Topic B

Measure and Estimate Length Using Different Measurement Tools

2.MD.1, 2.MD.3

Focus Standard:

2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

Instructional Days: 2

Coherence – Links from: G1–M3 Ordering and Comparing Length Measurement as Numbers

– Links to: G2–M7 Problem Solving with Length, Money, and Data

G3–M2 Place Value and Problem Solving with Units of Measure

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

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

Objective 1: Measure various objects using centimeter rulers and meter sticks.

(Lesson 4)

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

(Lesson 5)
Lesson 4

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

Suggested Lesson Structure
- Fluency Practice (13 minutes)
- Application Problems (7 minutes)
- Concept Development (30 minutes)
- Student Debrief (10 minutes)
- Total Time (60 minutes)

Fluency Practice (13 minutes)

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

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

Related Facts on a Ruler (4 minutes)

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: Number sentence?
S: 11 – 3 = 8.
T: Give a number sentence to show 8 less than 11.
S: 11 – 8 = 3.

Continue with possible sequence: 9, 2, 11; 4, 9, 13; 8, 5, 13; 7, 5, 12; 9, 6, 15.
Lesson 4

NYS COMMON CORE MATHEMATICS CURRICULUM

Lesson 4

Measure various objects using centimeter rulers and meter sticks.

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Sprint: Related Facts (9 minutes)

Materials: (S) Related Facts Sprint

Application Problem (7 minutes)

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

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

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

Concept Development (30 minutes)

Materials: (S) Centimeter rulers made in Lesson 3, meter sticks, meter tape, one text book per student

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: (Measures 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 to measure their length in centimeters?

T: How many centimeters are in one meter?

S: It is 100 cm. → It’s just a little longer than 3 centimeter rulers.

T: This is another unit of measure called a meter. When we are measuring things that are more than 100 cm we can measure in meters.

T: We use a meter stick exactly the same way we use a ruler.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Assign students a measurement discovery buddy to clarify directions and/or processes. Buddies compare answers to check their work.
T: (Call on a volunteer to measure the rug with a meter stick.)

T: I notice that the rug is 4 meters and some more. When a measurement does not reach an exact measurement we have to round up or down to whichever number is closer.

T: Since the rug is just a little more than 4 meters we can say it is about 4 meters long.

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 length of our books to see how high the shelf should be. Turn to your neighbor and estimate the length of your science book. (Students 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 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 and 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 solve these problems using the RDW approach used for Application Problems.

**Problem Set**

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

<table>
<thead>
<tr>
<th>Object Name</th>
<th>Length in centimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book</td>
<td>27 cm</td>
</tr>
<tr>
<td>postit</td>
<td>8 cm</td>
</tr>
<tr>
<td>crayon</td>
<td>9 cm</td>
</tr>
<tr>
<td>eraser</td>
<td>5 cm</td>
</tr>
<tr>
<td>pencil sharpener</td>
<td>3 cm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Object Name</th>
<th>Length in meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>door width</td>
<td>1 m</td>
</tr>
<tr>
<td>rug</td>
<td>2 m</td>
</tr>
<tr>
<td>teacher's desk</td>
<td>1 m</td>
</tr>
<tr>
<td>bookcase</td>
<td>2 m</td>
</tr>
</tbody>
</table>

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Student Debrief (10 minutes)

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

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

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson. You may choose to use any combination of the questions below to lead the discussion.

Share with your partner: Which things did you measure in centimeters? Why? Which things did you measure in meters? Why?

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

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Lesson 5

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

Suggested Lesson Structure

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

Fluency Practice (8 minutes)

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

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

Break Apart by Tens and Ones (4 minutes)

Materials: (S) Personal white boards

T: If I say 64, you write 6 tens 4 ones.
T: If I say 7 tens 2 ones, you write 72.
T: Turn your board over when you’ve written your answer. When I say, “Show me,” hold it up.
T: 5 tens 2 ones. (Pause.) Show me.
S: (Hold up boards showing 52.)
T: 84. (Pause.) Show me.
S: (Show 8 tens 4 ones.)

Continue with 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, 11 tens 5 ones.

T: Partner B, quiz Partner A for 1 minute.
Lesson 5: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks.

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Take Out a Part (4 minutes)

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. Get ready. (Signal.)
S: 2 tens + 3 tens = 5 tens.
T: 7 tens. Get ready. (Signal.)
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. Get ready. (Signal.)
S: 20 + 30 = 50.
T: 70. Get ready. (Signal.)
S: 20 + 50 = 70.

Continue with 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 (pause and signal).
S: 40 + 10 = 50.

Continue with possible sequence: 70, 75, 81, 87, etc.

Application Problem (7 minutes)

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

Note: Today’s problem asks students to choose the appropriate measurement tool by applying prior knowledge of length and making comparisons. Students work independently using personal boards and then compare their responses with a partner. The teacher listens in on conversations and invites a few students to share their responses with the whole class. The teacher may wish to return to this problem during the debrief segment to estimate the amount of rope needed to build the ladder.
Concept Development (35 minutes)

Materials: (T) Meter stick displayed horizontally for student reference  (S) 1 unsharpened brand new pencil and 1 centimeter cube per student, student-created ruler from Lesson 3, meter tape one per student

T: Put your pinky on your centimeter cube. Would you say it’s about the same length 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 student-created rulers to check estimates.)
T: The distance from the floor to the doorknob is about one 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 whiteboard is.
Lesson 5: Develop estimation strategies by applying prior knowledge of length and using mental benchmarks.

S: It looks like the board is a few meters long. → I can fit more than one meter stick along the length of the whiteboard. → 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 whiteboard 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. (Student volunteer measures the three-ring binder.)

T: It is. Now that we know this is 30 centimeters what other lengths can we estimate with this information?

S: The length of my science book. → The length of the paper that goes inside the binder.

T: All these measurements we use to estimate length are called mental benchmarks. The pencil is 20 centimeters. Your pinky is 1 centimeter. The three-ring binder is 30 centimeters. And the length from the doorknob to the floor is 1 meter. You can use these benchmarks at any time by picturing them in your head to estimate the length of an object. Now use your mental benchmarks to estimate length on your worksheet. Check your estimates by measuring.

Problem Set (10 minutes)

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

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

Exit Ticket (3 minutes)

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