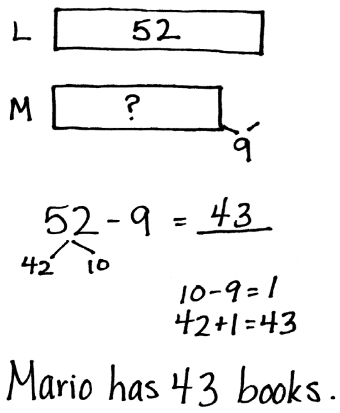
Materials: (S) Subtraction Sprint

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

Application Problem (6 minutes)

Luigi has 9 more books than Mario. Luigi has 52 books. How many books does Mario have?





Note: This *compare with smaller unknown* problem has the complexity that we subtract to find the number of books Mario has, though there is no action of taking away, and the word *more* in the first sentence might suggest addition to students. *More* and *more than* are often mistakenly taught as key words signaling either to add or subtract. This approach distracts students from the more essential task of considering the part–whole relationships within a problem after representing it with a drawing.

Concept Development (33 minutes)

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

Note: Prepare half of the bags with small paper clips and half the bags 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.

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 (e.g., erasers, fingers, crayons) either by using mark and move forward or by laying multiple copies.

T: Take out your crayon and measure with your paper clips. Share your measurement with your partner.

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

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

Tables now switch bags and measure all items in the bag 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 bags. 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 Student Debrief:

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

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

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.

Name Gianna 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 3 paper clips 9 cm
   b. Line B 2 paper clips 6 cm
   c. Line B is about 1 paper clips shorter than Line A.
   d. Line A is about 3 cm longer than Line B.

2. Line L
   Line M
   a. Line L 3 paper clips 9 cm
   b. Line M 1 paper clips 3 cm
   c. Line L is about 2 paper clips longer than Line M.
   d. Line M doubled is about 3 cm shorter than Line L.

3. 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 2 paper clips Line D 5 paper clips
   b. Line D is about 9 cm longer than Line C.
   c. Line C is about 3 paper clips shorter than Line D.
   d. Lines C and D together are about 7 paper clips long.
   e. Lines C and D together are about 21 centimeters long.
   15 + 6 = 21
   5 1

4. Christina measured Line F with quarters and Line G with pennies.

Line F

Line G

Line F is about 6 quarters long. Line G is about 8 pennies long. 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 there are not as many of them.

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.

Any combination of the questions below may be used 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 4. 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.

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

A

Number Correct: ________

Subtraction

1.	3 – 1 =	
2.	13 – 1 =	
3.	23 – 1 =	
4.	53 – 1 =	
5.	4 – 2 =	
6.	14 – 2 =	
7.	24 – 2 =	
8.	64 – 2 =	
9.	4 – 3 =	
10.	14 – 3 =	
11.	24 – 3 =	
12.	74 – 3 =	
13.	6 – 4 =	
14.	16 – 4 =	
15.	26 – 4 =	
16.	96 – 4 =	
17.	7 – 5 =	
18.	17 – 5 =	
19.	27 – 5 =	
20.	47 – 5 =	
21.	43 – 3 =	
22.	87 – 7 =	

23.	8 – 7 =	
24.	18 – 7 =	
25.	58 – 7 =	
26.	62 – 2 =	
27.	9 – 8 =	
28.	19 – 8 =	
29.	29 – 8 =	
30.	69 – 8 =	
31.	7 – 3 =	
32.	17 – 3 =	
33.	77 – 3 =	
34.	59 – 9 =	
35.	9 – 7 =	
36.	19 – 7 =	
37.	89 – 7 =	
38.	99 – 5 =	
39.	78 – 6 =	
40.	58 – 5 =	
41.	39 – 7 =	
42.	28 – 6 =	
43.	49 – 4 =	
44.	67 – 4 =	

B

Number Correct: ________

Improvement: ________

Subtraction

1.	2 – 1 =	
2.	12 – 1 =	
3.	22 – 1 =	
4.	52 – 1 =	
5.	5 – 2 =	
6.	15 – 2 =	
7.	25 – 2 =	
8.	65 – 2 =	
9.	4 – 3 =	
10.	14 – 3 =	
11.	24 – 3 =	
12.	84 – 3 =	
13.	7 – 4 =	
14.	17 – 4 =	
15.	27 – 4 =	
16.	97 – 4 =	
17.	6 – 5 =	
18.	16 – 5 =	
19.	26 – 5 =	
20.	46 – 5 =	
21.	23 – 3 =	
22.	67 – 7 =	

23.	8 – 7 =	
24.	18 – 7 =	
25.	68 – 7 =	
26.	32 – 2 =	
27.	9 – 8 =	
28.	19 – 8 =	
29.	29 – 8 =	
30.	79 – 8 =	
31.	8 – 4 =	
32.	18 – 4 =	
33.	78 – 4 =	
34.	89 – 9 =	
35.	9 – 7 =	
36.	19 – 7 =	
37.	79 – 7 =	
38.	89 – 5 =	
39.	68 – 6 =	
40.	48 – 5 =	
41.	29 – 7 =	
42.	38 – 6 =	
43.	59 – 4 =	
44.	77 – 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

      _____ paper clips _____ cm

   b. Line B

      _____ paper clips _____ cm

   c. Line B is about _____ paper clips shorter than Line A.

   d. Line A is about _____ cm longer than Line B.

2. ________________________________ Line L

   ___________ Line M

   a. Line L

      _____ paper clips _____ cm

   b. Line M

      _____ paper clips _____ cm

   c. Line L is about _____ paper clips longer than Line M.

   d. Line M doubled is about _____ cm shorter than Line L.

3. 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
      _____ paper clips

      Line D
      _____ paper clips

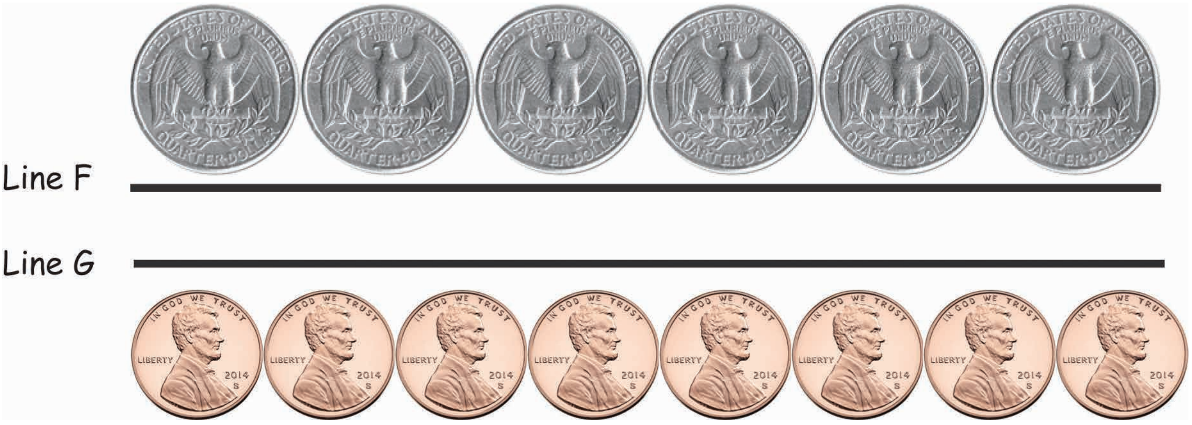
   b. Line D is about _____ cm longer than Line C.

   c. Line C is about _____ paper clips shorter than Line D.

   d. Lines C and D together are about _____ paper clips long.

   e. Lines C and D together are about _____ centimeters long.

4. Christina measured Line F with quarters and Line G with pennies.



Line F is about 6 quarters long. Line G is about 8 pennies long. 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

_____ paper clips _____ cm

b. Line 2

_____ paper clips _____ cm

c. Line 3

_____ paper clips _____ cm

Explain why each measurement required 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

_____ paper clips _____ cm

b. Line Z doubled would measure about _____ paper clips or about _____ cm long.

2. ____ Line A

______________________ Line B

a. Line A

_____ paper clips _____ cm

b. Line B

_____ paper clips _____ cm

c. Line A is about _____ paper clips longer than Line B.

d. 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 12 cm long.

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

a. Line F
_____ paper clips

Line G
_____ paper clips

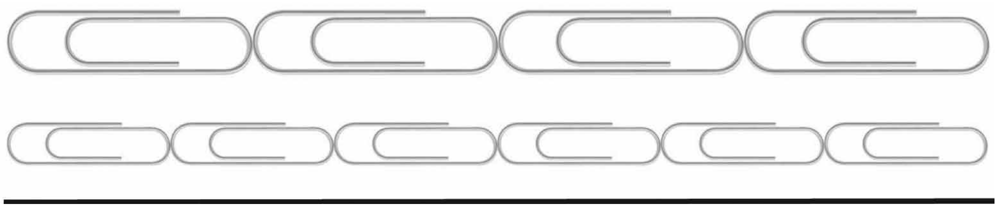
b. Line G is about _____ cm longer than Line F.

c. Line F is about _____ paper clips shorter than Line G.

d. Lines F and G are about _____ paper clips long.

e. Lines F and G are about _____ centimeters long

4. Jordan measured the length of a line with large paper clips. His friend measured the length of the same line with small paper clips.



a. About how many paper clips did Jordan use? _____ large paper clips

b. About how many small paper clips did his friend use? _____ small paper clips

c. Why did Jordan's friend need more paper clips to measure the same line as Jordan?

____

____

Topic D

Relate Addition and Subtraction to Length

2.2E, 2.2F, 2.9C, 2.9E, 2.9A, 2.9D

Focus Standards:	2.2E	Locate the position of a given whole number on an open number line.
	2.2F	Name the whole number that corresponds to a specific point on a number line.
	2.9C	Represent whole numbers as distances from any given location on a number line.
	2.9E	Determine a solution to a problem involving length, including estimating lengths.
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, strip diagrams for comparison) to solve word problems (**2.2E, 2.2F, 2.9C, 2.9E**).

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 strip diagrams to represent and compare lengths. Lesson 10 culminates with students solving two-step word problems involving measurement using like units.

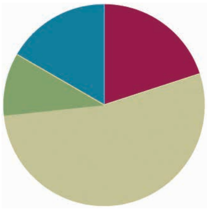
A Teaching Sequence Toward Mastery of Relating Addition and Subtraction to Length	
Objective 1:	**Solve addition and subtraction word problems using the ruler as a number line.** **(Lesson 8)**
Objective 2:	**Measure lengths of string using measurement tools, and use strip diagrams to represent and compare 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? **2.4B** (3 minutes)
- Sprint: Making a Meter **2.4B** (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 cm + 30 cm = 1 m.
T: 40 centimeters.
S: 60 centimeters.
T: Number sentence.
S: 40 cm + 60 cm = 1 m.

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

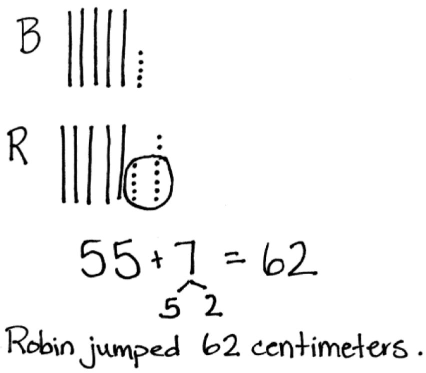
Sprint: Making a Meter (9 minutes)

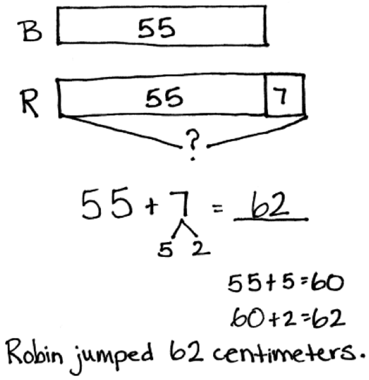
Materials: (S) Making a Meter Sprint

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

Application Problem (6 minutes)

Bill the frog jumped 7 centimeters less than Robin the frog. Bill jumped 55 centimeters. How far did Robin jump?





Note: This *compare with bigger unknown* problem uses the word *less*, which presents an opportunity for students to work through the easy mistake that *less* or *less than* means to subtract. Ask guiding questions such as, who jumped farther? This, along with a strip diagram, helps students recognize that Robin jumped farther and helps them determine the operation, addition.

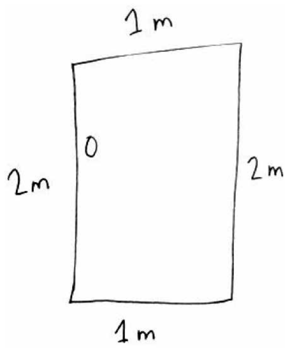
Concept Development (32 minutes)

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?

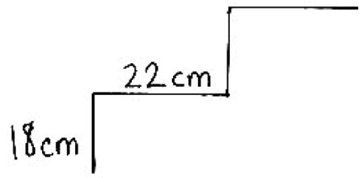
S: Figure out the length around the door using benchmarks like the height of the knob. → Measure around the door with a meter stick and make the ribbon the same length.

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 cm – 80 cm = 20 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 space 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.

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

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?"

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 cm – 45 cm = 15 cm.
→ 45 cm + 15 cm = 60 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.

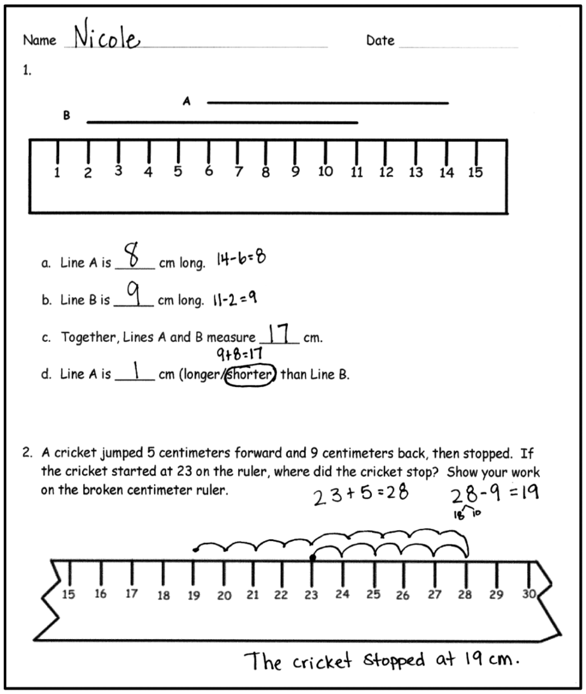
If necessary, repeat the above process with a few more examples:

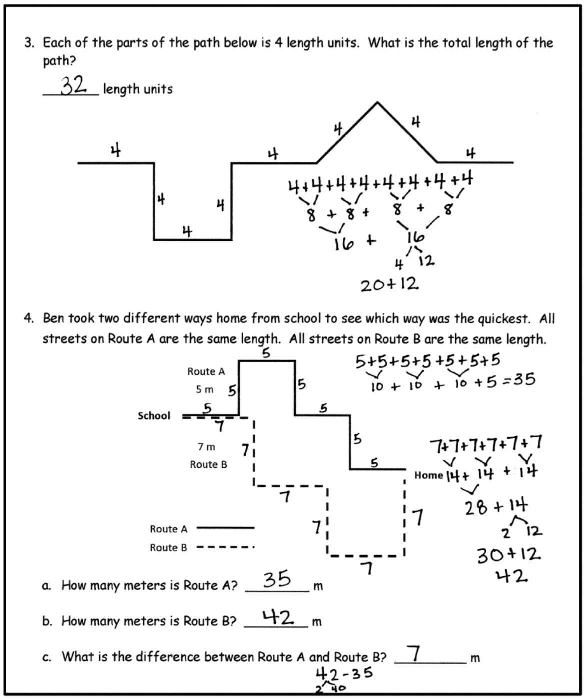
- Students measure an envelope and an invitation (index card) to see if the envelopes are the right size.
- Students measure 80 centimeters of streamer to see if it will fit across the width of the door, the width of the door being about a meter.

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

Any combination of the questions below may be used 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? Invite students to compare their drawings.
- 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 4. 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 4(c) on the class board.

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

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

A

Number Correct: ________

Making a 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

Number Correct: _______

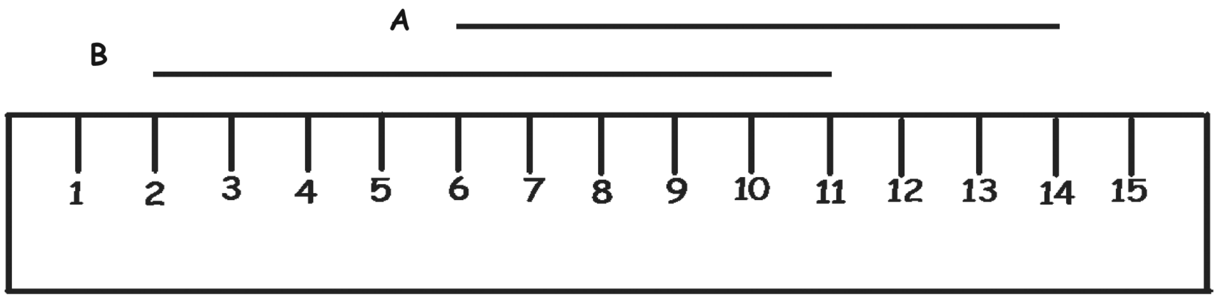
Improvement: _______

Making a 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.



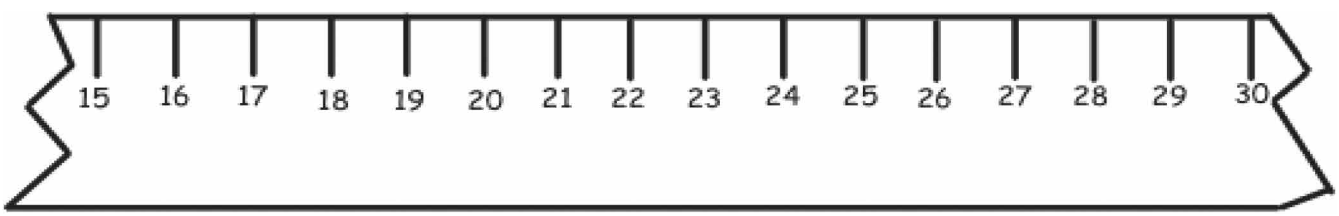
a. Line A is _____ cm long.

b. Line B is _____ cm long.

c. Together, Lines A and B measure _____ cm.

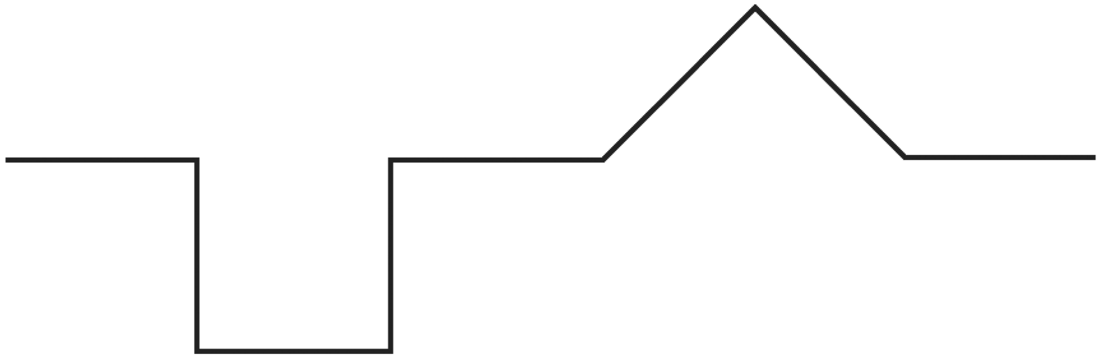
d. Line A is _____ cm (longer/shorter) than Line B.

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

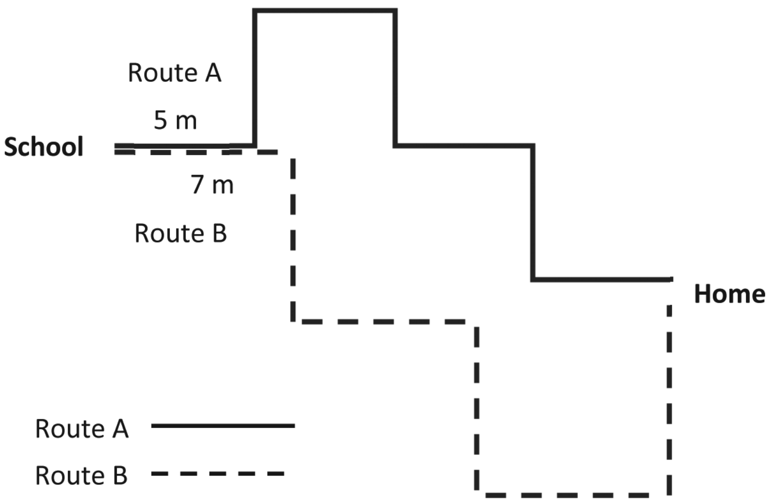


3. Each of the parts of the path below is 4 length units. What is the total length of the path?

_______ length units



4. 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.



a. How many meters is Route A? ________ m

b. How many meters is Route B? ________ m

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

Name ___________________________________ Date ________________

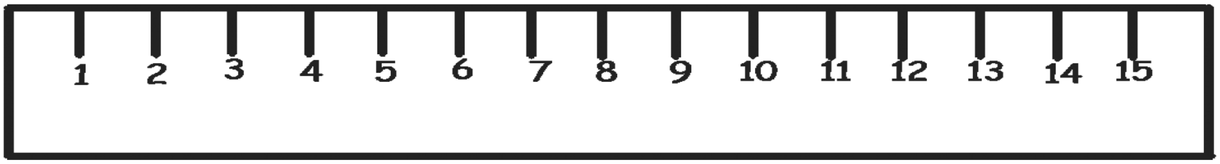
1. Use the ruler below to draw one line that begins at 2 cm and ends at 12 cm. Label that line R. Draw another line that begins at 5 cm and ends at 11 cm. Label that line S.

   a. Add 3 cm to Line R and 4 cm to Line S.

   b. How long is Line R now? ______ cm

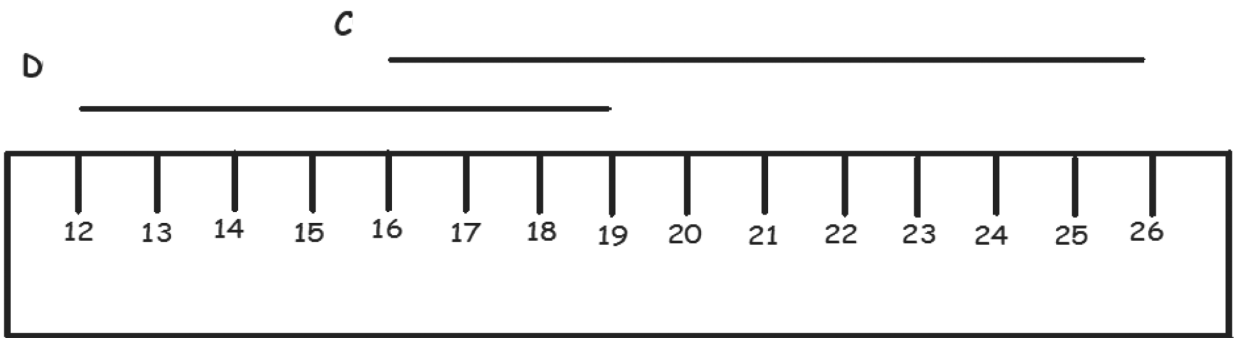
   c. How long is Line S now? ______ cm

   d. The new Line S is _____ cm (shorter/longer) than the new Line R.



Name ________________________________ Date ______________

1.



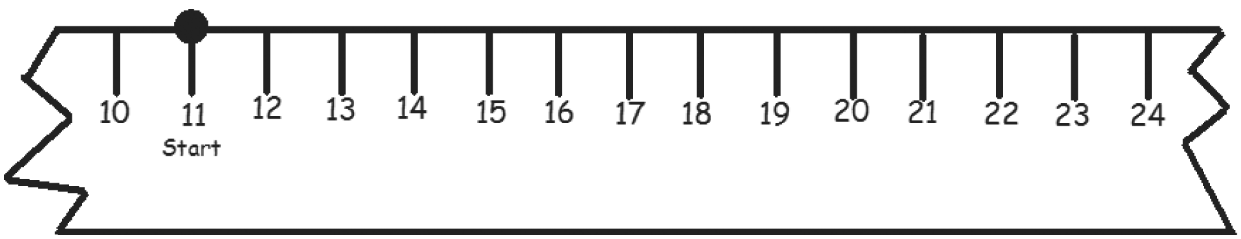
a. Line C is _____ cm.

b. Line D is _____ cm.

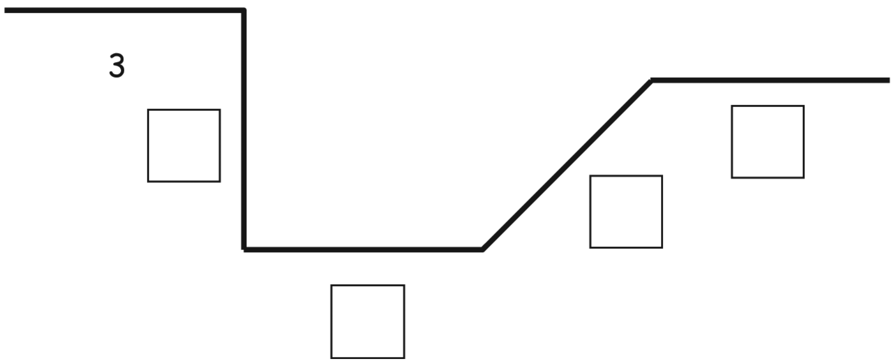
c. Lines C and D are _____ cm.

d. Line C is _____ cm (longer/shorter) than Line D.

2. An ant walked 12 centimeters to the right on the ruler and then turned around and walked 5 centimeters to the left. His starting point is marked on the ruler. Where is the ant now? Show your work on the broken ruler.



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



a. Fill in the empty boxes with the lengths of each side.

b. The path is _____ length units long.

c. How many more parts would you need to add for the path to be 21 length units long?

_____ parts

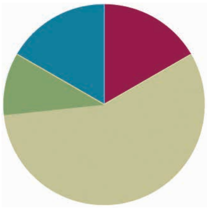
4. The length of a picture is 67 centimeters. The width of the picture is 40 centimeters. How many more centimeters is the length than the width?

Lesson 9

Objective: Measure lengths of string using measurement tools, and use strip 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)**

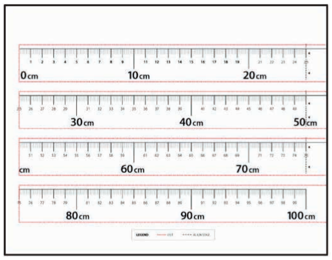


Fluency Practice (10 minutes)

- Meter Strip Addition: Adding Multiples of 10 to Numbers **2.4A, 2.4B** (6 minutes)
- Happy Counting by Centimeters **2.2C** (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 strip 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.

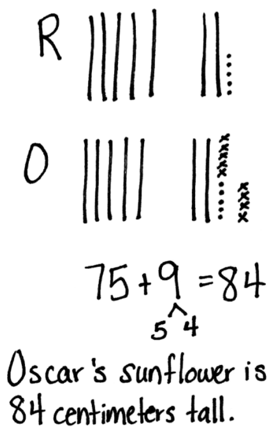
T: Let's count by 10 centimeters, starting at 80 centimeters. When we get to 100 centimeters, we say 1 meter, and then we will count by meters and centimeters. Ready? (Rhythmically point up until a change is desired. Show a closed hand, and then point down. Continue, mixing it up.)

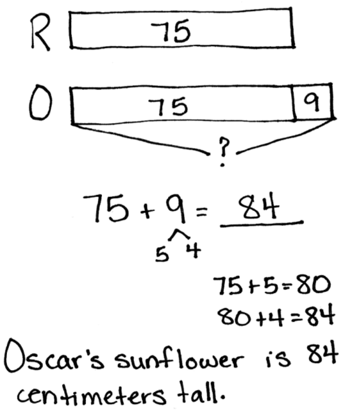
S: 80 cm, 90 cm, 1m, 1m 10 cm, 1 m 20 cm, 1 m 30 cm, 1 m 40 cm, 1 m 50 cm. (Switch direction.) 1 m 40 cm, 1 m 30 cm, 1 m 20 cm. (Switch direction.) 1 m 30 cm, 1 m 40 cm, 1 m 50 cm, 1 m 60 cm, 1 m 70 cm, 1 m 80 cm, 1 m 90 cm, 2 m. (Switch direction.) 1 m 90 cm. (Switch direction.) 2 m, 2 m 10 cm, 2 m 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)

Richard's sunflower is 9 centimeters shorter than Oscar's. Richard's sunflower is 75 centimeters tall. How tall is Oscar's sunflower?





This *compare with bigger unknown* problem is similar to the problem in Lesson 8, but here the word "shorter" relates to measurement. This is in anticipation of today's Concept Development, wherein students measure lengths of strings and use strip diagrams to represent and compare lengths.

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 zigzaggy. Convene students on the carpet, 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.

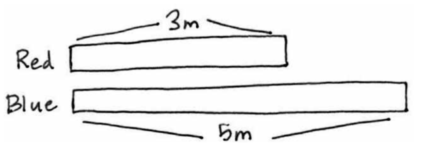
T: (Use the red string to measure the squiggly path and the blue string to measure the zigzag path.)

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 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 strip diagram. It is helpful because we can draw a small picture to represent any length.

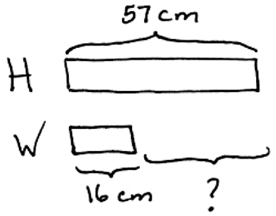
T: Let's practice making a strip diagram.

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

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 = ___. → 16 + _____ = 57.

Check students' strip 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.

Student Debrief (10 minutes)

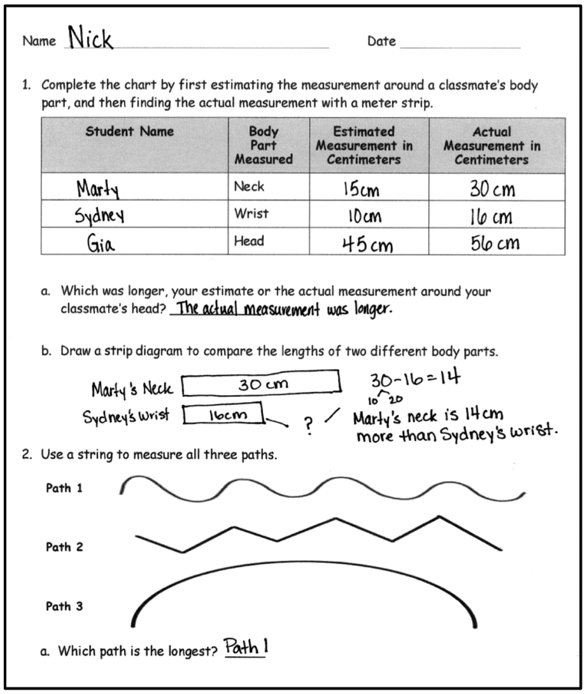
Lesson Objective: Measure lengths of string using measurement tools, and use strip diagrams to represent and compare lengths.

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.

Any combination of the questions below may be used 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 strip diagram? How do your drawings compare to your partner's?
- What do you think the math goal of this lesson was? What would be a good name for this lesson?
- How did you show your thinking today?



Name Nick 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
Marty	Neck	15cm	30 cm
Sydney	Wrist	10cm	16 cm
Gia	Head	45cm	56 cm

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

b. Draw a strip diagram to compare the lengths of two different body parts.

Marty's Neck 30 cm

Sydney's Wrist 16cm ?

30 − 16 = 14

Marty's neck is 14cm more than Sydney's wrist.

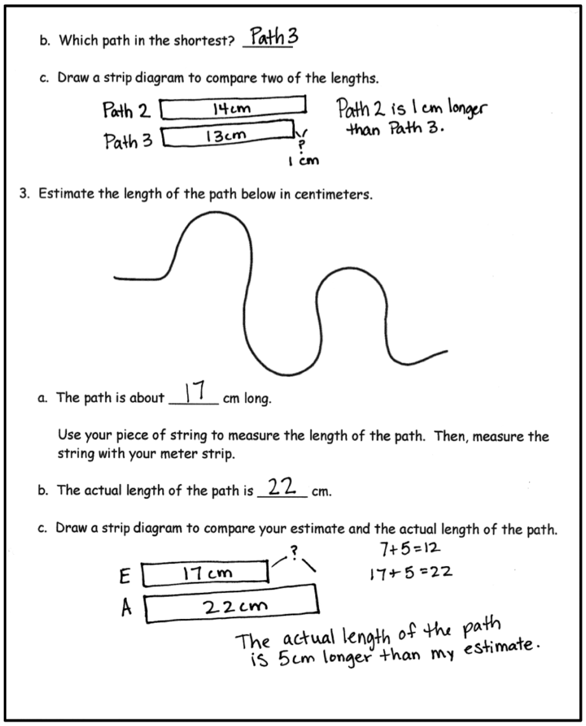
2. Use a string to measure all three paths.

Path 1

Path 2

Path 3

a. Which path is the longest? Path 1



b. Which path in the shortest? Path 3

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

Path 2 14cm

Path 3 13cm ? 1 cm

Path 2 is 1 cm 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 meter strip.

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

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

E 17 cm ?

A 22 cm

7 + 5 = 12

17 + 5 = 22

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

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Name ________________________________ Date ______________

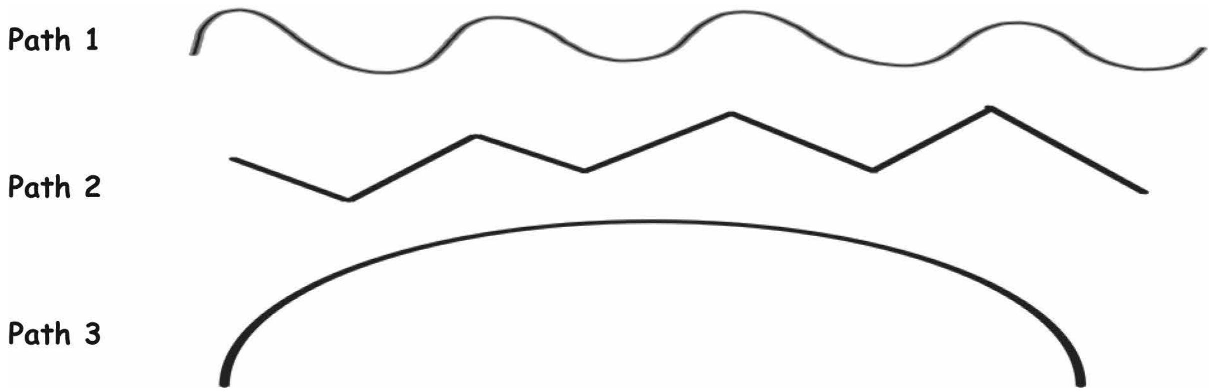
1. Complete the chart by first estimating the measurement around a classmate's body part and then finding the actual measurement with a meter strip.

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 strip diagram to compare the lengths of two different body parts.

2. Use a string to measure all three paths.

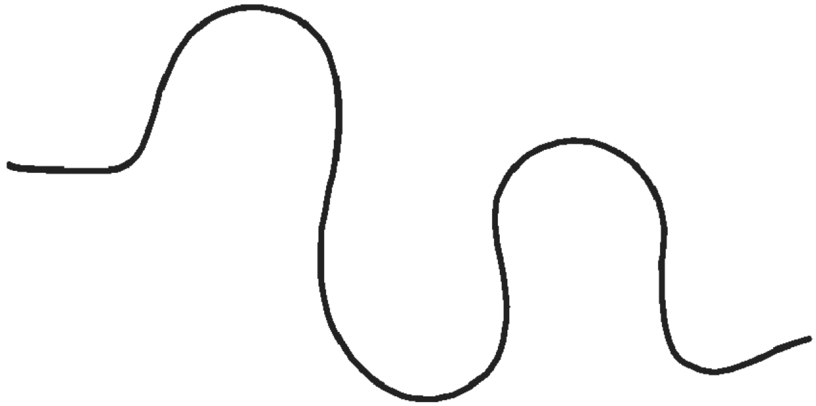


a. Which path is the longest? _______

b. Which path in the shortest? ______

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

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



a. The path is about ______ cm long.

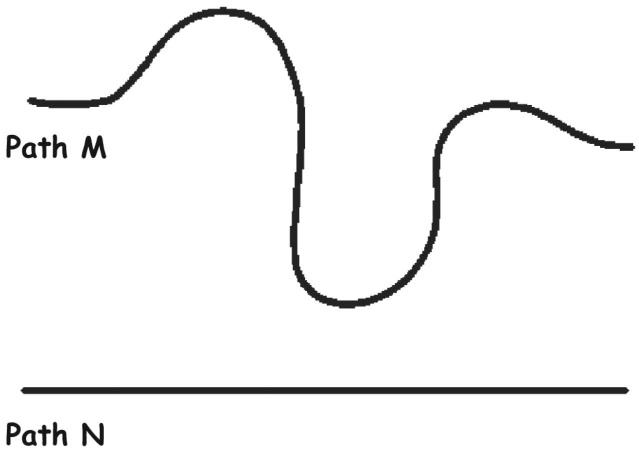
Use your piece of string to measure the length of the path. Then, measure the string with your meter strip.

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

c. Draw a strip 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 strip diagram to compare the two lengths.

Name ______________________________ Date ______________

1. Mia completed the chart by first estimating the measurement around three objects in her house and then finding the actual measurement with her meter strip.

Object Name	Estimated Measurement in Centimeters	Actual Measurement in Centimeters
Orange	40 cm	36 cm
Mini Basketball	30 cm	41 cm
Bottom of a glue bottle	10 cm	8 cm

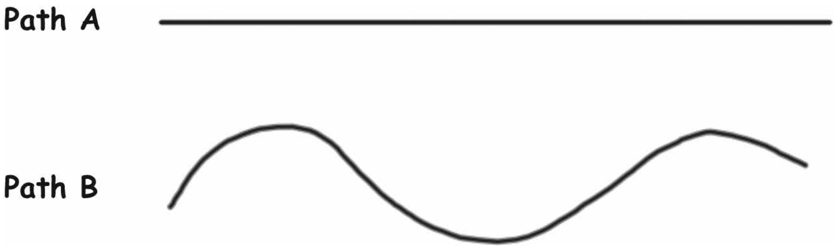
a. What is the difference between the longest and shortest measurements?

__________ cm

b. Draw a strip diagram comparing the measurements of the orange and the bottom of the glue bottle.

c. Draw a strip diagram comparing the measurements of the basketball and the bottom of the glue bottle.

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



   a. Path A is __________ cm long.

   b. Path B is __________ cm long.

   c. Together, Paths A and B measure __________ cm.

   d. Path A is __________ cm (shorter/longer) than Path B.

3. Shawn and Steven had a contest to see who could jump farther. Shawn jumped 75 centimeters. Steven jumped 9 more centimeters than Shawn.

   a. How far did Steven jump? _________ centimeters

   b. Who won the jumping contest? ___________

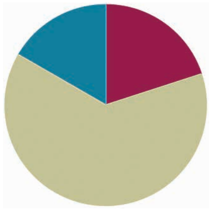
   c. Draw a strip diagram to compare the lengths that Shawn and Steven jump.

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 **2.4A, 2.4B** (6 minutes)
- Take from Ten **2.4A** (3 minutes)
- Relate Subtraction to Addition **2.4A** (3 minutes)

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

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

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 students show mastery, advance to subtracting 20 centimeters.

Take from Ten (3 minutes)

Note: Students explore an alternate method of using ten to subtract in preparation of subtracting throughout the year. 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?

(Draw on board)

12 – 3 =___

/

2 1

T: 12 – 3.

S: 12 – 2 – 1.

T: Answer.

S: 9.

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 board.)

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)

12 – 1 =____

/

10 2

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., linking cubes) to demonstrate conceptual understanding of addition and subtraction. Incremented bars can be added to the strip diagram as a transition from base ten blocks to a pictorial model, as well.

Concept Development (38 minutes)

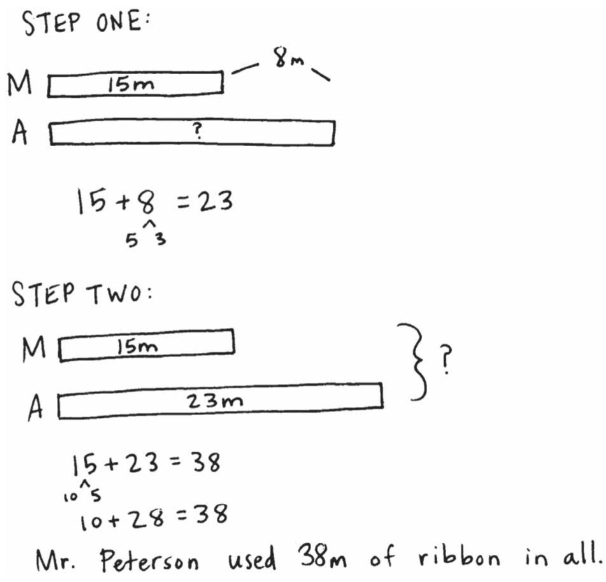
Materials: (S) Personal white board

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 strip 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.)

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. → 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.

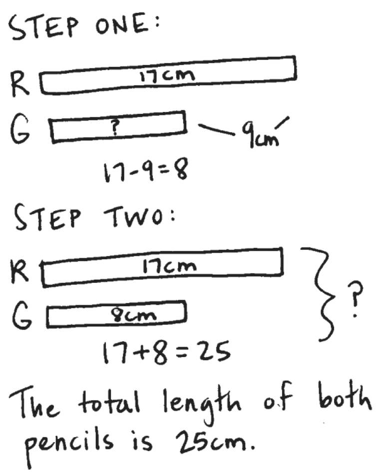
T: Remember, we also have to write our answer in a word sentence. How many meters of ribbon did Mr. Peterson use in all?

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 students through a similar process to that of Problem 1. Work the problem with them.

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 a 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 a number sentence and statement of the solution.

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

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.

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 strip diagrams. Modify two-step word problems so that they only involve single-digit addends. Assign struggling students to a buddy to clarify processes.

Student Debrief (10 minutes)

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

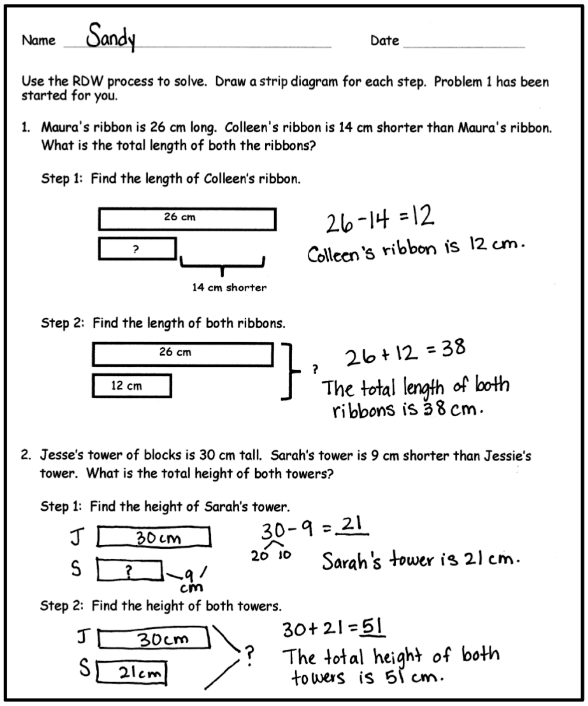
The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

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

Any combination of the questions below may be used to lead the discussion.

- How was your drawing for Problem 2, Step 1, similar to the model drawn for Problem 1, Step 1?
- With your partner, compare your strip 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?
- What must you do when drawing strip 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 strip diagrams help you to solve problems with more than one step?



Name Sandy Date

Use the RDW process to solve. Draw a strip 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.

$26 - 14 = 12$

Colleen's ribbon is 12 cm.

Step 2: Find the length of both ribbons.

$26 + 12 = 38$

The total length of both ribbons is 38 cm.

2. Jesse's tower of blocks is 30 cm tall. Sarah's tower is 9 cm shorter than Jessie's tower. What is the total height of both towers?

Step 1: Find the height of Sarah's tower.

$30 - 9 = 21$

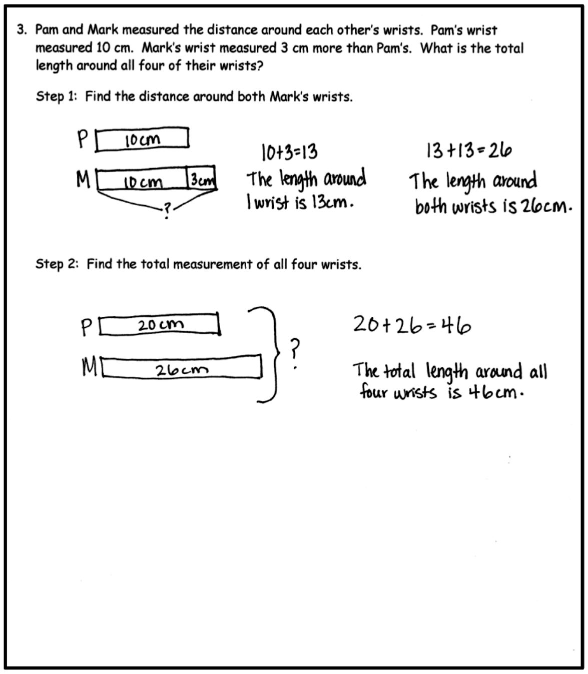
20 10

Sarah's tower is 21 cm.

Step 2: Find the height of both towers.

$30 + 21 = 51$

The total height of both towers is 51 cm.



3. 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.

$10 + 3 = 13$

The length around 1 wrist is 13 cm.

$13 + 13 = 26$

The length around both wrists is 26 cm.

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

$20 + 26 = 46$

The total length around all four wrists is 46 cm.

Exit Ticket (3 minutes)

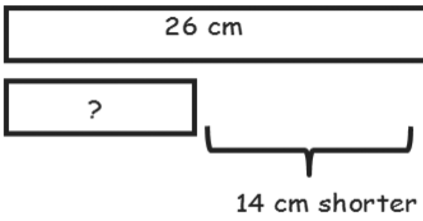
After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Name ______________________________ Date ________________

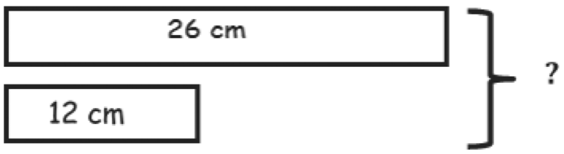
Use the RDW process to solve. Draw a strip diagram for each step. Problem 1 has been started for you.

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.



   Step 2: Find the length of both ribbons.



2. Jesse's tower of blocks is 30 cm tall. Sarah's tower is 9 cm shorter than Jessie's tower. What is the total height of both towers?

   Step 1: Find the height of Sarah's tower.

   Step 2: Find the height of both towers.

3. 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 ______________

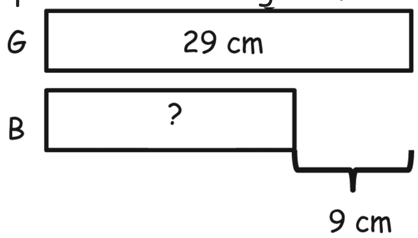
Steven has a black leather strip that is 13 centimeters long. He cut off 5 centimeters. His teacher gave him a brown leather strip that is 16 centimeters long. What is the total length of both strips?

Name ______________________________ Date ______________

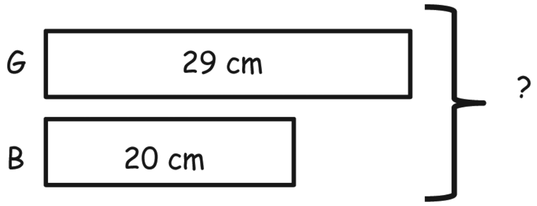
Use the RDW process to solve. Draw a strip diagram for each step. Problem 1 has been started for you.

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.