Measuring Length

Teacher Guide
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Measuring Length

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Family Support Materials
Assessments
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Unit 3: Measuring Length

At a Glance

Unit 3 is estimated to be completed in 16-20 days including 2 days for assessment.

This unit is divided into three sections including 14 lessons and 4 optional lessons.

- Section A—Metric Measurement (Lessons 1-7)
- Section B—Customary Measurement (Lessons 8-13)
- Section C—Line Plots (Lessons 14-18)

On pages 8-9 of this Teacher Guide is a chart that identifies the section each lesson belongs in and the materials needed for each lesson.

This unit uses eight student centers.

- Target Numbers
- Five in a Row: Addition and Subtraction
- Estimate and Measure
- Math Stories
- Capture Squares
- Number Puzzles: Addition and Subtraction
- Target Measurements
- Creating Line Plots
Unit 3: Measuring Length

Unit Learning Goals

• Students measure and estimate lengths in standard units and solve measurement story problems within 100.

This unit introduces students to standard units of lengths in the metric and customary systems. In grade 1, students expressed the lengths of objects in terms of a whole number of copies of a shorter object laid without gaps or overlaps. The length of the shorter object serves as the unit of measurement.

Here, students learn about standard units of length: centimeters, meter, inches, and feet. They examine how different measuring tools represent length units, learn how to use the tools, and gain experience in measuring and estimating the lengths of objects. Along the way, students notice that the length of the same object can be described with different measurements and relate this to differences in the size of the unit used to measure.

Throughout the unit, students solve one- and two-step story problems involving addition and subtraction of lengths. To make sense of and solve these problems, they use previously learned strategies for adding and subtracting within 100, including strategies based on place value.

To close the unit, students learn that line plots can be used to represent numerical data. They create and interpret line plots that show measurement data and use them to answer questions about the data.

Students relate the structure of a line plot to the tools they used to measure lengths. This prepares students for the work in the next unit, where they interpret numbers on the number line as lengths from 0. The number line is an essential representation that will be used in future grades and throughout students’ mathematical experiences.
Section A: Metric Measurement

Standards Alignments

Building On
1.MD.A.2
2.MD.A, 2.MD.A.1, 2.MD.A.3, 2.MD.A.4, 2.MD.B.5, 2.MD.B.6, 2.NBT.A.2, 2.NBT.B.5,

Addressing
2.OA.A.1, 2.OA.B.2

Building
Towards
2.MD.A.1, 2.MD.A.2

Section Learning Goals

- Measure length in centimeters and meters.
- Represent and solve one-step story problems within 100.

This section introduces two metric units: centimeter and meter. Students use base-ten blocks, which have lengths of 1 centimeter and 10 centimeters, to measure objects in the classroom and to create their own centimeter ruler. Students iterate the 1-centimeter unit just as they had done with non-standard units in grade 1.

Students relate the side length of a centimeter cube to the distance between tick marks on their ruler. They see that each tick mark notes the distance in centimeters from the 0 mark, and that the length units accumulate as they move along the ruler and away from 0.

Students then compare the ruler they created to a standard centimeter ruler. They learn the importance of placing the end of an object at 0 and discuss how the numbers on the ruler represent lengths from 0.

Students also learn about a longer unit in the metric system, meter, and use it to estimate lengths. They have opportunities to choose measurement tools and to do so strategically (MP5), by considering the lengths of objects being measured. Students also measure the length of longer objects in both centimeters and meters, which prompts them to relate the size of the unit to the measurement.

To close the section, students apply their knowledge of measurement to compare the lengths of objects and solve Compare story problems involving lengths within 100, measured in metric units.

PLC: Lesson 2, Activity 2, Measure with 10-centimeter Tools
Suggested Centers

- Target Numbers (1–5), Stage 5: Subtract Two-digit Numbers (Addressing)
- Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting)
- Estimate and Measure (1–4), Stage 1: Choose Your Unit (Addressing)
Section B: Customary Measurement

Standards Alignments

**Building On**
1.NBT.B.3, 1.OA.D.7

**Addressing**
2.MD.A.1, 2.MD.A.2, 2.MD.A.3, 2.MD.A.4, 2.MD.B.5, 2.NBT.B.5, 2.OA.A

**Building Towards**
2.OA.B.2

**舆论 Learning Goals**

- Measure length in feet and inches.
- Represent and solve one- and two-step story problems within 100.

In this section, students apply measurement concepts and skills from earlier to measure and estimate lengths in two customary units: inches and feet.

As in the previous section, students make choices about the tool to use based on the length of the object being measured (MP5) and measure the length of the same object in both feet and inches. They begin to generalize that when they use a longer length unit, fewer of those units are needed to span the full length of the object. This understanding is a foundation for their work with fractions in grade 3 and beyond.

To solidify their understanding of measurement concepts, students also solve one- and two-step story problems involving addition and subtraction of lengths within 100, expressed in customary units. Some problems involve measurements using a “torn tape” where the 0 cannot be used as a starting point.

*Jada and Han used an inch ruler to measure the short side of a notebook.*

How did Han and Jada get the same measurement?

 Married PLC: Lesson 11, Activity 1, Saree Silk Ribbon Necklaces
Suggested Centers

- Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting)
- Math Stories (K–2), Stage 5: Tape Diagrams (Supporting)
Section C: Line Plots

Standards Alignments
Building On 2.MD.A.1
Addressing 2.MD.A.1, 2.MD.A.3, 2.MD.A.4, 2.MD.B.5, 2.MD.B.6, 2.MD.D.9, 2.NBT.B.5,
Building Towards 2.OA.B.2

Section Learning Goals
- Represent numerical data on a line plot.

In this section, students apply their understanding of measurement and data to create and interpret line plots. Students learn that the horizontal scale is marked off in whole-number length units, the same ones used to collect the data.

They recognize that the numbers on the number line represent lengths and each “x” above a number represents an object of that length. They label line plots with titles and the measurement unit used. Throughout the section, students connect the features of the line plot to the tools they use to measure.

![Group A's Pencils](image1)

![Group B's Pencils](image2)

PLC: Lesson 15, Activity 2, Plot Pencil Lengths
## Suggested Centers

- Number Puzzles: Addition and Subtraction (1–4), Stage 4: Within 100 with Composing (Addressing)
- Target Measurements (2–5), Stage 1: Inches and Centimeters (Addressing)

## Throughout the Unit

Throughout the unit, the warm-up activities help students strengthen their conceptual understanding of numbers and develop fluency. Building from the place value understanding developed in the prior unit, students have an opportunity to add and subtract by adding a ten, counting on, and counting back. They can also use strategies that involve adding and subtracting by place value and decomposing a ten.

Here is a sampling of Number Talk warm-ups in the unit.

<table>
<thead>
<tr>
<th>lesson 6</th>
<th>lesson 7</th>
<th>lesson 13</th>
<th>lesson 15</th>
<th>lesson 16</th>
<th>lesson 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 + 5</td>
<td>37 – 20</td>
<td>58 + 10</td>
<td>47 – 20</td>
<td>15 + 5 + 1</td>
<td>3 + 5</td>
</tr>
<tr>
<td>15 + 5</td>
<td>37 – 21</td>
<td>58 + 12</td>
<td>47 – 24</td>
<td>25 + 6</td>
<td>5 – 3</td>
</tr>
<tr>
<td>15 + 15</td>
<td>37 – 17</td>
<td>58 + 13</td>
<td>36 – 10</td>
<td>16 + 7</td>
<td>5 – 3 + 5</td>
</tr>
<tr>
<td>15 + 25</td>
<td>37 – 16</td>
<td>67 + 14</td>
<td>36 – 15</td>
<td>37 + 6</td>
<td>3 + 5 + 3 + 3</td>
</tr>
</tbody>
</table>
# Materials Needed

<table>
<thead>
<tr>
<th>LESSON</th>
<th>GATHER</th>
<th>COPY</th>
</tr>
</thead>
</table>
| A.1    | ● Centimeter cubes  
● Connecting cubes  
● Straws  
● String | ● none | |
| A.2    | ● Base-ten blocks  
● Base-ten blocks | ● Bearded Dragon (groups of 1)  
● Reptile Length (groups of 1) | |
| A.3    | ● Base-ten blocks  
● Materials from a previous activity  
● Scissors | ● Centimeter Ruler Template (groups of 1) | |
| A.4    | ● Materials from a previous activity  
● Objects of various lengths  
● Rulers (centimeters) | ● none | |
| A.5    | ● Base-ten blocks  
● Metersticks  
● Rulers (centimeters)  
● Tape (painter's or masking) | ● none | |
| A.6    | ● Base-ten blocks | ● none | |
| A.7    | ● Materials from previous centers  
● Metersticks  
● Objects of various lengths  
● Rulers (centimeters) | ● Estimate and Measure Stage 2 Recording Sheet (groups of 1) | |
| B.8    | ● Inch tiles  
● Objects of various lengths  
● Rulers (inches) | ● none | |
### Grade 2, Unit 3

#### Unit 3 Materials Needed

<table>
<thead>
<tr>
<th>B.9</th>
<th>Inch tiles</th>
<th>none</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measuring tapes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Objects of various lengths</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rulers (inches)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tape (painter's or masking)</td>
<td></td>
</tr>
</tbody>
</table>

| B.10   | Objects of various lengths | none |
|--------| Rulers (inches) |      |

| B.11   | Base-ten blocks | none |

| B.12   | none | none |

<table>
<thead>
<tr>
<th>B.13</th>
<th>Materials from previous centers</th>
<th>Target Measurement Stage 1 Recording Sheet (groups of 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rulers (centimeters)</td>
<td>Number Puzzles Addition Stage 4 Gameboard (groups of 2)</td>
</tr>
<tr>
<td></td>
<td>Rulers (inches)</td>
<td>Number Puzzles Digit Cards (groups of 2)</td>
</tr>
<tr>
<td></td>
<td>Straightedges</td>
<td></td>
</tr>
</tbody>
</table>

| C.14   | Rulers (inches) | none |
|        | Sticky notes |      |

| C.15   | Objects of various lengths | Line Plot Template (groups of 1) |
|--------| Rulers (centimeters) |      |

| C.16   | none | Line Plot Template (groups of 1) |

<table>
<thead>
<tr>
<th>C.17</th>
<th>Materials from previous centers</th>
<th>Creating Line Plots Stage 1 Recording Sheet (groups of 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Objects of various lengths</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rulers (centimeters)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rulers (inches)</td>
<td></td>
</tr>
</tbody>
</table>

| C.18   | Chart paper | none |
|        | Index cards |      |
|        | Materials from a previous activity |      |
|        | Sticky notes |      |
|        | Tape |      |
Center: Target Numbers (1–5)

Stage 5: Subtract Two-digit Numbers

Lessons
- Grade2.3.A1 (addressing)
- Grade2.3.A2 (addressing)
- Grade2.3.A3 (addressing)

Stage Narrative
Students subtract two-digit numbers to get as close to 0 as possible. Students start their first equation with 100. Then, they take turns rolling the three cubes to get a number to subtract. They choose one of the numbers on the cubes to represent the tens and the other number to represent the ones. Students subtract their tens and ones from the starting number. The difference becomes the first number in the next equation. The player who gets closest to 0 in 6 rounds, without going below 0, is the winner.

Standards Alignments
Addressing 2.NBT.B.5

Materials to Gather
Base-ten blocks, Number cubes

Materials to Copy
Target Numbers Stage 5 Recording Sheet (groups of 1)

Additional Information
Each group of 2 needs 3 number cubes.

Stages used in Grade 1

Stage 1

Addressing
- Grade1.5.B

Supporting
- Grade1.5.C
- Grade1.6.A
- Grade1.6.B
- Grade1.7.B
- Grade1.7.C
Stage 2

Addressing
- Grade1.5.B

Supporting
- Grade1.5.C
- Grade1.6.A
- Grade1.6.B
- Grade1.7.B
- Grade1.7.C

Stage 3

Addressing
- Grade1.5.C

Supporting
- Grade1.6.A
- Grade1.6.B
- Grade1.7.B
- Grade1.7.C
Center: Five in a Row: Addition and Subtraction (1–2)

Stage 6: Add within 100 with Composing

Lessons
- Grade2.3.A1 (supporting)
- Grade2.3.A2 (supporting)
- Grade2.3.A3 (supporting)
- Grade2.3.A4 (supporting)
- Grade2.3.A5 (supporting)
- Grade2.3.A6 (supporting)

Stage Narrative
Partner A chooses two numbers and places a paper clip on each number. They add the numbers and place a counter on the sum. Partner B moves one of the paper clips to a different number, adds the numbers, and places a counter on the sum. Students take turns moving one paper clip, finding the sum, and covering it with a counter.

Standards Alignments
Addressing  1.NBT.C.4, 2.NBT.B.5

Materials to Gather
- Paper clips, Two-color counters

Materials to Copy
- Five in a Row Addition and Subtraction Stage 6 Gameboard (groups of 2)

Additional Information
Each group of 2 needs 25 counters and 2 paper clips.
Stages used in Grade 1

Stage 1

Addressing
- Grade1.1.A
- Grade1.1.B
- Grade1.1.C
- Grade1.3.D

Supporting
- Grade1.4.A
- Grade1.4.B
- Grade1.4.C
- Grade1.5.A
- Grade1.5.B
- Grade1.5.C
- Grade1.6.A
- Grade1.6.B

Stage 2

Addressing
- Grade1.1.A
- Grade1.1.B
- Grade1.1.C
- Grade1.3.D

Supporting
- Grade1.4.A
- Grade1.4.B
- Grade1.4.C
- Grade1.5.A
- Grade1.5.B
- Grade1.5.C
- Grade1.6.A
- Grade1.6.B
Stage 3

Addressing
- Grade1.3.C
- Grade1.3.D

Supporting
- Grade1.4.A
- Grade1.4.B
- Grade1.4.C
- Grade1.5.A
- Grade1.5.B
- Grade1.5.C
- Grade1.6.A
- Grade1.6.B

Stage 4

Addressing
- Grade1.4.A
- Grade1.4.B

Supporting
- Grade1.5.A
- Grade1.5.B
- Grade1.5.C
- Grade1.6.A
- Grade1.6.B

Stage 5

Addressing
- Grade1.5.A
- Grade1.5.B
- Grade1.5.C

Supporting
- Grade1.6.A
- Grade1.6.B
Stage 6

Addressing
- Grade1.5.C

Supporting
- Grade1.6.A
- Grade1.6.B
Center: Estimate and Measure (1–4)

Stage 1: Choose Your Unit

Lessons
- Grade2.3.A4 (addressing)
- Grade2.3.A5 (addressing)
- Grade2.3.A6 (addressing)

Stage Narrative
Students choose an object and a familiar unit to measure it with. They estimate the length of the object and then measure to see the actual length to the nearest whole unit.

Variation:
Students may use base-ten cubes and add the length of two objects to practice adding within 100.

Standards Alignments
Addressing 1.MD.A.2, 1.NBT.C.4

Materials to Gather
Base-ten blocks, Connecting cubes, Paper clips (2-inch)

Materials to Copy
Estimate and Measure Stage 1 Recording Sheet (groups of 1)

Additional Information
Gather or identify objects of various lengths that are less than 20 units (pencils, markers, books, glue, scissors, shoe, tape dispenser, side of desk).

Stage 2: Centimeters and Inches

Activities
- Grade2.3.A7.1 (addressing)
- Grade2.3.A7.2 (addressing)
- Grade2.3.B13.2 (addressing)
- Grade2.3.C17.2 (addressing)

Stage Narrative
Students choose an object and a unit (inches, feet, centimeters) to measure it with. They estimate the length of the object and then measure to see the actual length to the nearest whole unit.
Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3

Materials to Gather
Rulers (centimeters), Rulers (inches)

Materials to Copy
Estimate and Measure Stage 2 Recording Sheet (groups of 1)

Additional Information
Gather or identify objects of various lengths (pencils, markers, books, glue, scissors, shoes, tape dispensers, sides of desk, length of bulletin board).

Stages used in Grade 1

Stage 1

Addressing
• Grade 1.6.B
• Grade 1.6.C
Center: Math Stories (K–2)

Stage 5: Tape Diagrams

Lessons
- Grade2.3.B8 (supporting)
- Grade2.3.B9 (supporting)
- Grade2.3.B10 (supporting)
- Grade2.3.B11 (supporting)
- Grade2.3.B12 (supporting)

Activities
- Grade2.3.A7.2 (supporting)

Stage Narrative
Students pose and solve addition and subtraction story problems about tape diagrams.

Standards Alignments
Addressing 2.NBT.B.5, 2.OA.A.1

Materials to Copy
Math Stories Stage 5 Recording Sheet (groups of 1), Math Stories Stage 5 Tape Diagrams (groups of 2)

Stages used in Grade 1

Stage 4

Addressing
- Grade1.2.A
- Grade1.2.B
- Grade1.2.C
- Grade1.2.D
Center: Capture Squares (1–3)

Stage 4: Subtract within 20

Lessons

- Grade 2.3.B8 (supporting)
- Grade 2.3.B9 (supporting)
- Grade 2.3.B10 (supporting)
- Grade 2.3.B11 (supporting)
- Grade 2.3.B12 (supporting)

Stage Narrative

Students spin to get a number (16–20) and flip a card (0–10). They subtract the number on the card from the number on the spinner. The spinner includes a wild space where students can choose their own number.

Standards Alignments

Addressing 1.OA.C.6, 2.OA.B.2

Materials to Gather

- Colored pencils or crayons
- Number cards 0–10
- Paper clips

Materials to Copy

- Capture Squares Stage 4 Gameboard (groups of 2)
- Capture Squares Stage 4 Spinner (groups of 2)

Stages used in Grade 1

Stage 1

Addressing

- Grade 1.2.B
- Grade 1.2.C
- Grade 1.2.D

Supporting

- Grade 1.7.A
- Grade 1.7.B
- Grade 1.7.C
Stage 2

Addressing

- Grade1.2.C
- Grade1.2.D

Supporting

- Grade1.7.A
- Grade1.7.B
- Grade1.7.C
Center: Number Puzzles: Addition and Subtraction (1–4)

Stage 2: Within 20

Activities
• Grade2.3.C17.2 (addressing)

Stage Narrative
Students work together to use digit cards to make addition and subtraction equations within 20 true. Each digit card may only be used one time on a page.

Standards Alignments
Addressing 1.OA.C.6, 1.OA.D.8, 2.OA.B.2

Materials to Copy
Number Puzzles Addition and Subtraction Stage 2 Gameboard (groups of 1), Number Puzzles Digit Cards (groups of 2)

Stage 3: Within 100 without Composing

Activities
• Grade2.3.C17.2 (addressing)

Stage Narrative
Students work together to use digit cards to make addition and subtraction equations within 100 without composing true. Each digit card may only be used one time on a page.

Standards Alignments
Addressing 1.NBT.C.4, 1.OA.D.8

Materials to Copy
Number Puzzles Addition and Subtraction Stage 3 Gameboard (groups of 2), Number Puzzles Digit Cards (groups of 2)
Stage 4: Within 100 with Composing

Lessons
- Grade2.3.C14 (addressing)
- Grade2.3.C15 (addressing)
- Grade2.3.C16 (addressing)

Activities
- Grade2.3.B13.1 (addressing)
- Grade2.3.B13.2 (addressing)
- Grade2.3.C17.2 (addressing)

Stage Narrative
Students use digit cards to make addition and subtraction equations true. They work with sums and differences within 100 with composing and decomposing. Each digit card may only be used one time on a page.

Standards Alignments
Addressing 1.NBT.C.4, 1.OA.D.8, 2.NBT.B.5

Materials to Copy
Number Puzzles Addition Stage 4 Gameboard (groups of 2), Number Puzzles Digit Cards (groups of 2)

Stages used in Grade 1

Stage 1

Addressing
- Grade1.2.D
- Grade1.3.C

Supporting
- Grade1.3.A
- Grade1.3.B
- Grade1.4.A
- Grade1.4.B
- Grade1.5.A
- Grade1.5.B
- Grade1.5.C
Stage 2

Addressing

- Grade1.3.B
- Grade1.3.C

Supporting

- Grade1.4.A
- Grade1.4.B
- Grade1.5.A
- Grade1.5.B
- Grade1.5.C

Stage 3

Addressing

- Grade1.5.A
- Grade1.5.B
- Grade1.5.C

Stage 4

Addressing

- Grade1.5.C
Center: Target Measurements (2-5)

Stage 1: Inches and Centimeters

Lessons
- Grade2.3.C14 (addressing)
- Grade2.3.C15 (addressing)
- Grade2.3.C16 (addressing)

Activities
- Grade2.3.B13.2 (addressing)
- Grade2.3.C17.2 (addressing)

Stage Narrative
Students try to draw a line segment as close as possible to the length of the target measurement (in whole inches or centimeters).

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3

Materials to Gather
Paper, Rulers (centimeters), Rulers (inches)

Materials to Copy
Target Measurement Stage 1 Recording Sheet (groups of 2)
Center: Creating Line Plots (2-5)

Stage 1: Inches and Centimeters

Activities
- Grade2.3.C17.1 (addressing)

Stage Narrative

Students measure up to eight objects to the nearest centimeter or inch. They work with a partner to create a line plot to represent their measurement data. Then they ask their partner two questions that can be answered based on their line plot.

Variation:

If students completed the Estimate and Measure Center, they may choose to use their length measurements to represent on the line plot.

Standards Alignments

Addressing 2.MD.D.9

Materials to Gather

Objects of various lengths, Rulers (centimeters), Rulers (inches)

Materials to Copy

Creating Line Plots Stage 1 Recording Sheet (groups of 1)

Additional Information

Gather or identify objects of various lengths (pencils, markers, books, glue, scissors, shoe, tape dispenser, side of desk, length of bulletin board).
Section A: Metric Measurement

Lesson 1: Standard Units of Measure

Standards Alignments
Building On 1.MD.A.2
Addressing 2.MD.A
Building Towards 2.MD.A.1, 2.MD.A.2

Teacher-facing Learning Goals
• Measure by iterating same-size length units.

Student-facing Learning Goals
• Let’s measure length.

Lesson Purpose
The purpose of this lesson is for students to measure by iterating same-size length units and identify the need for standard units of measurement.

In grade 1, students learned how to measure length by laying multiple copies of a shorter object end to end without gaps or overlaps. In this lesson, students use these measuring skills to measure the length of objects by iterating with straws and centimeter cubes. In the first activity, students use different length units when measuring the same objects and see that this leads to different measurements. In the second activity, all students use the same length unit (centimeter cubes) and see they all find the same measurement. In the lesson synthesis, students are introduced to the centimeter as the length of a centimeter cube. Students will use the centimeter as a length unit in future lessons.

Give students access to centimeter cubes during the cool-down.

Access for:

⚠ Students with Disabilities
• Representation (Activity 2)

Instructional Routines
MLR8 Discussion Supports (Activity 1), What Do You Know About ____? (Warm-up)
Materials to Gather

- Centimeter cubes: Activity 2
- Connecting cubes: Activity 2
- Straws: Activity 1
- String: Activity 1

Lesson Timeline

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Teacher Reflection Question

In grade 1, students measured by iterating same-size length units. How did students demonstrate their understanding and skill with measurement in this lesson? What can you do in future lessons to build on these strengths?

Cool-down (to be completed at the end of the lesson)

Measure a Rectangle

Standards Alignments

Addressing 2.MD.A

Student-facing Task Statement

1. How long is the rectangle?
   Use centimeter cubes to measure.
   
   _________ centimeter cubes

2. Clare got 6 when she measured the same rectangle. Why might her measurement be different?
Student Responses

1. 11 centimeter cubes
2. Sample response: Clare’s measurement might be different because she probably used a different kind of cube to measure.

Warm-up

What Do You Know About Measuring?

Standards Alignments

Building Towards 2.MD.A.1

The purpose of this warm-up is to invite students to share what they know about measuring. Students measured the length of objects in grade 1 using non-standard units such as paper clips and tiles and may also have experience measuring length outside of school. This warm-up allows teachers to hear the language students use to talk about measurement and what attributes of objects they attend to in order to measure.

Instructional Routines

What Do You Know About ____?

Student-facing Task Statement

What do you know about measuring?

Launch

- “What do you know about measuring?”
- 1 minute: quiet think time

Activity

- Record responses.

Synthesis

- “What does it mean to measure?” (To find out
how long something is.)

• “We are going to continue thinking about what we know and learn more about measuring in our upcoming activities.”

Student Responses

Sample responses:

- You can measure with a ruler.
- You can measure with other objects.
- You can measure your weight in pounds.

Activity 1

Priya’s Pet

Standards Alignments

Building On 1.MD.A.2
Building Towards 2.MD.A.1, 2.MD.A.2

The purpose of this activity is to emphasize the importance of identifying the length of a unit when measuring (MP6). Students work in groups to measure the same length of string using straws. Students find and report measurements of different lengths because they are provided with straws of different lengths. In the synthesis, students discuss that although the same length of string was measured, the measurements are different, because different length units were used. This sets students up to discuss what happens when everyone uses the same length unit in the next activity.

Straws may be replaced by pipe-cleaners or other rigid objects that can be cut to the specified lengths.

This activity uses MLR8 Discussion Supports. Advances: Listening, Representing
**Instructional Routines**

MLR8 Discussion Supports

**Materials to Gather**

Straws, String

**Required Preparation**

- Create a 40-cm length of string or ribbon for each group of 2–3.
- Create five 10-cm length straws for half of the groups of 2–3.
- Create ten 5-cm length straws for half of the groups of 2–3.

**Student-facing Task Statement**

Use straws to measure the string that shows how long Priya's iguana is.

Priya's iguana is __________ straws long.

**Student Responses**

4 straws (10 cm) or 8 straws (5 cm)

**Launch**

- Groups of 2–3
- Give each group a set of straws (some groups get 10-cm long straws and others get 5-cm long straws) and a string that measures 40 cm long.
- Display the image.
- “What do you know about this animal? What could you measure?”
- 30 seconds: quiet think time
- 1 minute: partner discussion
- Share responses.

**Activity**

- “Priya has a pet iguana. She thinks he may be ready for a new cage and wants to know how long he is.”
- “First, Priya used a piece of string to measure the length of her pet. She started at the iguana’s head and stretched it all the way to its tail. She cut the string so it was the same length as her iguana.”

**MLR8 Discussion Supports**

- Use gestures to emphasize how Priya might measure the length of the iguana.
For example, when describing how Priya uses the string, use your hands to emphasize one end of the string at the head, pull the string taut, and emphasize the end at the tail.

- “Each group has a piece of string that is the same length as Priya's string.”
- “You are going to measure Priya's string using the straws at your tables.”

5 minutes: small-group work time

As students work, monitor for students from each group (short straws and long straws) who line up the straws end to end with no gaps or overlaps to share their method in the synthesis.

**Synthesis**

- “How long is Priya's string?”
- Record responses.
- “Why are our length measurements different?” (Some groups maybe didn't line up their straws correctly. Maybe the straws weren't the same size.)
- 30 seconds: quiet think time
- 1 minutes: partner discussion
- Share responses.
- Invite previously identified students to demonstrate their measurements.
- “Both of these groups started at the beginning of the string and lined up straws with no gaps or overlaps until they reached the end.”
- “Why are the measurements different?” (The straws are different sizes. One group used short straws and one group used long straws.)
- “The measurements are different because each group used different length units.”
- “A length unit is the length of the object you use to measure.”
Advancing Student Thinking

If students leave gaps between straws or have straws overlapping, have them compare their measurements with another group who had straws of the same length. Consider asking:

- “Why do you think your total number of straws is different?”
- “How did you make sure the entire length of the string was measured?”

Activity 2

Use a Standard Unit

Standards Alignments

Addressing 2.MD.A

The purpose of this activity is for students to understand why it is important to be precise about the length of the unit used to measure (MP6). All student groups use centimeter cubes to measure. After measuring, students compare their measurements with other groups. In the synthesis, they discuss why each group’s measurement is the same, or nearly the same, after they measured with the cubes. Students are introduced to standard units, but do not need to use this term.

Access for Students with Disabilities

Representation: Internalize Comprehension. Invite students to identify which details were important to solve the problem in Activity 1. Display the sentence frame, “The next time we want to measure the length of an object, I will pay attention to how I line up the measuring tool with the end of the object to be measured, and make sure there is no space between the measuring units.”

Supports accessibility for: Organization, Attention

Materials to Gather

Centimeter cubes, Connecting cubes

Required Preparation

- Gather a connecting cube to display in the activity synthesis. Students will not need connecting
cubes for this activity.

**Student-facing Task Statement**

Use the cubes to measure Priya’s string.

1. Priya’s iguana is _____ cubes long.
2. Compare your measurement with another group.

**Student Responses**

1. Priya’s iguana is 40 cubes long.
2. Sample response: Our measurements are the same because we used the same unit.

**Launch**

- Groups of 2–3
- Give each group centimeter cubes.
- “In the last activity, we saw why it’s important to use the same length unit to measure. If we use objects as our length unit, we need to all agree on the size of each object.”
- “We are all going to use single base-ten blocks to measure Priya’s string. What do you know about the size and shape of these blocks?” (They are small. They are all the same size. They are cubes.)

**Activity**

- “Your job is to use these cubes to measure the length of the string.”
- 5 minutes: small-group work time
- 5 minutes: small-group discussion

**Synthesis**

- Share and record measurements.
- “Why is every group’s measurements the same, or closer to the same, length?” (They are the same because we all used the same length unit. We all used cubes that have the same length.)
- As needed, restate student responses when they say the cubes are “the same” to emphasize that the cubes have the same length.
- Display a centimeter cube and a connecting cube.
- “If some groups used these cubes and other groups used connecting cubes, would our measurements have been the same? Why?” (It would not be the same because the cubes are not the same...
“Straws and cubes can be confusing to use as length-units because they can be lots of different sizes.”

“There are units that people around the world use to measure that always have the same size. They are called standard units.”

Lesson Synthesis

“Today, we measured a length of string using different units. We used straws and cubes.”

Display a centimeter cube.

“The cubes we used today can be called centimeter cubes because the edge of each cube is 1 centimeter long. A centimeter is a standard length unit in the metric measurement system.”

Display:

- Priya’s iguana is 40 cubes long.
- Priya’s iguana is 40 centimeter cubes long.

“Which sentence best describes the length of Priya’s iguana? Explain.”

Suggested Centers

- Target Numbers (1–5), Stage 5: Subtract Two-digit Numbers (Addressing)
- Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting)
Response to Student Thinking

Students find a measurement other than 11 centimeter cubes.

The work in this lesson builds from the measurement concepts developed in a prior unit.

Next Day Support

- After the warm-up, pair students up to use connecting cubes and centimeter cubes, including the 10-centimeter tools, to check their measurement from the previous day's cool down.

Prior Unit Support

Grade 1, Unit 6, Section B: Measure by Iterating up to 120 Length Units
Lesson 2: Measure in Centimeters

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.4

Teacher-facing Learning Goals
• Measure length in centimeters.

Student-facing Learning Goals
• Let's measure in centimeters.

Lesson Purpose
The purpose of this lesson is for students to measure in centimeters.

In an earlier lesson, students learned the importance of using a standard unit to ensure that they can communicate clearly about their measurements. They learned that a single base-ten block is a centimeter cube because each edge of the cube is 1 centimeter long.

The purpose of this lesson is for students to measure in centimeters and consider more efficient ways to measure. Students use tools (base-ten blocks) that have lengths of 1 centimeter and 10 centimeters to measure the length of objects. In the warm-up and Activity 1, students begin a transition from describing their measurements of length based on the number of objects they use to describing the number of standard length units (centimeters) the objects represent. In Activity 2, students choose to measure with centimeter cubes or 10-centimeter tools (base-ten block “tens”) and explain their choices (MP5).

Give students access to base-ten blocks during the cool-down.

Access for:

Students with Disabilities
• Action and Expression (Activity 1)

English Learners
• MLR8 (Activity 2)

Instructional Routines
Notice and Wonder (Warm-up)

Materials to Gather
• Base-ten blocks: Activity 1, Activity 2
• Base-ten blocks: Warm-up

Materials to Copy
• Bearded Dragon (groups of 1): Activity 1
• Reptile Length (groups of 1): Activity 2
Lesson Timeline

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Teacher Reflection Question

What evidence have students given that shows they understand that a centimeter is a length unit? What language do they use to describe how they measure a length in centimeters?

Cool-down (to be completed at the end of the lesson)  

Measure with Centimeters

Standards Alignments

Addressing 2.MD.A.1

Student-facing Task Statement

1. Measure the length of the reptiles in centimeters.

   a.

   b.
**Student Responses**

1. 7 cm
2. 13 cm

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**Warm-up**

**Notice and Wonder: Centimeters**

**Standards Alignments**

Addressing 2.MD.A.1

The purpose of this warm-up is to elicit the idea that a centimeter is the length of the edge of a centimeter cube and to connect this with the length of a base-ten block composed of 10 centimeter cubes. This will be useful when students measure with base-ten blocks and report their measurements in centimeters in a later activity. While students may notice and wonder many things about these images, discussion of the attributes of the shapes are emphasized by the labels and the meaning of a centimeter are the important discussion points. Students use and revise their language to clearly describe the images (MP6).

**Instructional Routines**

Notice and Wonder

**Materials to Gather**

Base-ten blocks

**Student-facing Task Statement**

What do you notice? What do you wonder?

A

**Launch**

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time
**Student Responses**

Students may notice:
- It looks like base-ten blocks - a “one” and a “ten.”
- Both pictures have a label that includes a 1.

Students may wonder:
- Is Image A a centimeter cube?
- Are these base-ten blocks?
- What does cm mean?
- Is cm the same as a centimeter?
- Is Image B 10 centimeters long?

**Activity**

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

**Synthesis**

- “How are the labels on both images the same? How are they different?” (They both show the length of one square. They both show 1 length unit. One says centimeter and one says cm.)
- “Both labels show the length of 1 centimeter. Centimeter is a long word and can be hard to use to label your length units. We can use cm for short. ‘C’ represents centi and ‘m’ represents meter.”
- Display a centimeter cube and 10-centimeter tool.
- “If the length of 1 edge of a centimeter cube is 1 centimeter, how long is this block? Explain.” (It’s 10 centimeters long because it shows 10 blocks put together. Each block is 1 centimeter long.)
- “When we practiced adding and subtracting by place, we used these tools to show ones and tens.”
- “When we measure we will call them centimeter cubes and 10-centimeter tools to describe their lengths.”

**Activity 1**

Length in Centimeters

**Standards Alignments**

Addressing 2.MD.A.1
The purpose of this activity is for students to transition from expressing the length of objects as a count of physical length units (for example, 12 cubes) to expressing the length of objects using a standard unit (for example, 12 centimeters). Students use centimeter cubes and 10-centimeter tools (base-ten blocks) to measure the length of an earthworm. Throughout the activity, students make connections to place value and describe the convenience of different types of tools based on their length (MP5).

Access for Students with Disabilities

Action and Expression: Internalize Executive Functions. Check for understanding by inviting students to rephrase directions in their own words. Keep a display of the objectives visible throughout the activity.

Supports accessibility for: Memory, Organization

Materials to Gather

Base-ten blocks

Student-facing Task Statement

1. Measure the length of the bearded dragon using the single centimeter cubes.
   
   The bearded dragon is __________ centimeter cubes long.

2. Measure the bearded dragon using the 10-centimeter tool.

   The bearded dragon is __________ 10-centimeter tools long.

3. How many centimeters long is the bearded dragon?

   The bearded dragon is __________ centimeters long.

Student Responses

1. 24
2. 2 or 3
3. 24

Materials to Copy

Bearded Dragon (groups of 1)

Launch

- Groups of 2
- Give centimeter cubes and 10-centimeter tools to each group.
- Give each student a copy of the bearded dragon.
- “Yesterday we measured the length of Priya's iguana. An iguana is a reptile. What do you know about reptiles?”
- Share responses.
- Display the image.
- “This is a drawing of a bearded dragon. Like iguanas, bearded dragons are a kind of reptile that are often kept as pets.”

Activity

- “Measure the length of the bearded dragon using the centimeter cubes. Then use the 10-centimeter tool to measure the length.”
- 10 minutes: partner work time
- Monitor for students who answer the last
question by using:
  ○ only centimeter cubes
  ○ only 10-centimeter tools
  ○ a combination of 10-cm tools and centimeter cubes.

**Synthesis**

- Share and display student measurements for the last problem.
- As needed, select previously identified students to demonstrate their responses to the following discussion questions.
- “How can you prove that the bearded dragon is 24 centimeters long with only centimeter cubes?” (Start at one end and line up the cubes until you reach the other end. You can count the cubes because each cube is 1 centimeter long.)
- “How can you prove the bearded dragon is 24 cm long with 10-centimeter tools?” (Start at one end with one 10-centimeter tool, then keep lining up more 10-centimeter tools until you go past the end. You can count the first two by 10, then start counting by ones until you get to the block that lines up with the end.)
- “Which tool was easier to use to measure the length of the bearded dragon?” (I liked using the 10-centimeter tools because you could measure faster without having to use as many blocks. It was easier to count.)

**Activity 2**

**Measure with 10-centimeter Tools**

🕐 15 min

👥 PLC Activity
Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.4

The purpose of this activity is for students to practice measuring and expressing the length of objects in centimeters. Students measure the length of different reptiles and choose whether to use centimeter cubes, 10-centimeter tools, or a combination of the two tools (MP5).

Access for English Learners
MLR8 Discussion Supports. Synthesis: At the appropriate time, give students 2–3 minutes to make sure that both partners can explain how they used their tools to measure and find the difference. Invite groups to rehearse what they will say when they share with the whole class. Advances: Speaking, Conversing

Materials to Gather
Base-ten blocks

Student-facing Task Statement
1. Measure the length of each reptile in centimeters.
   a. ________ cm
   b. ________ cm
   c. ________ cm
   d. ________ cm
2. Compare your measurements with your partner's measurements.
3. How much longer is the day gecko than the threadsnake?

Student Responses
1.
   a. 2
   b. 20
   c. 11
   d. 22

Materials to Copy
Reptile Length (groups of 1)

Launch
- Groups of 2
- Give each student a Reptile Length sheet and access to base-ten blocks.

Activity
- “Use the tools that make sense to you to find the length of each reptile. Then compare your measurements with your partner. If any measurements are different, measure the reptile again together to find a length you agree on.”
- “Then decide how much longer the day gecko is than the threadsnake together. Show your thinking using drawings, numbers, or words.”
- 5 minutes: independent work time
- 5 minutes: partner work time
- Monitor for students who use:
  - centimeter cubes to measure
2. Answers vary.

3. 7 cm. Sample response: 16 - 9 = 7

- lengths shorter than 10 cm
  - 10-centimeter tools to measure lengths shorter than 10 cm
  - a combination of centimeter cubes and 10-centimeter tools
  - only the 10-centimeter tools to measure lengths that are longer than 10 cm

**Synthesis**

- Invite previously identified students to share how they measured a length that was shorter than 10 cm (A or E).
- Invite previously identified students to share how they measured a length longer than 10 cm (B, C, D, or F).

**Advancing Student Thinking**

If students use centimeter cubes to measure longer reptile lengths, consider asking:

- “How did you decide which tools to use to measure the ___?”
- “How could you use the 10-centimeter tool to measure the next reptile?”
- “How could you use both tools to measure?”

**Lesson Synthesis**

“Today, we measured different reptiles using the length unit of centimeters, which is a small unit. We saw that we can use the centimeter cubes or the 10-centimeter blocks as tools to measure centimeters.”

“How could you use a centimeter cube to show someone how long 1 centimeter is?”

“How could you use a 10-centimeter tool to show someone how long 1 centimeter is?”

“What if you wanted to show someone how long 5 centimeters is? What would you use?” (I could use 5 centimeter cubes lined up together. I could use the 10-centimeter cube and just show them the length of the first 5 cubes.)
“What if you wanted to show someone how long 50 centimeters is? What would you use?” (I’d use 5
10-centimeter tools lined up together.)

Suggested Centers

- Target Numbers (1–5), Stage 5: Subtract Two-digit Numbers (Addressing)
- Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing
  (Supporting)

Response to Student Thinking

Students find lengths other than actual lengths.

Next Day Support

- During the launch of the next day's activity, have students work in pairs to compare
  measurements and techniques.
Lesson 3: Create and Use a Ruler

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.4, 2.MD.B.6, 2.NBT.B.5

Teacher-facing Learning Goals
- Create and use a ruler with centimeter units.
- Measure to determine how much longer one object is than another.

Student-facing Learning Goals
- Let’s create rulers and use them to measure and compare lengths in centimeters.

Lesson Purpose
The purpose of this lesson is for students to use a ruler to measure and compare lengths in centimeters.

In earlier lessons, students measured with centimeters using centimeter cubes and 10-centimeter tools (base-ten blocks). They used multiple copies of the units to measure objects and line segments of different lengths.

In this lesson, students transition from measuring length with physical objects to measuring length with more abstract tools such as rulers, measuring tapes, and meter sticks. They create rulers and describe how a centimeter is represented on the tool (MP2). They learn that a centimeter is represented by the length between two tick-marks on a ruler and that each number on the centimeter ruler represents the distance in centimeters from zero.

Students use the ruler they create in the first activity throughout the lesson, including the cool-down. They should store their rulers for easy access in upcoming lessons.

Access for:

🔗 Students with Disabilities
- Representation (Activity 1)

Instructional Routines
MLR8 Discussion Supports (Activity 1), Number Talk (Warm-up)
**Materials to Gather**
- Base-ten blocks: Activity 1, Activity 2
- Materials from a previous activity: Activity 2
- Scissors: Activity 1

**Materials to Copy**
- Centimeter Ruler Template (groups of 1): Activity 1

**Lesson Timeline**

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**Teacher Reflection Question**
In future lessons, students will learn how to represent whole numbers as lengths from 0 on a number line. How does their work today with represent length units on a ruler help lay the foundation for the more abstract work with the number line? How can you continue to reinforce how measuring tools represent length units in upcoming lessons to prepare for student work with number lines?

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**Cool-down** (to be completed at the end of the lesson)

Use a Ruler

**Standards Alignments**
Addressing 2.MD.A.1, 2.MD.A.4

**Student-facing Task Statement**
Use your ruler to find the length of each rectangle and figure out how much longer Rectangle B is than Rectangle A. Record any lengths in centimeters.

A

```
```

B

```
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Student Responses
11 cm. Sample response: $15 - 4 = 11$

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Warm-up

Number Talk: Subtract Two Digits

Standards Alignments
Addressing 2.NBT.B.5

This Number Talk encourages students to think about subtraction with two-digit numbers in expressions that may require decomposing a ten. Students rely on using what they know about place value and counting on or back to mentally solve problems. When they share how each expression helps them find the value of the next, they look for and express regularity in repeated reasoning (MP8). The thinking elicited here helps students develop fluency when adding and subtracting within 100 using methods based on place value and the properties of operations.

 Instructional Routines

Number Talk

Student-facing Task Statement
Find the value of each expression mentally.
- 63 - 3
- 63 - 20
- 63 - 23
- 63 - 24

Student Responses
- 60: I just took away the ones.
- 43: I took away 2 tens, so $60 - 20 = 40$, and

Launch
- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

Activity
- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.
the ones stay the same.

- 40: I used the first 2 problems to help me. I took away 3 ones to get 60, and then took away 20 from that.
- 39: I took away 1 more from 0 based on the last problem.

**Synthesis**

- “Which expressions were easier to find mentally? Why?”
- “How did the third expression help you think about the fourth one?”

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**Activity 1**

Create a Ruler

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.B.6

The purpose of this activity is to create a ruler with centimeter units. Students begin their ruler at 0 and measure and label each centimeter up to 25 centimeters. It is important to include 0 on the ruler as this helps build the foundation for making sense of the number line in later lessons. Just as they will on the number line, students label each tick mark—not the space between the tick marks. They notice that the length between successive tick marks on their ruler is 1 centimeter and each tick mark represents a length in centimeters from zero, allowing them to use the ruler to measure without counting cubes (MP2).

This activity uses MLR8 Discussion Supports in the synthesis to support students in describing how their ruler shows different lengths. *Advances: speaking*

**Access for Students with Disabilities**

*Representation: Internalize Comprehension.* Begin by asking, “Does making this tool remind anyone of something we have done before?” Remind students of measuring with the non-standard units. “What were some of the things that needed close attention when measuring?” Students should recall lining up a tool right at the edge, making sure the units are touching and without gaps between them, tick marks are made at the end of the object to measure the distance from one end to the other as one unit.

*Supports accessibility for: Organization, Memory, Visual-Spatial Processing*

**Instructional Routines**

MLR8 Discussion Supports
Materials to Gather
Base-ten blocks, Scissors

Student-facing Task Statement
1. Use your tools to make a ruler that shows lengths in centimeters.
2. Compare your ruler with your partner’s ruler.

Student Responses
Completed ruler with 25 centimeters marked and labeled on each mark.

Materials to Copy
Centimeter Ruler Template (groups of 1)

Launch
- Groups of 2
- Give each student the Centimeter Ruler Template and access to centimeter cubes and 10-centimeter tools.

Activity
- “We are going to make our own tool to measure in centimeters so we won’t have to carry around so many cubes and blocks.”
- Display the ruler template.
- “What do you notice? What do you wonder?” (It’s a long line. There’s a mark with 0. I wonder why there’s a 0. I wonder if we’ll have to put more numbers on it.)
- 30 seconds: quiet think time
- 1 minute: partner discussion
- Share connections students make to rulers and the need to add more numbers to the ruler.
- “We are going to make a ruler.”
- “What will we need to show on this ruler so we can use it to measure in centimeters? How could we use our other tools to help us?” (We will need lines to show different lengths and numbers to show how long the distance is between them.)
- Ask a student to demonstrate how to line up the edge of the centimeter cube with 0. Draw a tick mark to show the length of 1 centimeter cube.
• “How far is the tick mark from 0? How do you know?” (It’s 1 centimeter from 0 because there’s 1 centimeter cube between the tick marks.)

• Label the tick mark and repeat with the first 2-3 centimeters.

• “Complete your own ruler in the same way by marking the length of a centimeter and labeling each new length. Stop when you reach the end of the line and cut out your ruler.”

• 10 minutes: independent work time

• “Compare your ruler with your partner.”

• 2 minutes: partner discussion

**Synthesis**

• “How can you use your ruler to show someone how long 1 centimeter is?” (It’s the length from 0 to 1. It’s the length between any two numbers.)

**MLR8 Discussion Supports**

• If needed, invite students to repeat their reasoning using mathematical language: “Can you say that again, using the phrase I could show them the length from __ to __?”

• “How can you use the ruler to show someone how long 10 centimeters is?” (It’s the length from 0 to 10.)

• “What other lengths could you use your ruler to show?” (Answers vary between 0 and 25 centimeters)

• “Now we have a measuring tool we can use instead of using lots of centimeter cubes. You’re going to use the rulers you’ve made in the next activity.”
Advancing Student Thinking

If students create intervals that are a measurement other than 1 cm or label spaces instead of tick marks, consider asking:

- “Which tick mark shows ___ cm from 0? How can you use your labels to show that length?”
- “Which of your tools should fit between each tick mark?”
- “How can you use your tools to make sure you draw each new tick mark 1 centimeter away from the last tick mark?”

Activity 2

Measure and Compare Lengths

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.4

The purpose of this activity is to measure the length of rectangles with the rulers created in a previous activity. If students’ rulers are not accurate, they should work with a partner who made an accurate ruler and encourage them to check their measurements with 10-centimeter tools and centimeter cubes. Students notice that each labeled tick mark on the ruler represents a length in centimeters from zero (MP8). The lesson synthesis allows students to share their measurements for each rectangle. They discuss any different measurements that were made and what the source of the different measurements might be (MP6).

Materials to Gather
Base-ten blocks, Materials from a previous activity

Student-facing Task Statement
1. Use your ruler to measure the length of each rectangle. Don't forget to label your measurements.

Launch
- Groups of 2
- Give each group access to base-ten blocks.
2. How many centimeters longer is rectangle A than rectangle B?

3. How many centimeters longer is rectangle F than rectangle D?

4. Which two rectangles are the longest? How long would the rectangle be if you joined them together?

**Student Responses**

1. 
   a. 14 cm  
   b. 4 cm  
   c. 10 cm  
   d. 7 cm  
   e. 9 cm  
   f. 12 cm  

2. 10 centimeters longer. Sample response:  
   \[14 - 4 = 10\]

3. 5 centimeters longer. Sample response:  
   \[12 - 7 = 5\]

4. Rectangle A and F are the longest. The rectangle would be 26 centimeters long. Sample response:  
   \[14 + 12 = 26\]

**Activity**

- “Measure the length of each rectangle with your ruler. You can use the centimeter cubes and 10-centimeter blocks to check your measurement if it helps you.”
- “When you finish, check your measurements with your partner and work together to answer the questions.”
- 3 minutes: independent work time
- 5–7 minutes: partner work time
- Monitor for students who find the difference between the longest and shortest length by:
  - directly measuring the length from the end of shortest rectangle to the end of the longest rectangle
  - measuring both rectangles and finding the difference

**Synthesis**

- Share measurements for each rectangle.
- Discuss any differences in measurement.
- “How was the number 0 helpful when you measured each rectangle?” (It showed us where to put the tool. If you start with 0 then the length is the closest number to the end of the rectangle.)

- Invite previously identified students to share how they found the difference between the shortest and longest rectangles.
- “How can we use our ruler to prove that the longest rectangle is 10 cm longer than the shortest rectangle?”
Advancing Student Thinking

If students have measurements other than the precise measure of each rectangle, consider asking:

- “How did you decide how long the rectangle is?”
- “Where do you see this on the ruler?”

Lesson Synthesis

“Today, we created a ruler so we didn't have to line up centimeter cubes or 10-centimeter tools to measure. We learned what the numbers and tick-marks on a ruler represent.”

“How is measuring with a ruler the same as measuring with centimeter cubes or a 10-centimeter tool? How is it different?” (They both measure in centimeters. The ruler just uses a line and tick-marks to show centimeter lengths and the other tools use the edges of the blocks. The ruler is easier to carry around and use to measure longer lengths. You don't have to count on the ruler if you line up what you are measuring with 0.)

“How did you use a ruler to find how many more centimeters longer one line was than another?” (You can measure from the end of the shorter line to the end of the longer line. You could find the length of both lines on the ruler and count up from the shorter line. You could find both lengths and subtract the smaller length from the larger length).

Suggested Centers

- Target Numbers (1–5), Stage 5: Subtract Two-digit Numbers (Addressing)
- Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting)
but find a difference other than 11 cm.
Lesson 4: Measure and Estimate in Centimeters

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3

Teacher-facing Learning Goals
- Estimate lengths in centimeters.
- Use standard rulers to measure length in centimeters.

Student-facing Learning Goals
- Let’s estimate and measure in centimeters.

Lesson Purpose
The purpose of this lesson is for students to estimate and measure lengths in centimeters. Students use a ruler for the first time.

In previous lessons, students measured lengths in centimeters with physical units and the rulers they constructed.

The purpose of this lesson is to build on their experiences with centimeters to estimate lengths in centimeters and measure lengths with a centimeter ruler. In Activity 1, students estimate the length of objects in the classroom. Objects have been suggested, but they can be changed based on what is available in the classroom. Most of the objects students use to estimate and measure length for the purposes of this lesson should be 5–30 cm long. At least one object should be between 50–90 cm long to give students the opportunity to estimate longer objects and an opportunity to experience the need to iterate a ruler to find a longer measurement in anticipation of future lessons. In Activity 2, students measure the actual length of the objects.

Access for:

Students with Disabilities
- Action and Expression (Activity 2)

English Learners
- MLR2 (Activity 2)

Instructional Routines
Which One Doesn’t Belong? (Warm-up)

Materials to Gather
- Materials from a previous activity: Activity 2
Objects of various lengths: Activity 1

Rulers (centimeters): Activity 2

**Lesson Timeline**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>15 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>20 min</td>
</tr>
<tr>
<td>Lesson Synthesis</td>
<td>10 min</td>
</tr>
<tr>
<td>Cool-down</td>
<td>5 min</td>
</tr>
</tbody>
</table>

**Teacher Reflection Question**

Reflect on how you can reinforce the work done in today's lesson outside of math class. When can you ask students questions involving the estimation work done today? Are there opportunities at other times during the day to ask students to estimate the lengths of objects?

---

**Cool-down** (to be completed at the end of the lesson)  

5 min

The Pencil

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.A.3

**Student-facing Task Statement**

1. Estimate: I think the length of the pencil is about ________ cm.
2. Measure: The length of the pencil is actually ________ cm.

**Student Responses**

1. I think the length of the pencil is about (15–20) cm.
2. The length of the pencil is actually 17 cm.
Warm-up

Which One Doesn’t Belong: Length

Standards Alignments
Addressing 2.MD.A.1

This warm-up prompts students to compare four images. It gives students a reason to use language about measurement precisely (MP6). It gives the teacher an opportunity to hear how students use terminology and talk about characteristics of the measurement tools, measurement units, and objects in the images. During the synthesis, ask students to explain the meaning of any terminology they use to describe the tools, objects, and lengths.

Instructional Routines
Which One Doesn’t Belong?

Student-facing Task Statement
Which one doesn’t belong?

Launch
• Groups of 2
• Display image.
• “Pick one that doesn’t belong. Be ready to share why it doesn’t belong.”
• 1 minute: quiet think time

Activity
• “Discuss your thinking with your partner.”
• 2–3 minutes: partner discussion
• Share and record responses.

Synthesis
• “If the length unit on the tools should be centimeters, which images show shapes that have a length of 4 centimeters? Explain.” (A shows a length of 4 centimeters because the side starts at 0 and ends at 4. B shows 4 cm because I can count 4 cm lengths starting at the beginning of the ruler or counting back from the 4. C does not show 4 cm because each length between the numbers is not a
before the first unit.

C doesn't belong because:
• It is the only one that doesn't have the same amount of space between each number.
• It is the only one that doesn't show a side length of 4 units.

D doesn't belong because:
• It is the only one that doesn't show the shape beginning at 0 (beginning at a length of 0).

---

Activity 1

Estimate Length in Centimeters

Standards Alignments

Addressing 2.MD.A.3

The purpose of this activity is for students to practice the skill of estimating a reasonable length in centimeters based on their experiences and known information. When students compare and explain their estimates in pairs and in the full class discussion they make, interpret, and defend mathematical claims (MP3).

This activity uses the Estimation Exploration routine in the launch. This gives students the opportunity to revisit the meaning of estimation and estimate before making estimations on their own. The launch can be completed with the images provided or with an object that is more interesting to your students.

If needed, review all the objects that students will estimate as a class and record the names of each object (or length) so that all students can see.

Materials to Gather

Objects of various lengths

Required Preparation

• Each group of 2 needs access to several objects between 5–30 cm long and at least one object between 50–90 cm long.
Student-facing Task Statement

1. Record an estimate that is:

<table>
<thead>
<tr>
<th>too low</th>
<th>about right</th>
<th>too high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Record an estimate that is:

<table>
<thead>
<tr>
<th>too low</th>
<th>about right</th>
<th>too high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Record an estimate for each object on the recording sheet.
4. Tell your partner why you think your estimates are “about right.”

Recording Sheet

<table>
<thead>
<tr>
<th>object</th>
<th>estimate</th>
<th>measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Choose an object:

Student Responses

1. Sample responses:
   - Too low: 1 cm-10 cm
   - About right: 20 cm-30 cm
   - Too high: 40 cm or more

2. Sample responses:
   - Too low: 1 cm-20 cm
   - About right: 22 cm-30 cm
   - Too high: 35 cm or more

3. Sample responses:
   - glue stick: 10 cm
   - top of paper: 22 cm
   - unsharpened pencil: 15 cm

Launch

- Groups of 2
- Give objects to each group.
- Display the image or a real notebook.

- “Andre wanted to measure the length of his notebook, but he didn’t have any tools to measure it. He made a guess that he thought would be close.”
- “Look at the notebook and think about how long you think it is in centimeters.”
- “What is an estimate that’s too high? Too low? About right?”
- 1 minute: quiet think time
- 1 minute: partner discussion
- Record responses.
- “Let’s look at another image of the object.”
- Display the image or hold a folder next to a 10-centimeter tool.
○ length of desk: 70 cm

4. Sample response: “I think the glue stick is about 10 centimeters because a 10-centimeter tool is about the same size.”

• “Based on the second image, do you want to revise, or change, your estimates?”
• 1 minute: quiet think time
• 1 minute: partner discussion
• Record responses.
• “How did your estimation change?”
• 30 seconds: quiet think time
• Share responses.

Activity

• As needed, display the names of the objects that students will estimate.
• “Now look at the objects I gave each group and think about how long they are. Record your estimates on the recording sheet on your own.”
• “When you and your partner finish, compare your estimates and explain why you think they are ‘about right’.”
• 5 minutes: independent work time
• 2 minutes: partner discussion

Synthesis

• Share and record estimates for each of the classroom objects.
• “How did you make your estimates? What
did you think about?” (I thought about the size of a 10-centimeter tool and imagined measuring with it. I thought about the length of the ruler we made.)

- 30 seconds: quiet think time
- 1 minute: partner discussion
- Share responses.
- “Can you think of a time when you might need to estimate the length of an object?”

**Advancing Student Thinking**

If students make estimates without justifying their thinking, consider asking:

- “Tell me more about how you decided that the object was about ___ cm.”
- “What objects can you think of that are about 1 cm? 10 cm?”
- “How could the lengths of objects that you know help you explain the estimated length of another object?”

---

**Activity 2**

**Measure and Compare**

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.A.3

The purpose of this activity is for students to measure the lengths they estimated in the previous activity with a centimeter ruler to find the actual lengths. As needed, encourage students to use base-ten blocks to check their measurements to help them assess their accuracy and deepen their understanding of how length is represented on the ruler (MP2, MP6).
Access for English Learners

MLR2 Collect and Display. Collect the language students use to explain how they are measuring. Display words and phrases such as: “ruler,” “edge,” “measure,” “length,” “centimeter,” “estimate,” “longer,” and “shorter.” During the synthesis, invite students to suggest ways to update the display: “What are some other words or phrases we should include?” Invite students to borrow language from the display as needed.

Advances: Conversing, Reading

Access for Students with Disabilities

Action and Expression: Internalize Executive Functions. Invite students to verbalize their strategy for determining how to line up their measuring tool before they begin; the base-ten blocks and handmade rulers need to be lined up with the edge because that indicates where zero is, and the actual ruler needs to be lined up with the tick mark indicating where zero is. Students can speak quietly to themselves, or share with a partner.

Supports accessibility for: Organization, Conceptual Processing, Language

Materials to Gather

Materials from a previous activity, Rulers (centimeters)

Student-facing Task Statement

1. Measure each object on your recording sheet. Record each length in centimeters.
2. Compare your measurements to your estimates.

Student Responses

1. Sample response:

<table>
<thead>
<tr>
<th>object</th>
<th>estimate</th>
<th>measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>glue stick</td>
<td>10 cm</td>
<td>8 cm</td>
</tr>
<tr>
<td>top of paper</td>
<td>22 cm</td>
<td>25 cm</td>
</tr>
<tr>
<td>unsharpened pencil</td>
<td>20 cm</td>
<td>20 cm</td>
</tr>
<tr>
<td>length of desk</td>
<td>70 cm</td>
<td>90 cm</td>
</tr>
</tbody>
</table>

Choose an object:

2. Sample response: My measurement for the pencil was the same as my estimate. My

Launch

- Groups of 2
- Give students centimeter rulers and access to base-ten blocks.
- “What do you notice about this ruler? How is it the same and different from the rulers you created?”
- 30 seconds: quiet think time
- Share responses.
- Depending on your rulers, say one of the following:
  - “Look at the edge of your ruler. Our rulers have 0 labeled, but they have some space before the 0. Our measurements won’t be accurate if we start at the edge of the ruler instead of 0. So, we need to line up
estimate for the glue stick and top of the paper was close. My estimate for the height of the table was too low.

Our objects with the 0, not the edge of our ruler.

- “Look at the edge of your ruler. It looks like our rulers start at 1, because that is the first number. There is some space before the 1, though. This space is 1 centimeter long. The edge of our ruler is 0, but there was no room to label it. So, in order to measure accurately, we must line up our objects with the edge of the ruler, so we are beginning at 0.”

**Activity**

- “Now we will use our rulers to measure the objects to find their actual length.”
- 10 minutes: partner work time
- Monitor for a few students to share their chosen object in the synthesis.

**Synthesis**

- Invite previously identified students to share the chosen object.
- “What is an estimate for the ___ that is about right? Explain.”
- 1 min: quiet think time
- Share and record responses.
- Ask the student to demonstrate how they used the ruler to find the actual measurement, or, if possible, ask all students to find and share the actual measurement.
- Repeat with other objects, if time permits.

**Lesson Synthesis**

- 10 min
“Today we practiced estimating length and we used rulers to measure the length of objects in centimeters.”

“How was measuring with the rulers like measuring with other tools? How was it different?” (The rulers measured centimeters like the other tools. It shows centimeters using lines and numbers just like the rulers we made. It is different because it was stiffer than paper. It showed more centimeters than the ruler we made or the base-ten blocks.)

“What did you think about when you were making your estimates? How could you use the length of a ruler to make estimates?” (I thought about the size of a 10-centimeter tool and imagined counting them by ten. Now I know a ruler is 30 centimeters. I can think about how long things might be next to a ruler).

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**Suggested Centers**

- Estimate and Measure (1–4), Stage 1: Choose Your Unit (Addressing)
- Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting)

---

**Response to Student Thinking**

Students make estimates that are unreasonably low (0–5 cm) or high (20 or more cm).

**Next Day Support**

- Launch the lesson by asking students to recap the important points for estimating and measuring accurately with different tools. Record responses, so students can refer to them later.
Lesson 5: Measure in Meters

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3, 2.NBT.A.2
Building Towards 2.MD.A.2

Teacher-facing Learning Goals
- Use standard rulers and meter sticks to measure length in centimeters and meters.

Student-facing Learning Goals
- Let's measure length in meters.

Lesson Purpose
The purpose of this lesson is for students to learn that the meter is a larger unit of metric length measurement.

In previous lessons, students measured and estimated varied lengths in centimeters. They measured using centimeter cubes and centimeter rulers.

In this lesson, students measure longer lengths and identify the need for a more appropriate length unit and tool for these measurements. Students use meter sticks to measure strips of tape on the floor, which represent the measurements of a variety of reptiles. Students recognize that a meter stick makes measuring longer lengths easier.

Access for:

Students with Disabilities
- Engagement (Activity 2)

English Learners
- MLR2 (Activity 2)

Instructional Routines
Choral Count (Warm-up)

Materials to Gather
- Base-ten blocks: Activity 1
- Metersticks: Activity 2
- Rulers (centimeters): Activity 1, Activity 2
- Tape (painter’s or masking): Activity 1
Lesson Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>20 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>15 min</td>
</tr>
<tr>
<td>Lesson Synthesis</td>
<td>10 min</td>
</tr>
<tr>
<td>Cool-down</td>
<td>5 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question

Reflect on who participated in math class today. What assumptions are you making about those who did not participate? How can you leverage each of your students' ideas to support them in being seen and heard in tomorrow's math class?

Cool-down (to be completed at the end of the lesson) 5 min

Measure in Meters

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3

Student-facing Task Statement

Noah held a gecko at the zoo. The length of the gecko fit in his hands. He measured it and said it was about 13 meters long.

Do you think his measurement is correct? Why or why not?

Student Responses

Sample responses:
- No, that would be way too long. I think he means 13 centimeters, not meters.
- If it fit in his hands it couldn't be 13 meters. 1 meter is way longer than his hands.

Warm-up 10 min

Choral Count: Beyond 100
The purpose of this Choral Count is to invite students to practice counting by 1 beyond 120 and notice patterns in the count. These understandings help students develop fluency and will be helpful later in this lesson when students will need to use centimeters and meters to record lengths. For example, some students may record 1 meter and 30 centimeters as 130 centimeters.

Students may wonder about the place value of three-digit numbers. Although students are not expected to understand the hundreds place yet, be prepared to say that the 1 means 1 hundred without going too far. Unitizing 100 will be addressed in a later unit.

**Instructional Routines**

**Choral Count**

**Student Responses**

Record the count from 20 to 30 in one row. Record the count from 120 to 130 directly below the first count.

Sample responses:

- The numbers are the same in the second row except there's a 1 in front.
- The second row of numbers has 3 digits instead of 2.
- Each number is 100 more than the number above it.

**Launch**

- “Count by 1, starting at 20.”
- Record as students count.
- Stop counting and recording at 30.
- “Count by 1, starting at 120.”
- Record as students count directly below the first count.
- Stop counting and recording at 130.

**Activity**

- “What patterns do you see?”
- 1–2 minutes: quiet think time
- Record responses.

**Synthesis**

- “Who can restate the pattern in different words?”
- “Does anyone want to add an observation on why that pattern is happening here?”
- “Do you agree or disagree? Why?”
Activity 1
Reptiles to Measure

Standards Alignments
Addressing 2.MD.A.1

The purpose of this activity is for students to experience the need for a longer length unit and measuring tool. Students practice measuring the lengths of reptiles that are represented by lengths of tape. During the activity, students measure a length of tape that is 1 meter and 80 centimeters long. They can choose to measure with centimeter cubes, 10-centimeter tools, their self-made rulers, or centimeter rulers (MP5). The synthesis focuses on discussing why measuring longer lengths is difficult with the tools they have. Students consider how longer tools or longer length units would help their measurement challenges. Students measure tape strips A–D in this activity.

Materials to Gather
Base-ten blocks, Rulers (centimeters), Tape (painter's or masking)

Required Preparation
- Tape strips of these lengths on the floor. Label each strip with the letter and the name of the reptile. (It may be helpful to make multiple sets of the strips to keep the groups small.)
  - Tape A, gila monster: 58 cm
  - Tape B, baby alligator: 72 cm
  - Tape C, baby cobra: 44 cm
  - Tape D, komodo dragon: 180 cm
  - Tape E, adult alligator: 3 meters and 36 cm
  - Tape F, adult cobra: 1 meter and 90 cm
  - Tape G, ribbon snake: 2 meters and 82 cm

Student-facing Task Statement
Each length of tape on the floor represents the length of a reptile.

Launch
- Groups of 3–4
- Give students access to centimeter rulers and base-ten blocks.
A: gila monster  
B: baby alligator

C: baby cobra  
D: komodo dragon

1. Measure to find the length of each reptile. Don’t forget the unit.
   a. What is the length of a gila monster?
   b. What is the length of a baby alligator?
   c. What is the length of a baby cobra?
   d. What is the length of a komodo dragon?

Student Responses

1.   a. gila monster 58 cm
    b. baby alligator 72 cm
    c. baby cobra 44 cm
    d. komodo dragon 180 cm

Activity

- “Record the length of these four reptiles in centimeters.”
- 10 minutes: small-group work time
- Monitor for different ways students use their tools to measure the komodo dragon:
  - iterating 10-centimeter tools
  - iterating rulers
  - iterating a combination of tools

Synthesis

- “Which measuring tool did you choose to use? Why?” (We used the 10-centimeter tools and cubes because they were easier to count tens and ones. We used the rulers because we didn’t have to use as many blocks. It was faster.)
- Invite previously identified students to share how they measured the komodo dragon and calculated its length.
- “What was challenging about measuring longer lengths in centimeters?” (We had to
line up our tools and count the centimeters. Centimeters are small so there were a lot of them to count.

- “Would you want to use these tools to measure real large reptiles?” (No. It’d take too long. I might get bit.)
- “What would make measuring longer lengths easier?” (We could use a tool that has more centimeters on it. We could use a longer length unit to measure.)

**Advancing Student Thinking**

If students use centimeter cubes or 10-centimeter tools to measure all of the tape strips including the length of the komodo dragon, consider asking:
- “Can you show me how you measured the __?”
- “How could you use your rulers to find the same measurement?”

---

**Activity 2**

Measure with a Meter Stick

**Standards Alignments**

<table>
<thead>
<tr>
<th>Addressing</th>
<th>2.MD.A.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Towards</td>
<td>2.MD.A.2</td>
</tr>
</tbody>
</table>

The purpose of this activity is for students to learn about the meter as a longer metric unit of length. Students measure longer lengths with a new tool, the meter stick. Students measure strips of tape of different lengths and choose between a centimeter ruler and a meter stick in order to measure each. In the synthesis, students share their measurements of each line and discuss how they chose which tool to use to measure (MP5). Students measure Strips D–G in this activity. Students measure the komodo dragon (Strip D) twice to experience measuring the same length with a ruler and a meter stick. They discuss and compare their measurements in the lesson synthesis.
**Access for English Learners**

*MLR2 Collect and Display.* Direct attention to words collected and displayed from the previous lesson. Add “meter stick” to the collection. Invite students to borrow language from the display as needed, and update it throughout the lesson. *Advances: Conversing, Reading*

**Access for Students with Disabilities**

*Engagement: Provide Access by Recruiting Interest.* Synthesis: Optimize meaning and value. Invite students to share people they know or specific jobs they recognize that may use the measuring tools they have been exposed to. “When and why might someone use these measuring tools?” *Supports accessibility for: Conceptual Processing*

---

**Materials to Gather**

Metersticks, Rulers (centimeters)

---

**Student-facing Task Statement**

D: komodo dragon  
E: adult alligator  
F: adult cobra  
G: ribbon snake

1. Measure the length of the komodo dragon in meters.
2. What is the same or different about your measurements for the komodo dragon from Activity 1 and Activity 2?
3. Measure each reptile in centimeters or meters. Don’t forget the units.  
   a. How long is an adult alligator?  
   b. How long is an adult cobra?  
   c. How long is a ribbon snake?

---

**Launch**

- Groups of 3–4
- Give each group a meter stick.
- “We saw that measuring longer lengths with centimeters can be challenging. Luckily, there is a standard unit that is much larger than a centimeter that we can use. It’s called a **meter**.”
- Show students a meter stick.
- “This is called a meter stick. The length of one end to the other is 1 meter long. Just like we used centimeter cubes at first to measure centimeters. We can use the length of a meter stick to measure length in meters.”
- “What do you notice about the meter stick?” (There are lots of little lines; the numbers go up to 100; every tenth number is bold)
- 30 seconds: quiet think time
- Share responses.
- “The meter stick makes it easier to measure longer lengths. We can use the
Sample responses: about 2 meters or 1 meter and 80 centimeters.

Student Responses

1. Sample responses: about 2 meters or 1 meter and 80 centimeters.

2. Sample response: It was easier to use the meter stick because we just used it twice, but we used the centimeter ruler a lot of times. I can see that the meter stick is 100 cm.

3. Sample responses: about 3 meters, 335 centimeters, or 3 meters and 36 cm.

Activity

- “Now, let’s go back to our job as zookeepers and measure some even larger reptiles.”
- “You are going to measure the komodo dragon again and 3 new reptiles.”
- “You may use any of the measuring tools you have used today. Be prepared to explain why you chose each tool.”
- 12 minutes: group work time

Monitor for the different ways students measure the ribbon snake and adult alligator including how they record their measurements in meters.

Synthesis

- “Which tools did you use to measure Strip G, the ribbon snake? Why did you choose this tool?” (We used the meter stick and took away 10 because it was so close.)
- “What did you do when you found that Strip E, the adult alligator, was longer than 3 meters but shorter than 4 meters?” (We saw it was closer to 3 meters so we said it was about 3 meters. We used the meter stick 3 times and then the cm ruler for the rest.)

Advancing Student Thinking

If students do not measure using the meter stick, or only report their measurements in centimeters, consider asking:

- “About how many meters long is the __?”
- “What is different about measuring the __ in meters (or meters and centimeters) rather than...”
Lesson Synthesis

“Today, we learned about another standard unit of length—the meter. We used meter sticks to make measuring longer lengths a lot easier.”

“You measured the length of the komodo dragon two times. What was the same or different about your measurements?” (When we measured in meters it was only about 2 meters. When we measured in centimeters it was 180 centimeters. We only had to use the meter stick 2 times to measure the whole length. We had to use the ruler lots of times.)

Display the meter stick.

“What did you like about using the meter stick? When do you think it is helpful to use a meter stick to measure instead of a ruler or other tools?” (I liked using it for the longer lengths because you didn’t need as many tools or you didn’t need to move the tool a bunch of times. It’d be good to use to measure longer things. If you were measuring meters you would want to use it.)

Suggested Centers

- Estimate and Measure (1–4), Stage 1: Choose Your Unit (Addressing)
- Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting)

Response to Student Thinking

Students agree with Noah that 13 meters is a reasonable measurement for the gecko.

Next Day Support

- Launch Activity 1 with a discussion about this cool-down.
Lesson 6: Compare Reptile Lengths in Story Problems

Standards Alignments
Addressing 2.MD.B.5, 2.NBT.B.5, 2.OA.A.1, 2.OA.B.2

Teacher-facing Learning Goals
- Solve addition and subtraction story problems about length.

Student-facing Learning Goals
- Let’s solve story problems about reptile lengths.

Lesson Purpose
The purpose of this lesson is for students to solve Compare story problems within 100 involving length.

In previous lessons, students measured lengths and determined how much longer one object is than another using centimeters. They have also developed strategies for adding and subtracting numbers within 100.

This lesson combines these skills. Students interpret story problems about length measurements whose solution requires addition and subtraction within 100. In each activity, students solve Compare problems in situations where the language of the problem may direct students to use an incorrect operation. Throughout the lesson, they are encouraged to make sense of and use tape diagrams to visualize the measurement contexts and make sense of the lengths and their relationships (MP1, MP2).

This lesson has a Student Section Summary.

Access for:

_students with Disabilities_
- Action and Expression (Activity 1)

_English Learners_
- MLR8 (Activity 2)

Instructional Routines
MLR6 Three Reads (Activity 1), Number Talk (Warm-up)

Materials to Gather
- Base-ten blocks: Activity 1, Activity 2
**Cool-down** (to be completed at the end of the lesson) 

Kiran and Han Compare Pets

**Standards Alignments**
Addressing 2.MD.B.5, 2.OA.A.1

**Student-facing Task Statement**

Kiran's pet snake is 47 cm long. It is 26 cm shorter than Han's pet snake. How long is Han's pet snake?

1. Circle the diagram that matches the story.

   ![Diagram](image)

2. Solve. Show your thinking.

   ![Diagram](image)
Han's snake is ___________ cm long.

**Student Responses**

1. Students circle the tape diagram showing Han's pet as the larger unknown.
2. Han's snake is 73 cm long. Sample response:
   
   
   \[
   \begin{align*}
   40 + 20 &= 60 \\
   7 + 6 &= 13 \\
   60 + 10 + 3 &= 73 \\
   47 + 26 &= 73
   \end{align*}
   \]

---

**Warm-up**

Number Talk: Fives and Tens

---

**Standards Alignments**

Addressing 2.NBT.B.5, 2.OA.B.2

The purpose of this warm-up is to elicit the strategies and understanding students have for composing a ten when adding within 100. This Number Talk focuses on adding fives to compose a ten mentally. Each successive expression is ten more than the previous. When students notice and express the regularity in this pattern, they use the structure of base-ten numbers and the properties of operations (MP7, MP8). These understandings help students develop fluency with addition within 100.

---

**Instructional Routines**

Number Talk

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**Student-facing Task Statement**

Find the value of each expression mentally.

- 5 + 5
- 15 + 5
- 15 + 15

**Launch**

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time
Student Responses

- 10: It’s a sum I know.
- 20: It’s like counting by 5s. 15 and 5 more is 20.
- 30: It’s like $15 + 5$, but there’s 10 more.
- 40: $15 + 5 = 20, 20 + 20 = 40$

Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

Synthesis

- “How does $15 + 5$ compare to $5 + 5$?” (It’s 10 more)
- “How does $15 + 15$ compare to $15 + 5$?” (It’s 10 more)
- “How does $15 + 25$ compare to $15 + 15$?” (I see $10 + 20 = 30$ and the $5 + 5$ is 10 more.)
- Highlight how to see the 10 more structure in these sums: the tens place of one number grows by one each time.

Activity 1

Whose Pet is Longer?

Standards Alignments

Addressing 2.MD.B.5, 2.OA.A.1

The purpose of this activity is for students to interpret and solve Compare problems involving length where the language suggests an incorrect operation. For example, the first problem uses the word “shorter” which usually suggests subtraction. However, in this problem students are looking for an unknown that is the greater length and must add the two known values.

The Three Reads routine is used to help student practice making sense of the problem before solving. Students begin the activity by looking at the first problem displayed, rather than in their books. At the end of the launch, students open their books and work to find the diagram that matches the story problem. This further helps them to visualize the quantities in the problem before they work to find a solution (MP1).

After reading the other story problems, students consider which pet is longer or shorter and choose tape diagrams to match the lengths in the problem (MP2). Students solve each story problem independently and compare their solutions.
This activity uses *MLR6 Three Reads. Advances: Reading, Listening, Representing*

**Access for Students with Disabilities**

*Action and Expression: Develop Expression and Communication.* Provide students with alternatives to writing on paper. This unit has involved a lot of paper and pencil work, so there is an opportunity for students to share their learning using white boards, chart or poster paper, and markers. *Supports accessibility for: Organization, Attention*

### Instructional Routines

**MLR6 Three Reads**

### Materials to Gather

Base-ten blocks

### Student-facing Task Statement

1. Lin's pet lizard is 62 cm long. It is 19 cm shorter than Jada's. How long is Jada's pet lizard?
   
   a. Whose pet is longer?
   
   b. Circle the diagram that matches the story.

   ![Diagram](image)

   Jada's pet
   
   Lin's pet
   
   Lin's pet
   
   Jada's pet

   c. Solve. Show your thinking.

   Jada’s pet lizard is _________ cm long.

### Launch

- Groups of 2
- Give students access to base-ten blocks.
- “Lin and Jada both have pet lizards. They are comparing the lengths of their pets.”

**MLR6 Three Reads**

- Display only the problem stem for the first problem, without revealing the question.
- “We are going to read this problem 3 times.”
- 1st Read: “Lin's pet lizard is 62 cm long. It is 19 cm shorter than Jada's.”
- “What is this story about?”
- 1 minute: partner discussion.
- Listen for and clarify any questions about the context.
- 2nd Read: “Lin's pet lizard is 62 cm long. It is 19 cm shorter than Jada's.”
- “Which measurements are important to pay attention to in the story?” (the length of Lin's lizard, the length of Jada's lizard, the difference between the lengths of the two...
2. Diego and Mai have pet snakes. Mai’s snake is 17 cm longer than Diego’s. Mai’s snake is 71 cm. How long is Diego’s pet snake?
   a. Whose pet is shorter?
   b. Circle the diagram that matches the story.
   
   ![Diagram of two rectangles representing Diego’s and Mai’s pet snakes, with labels indicating lengths.]
   
   c. Solve. Show your thinking.
   Diego’s pet snake is _______ cm long.

**Student Responses**

1. a. Jada’s lizard is longer.
   b. Circle

   ![Diagram of two rectangles representing Lin’s and Jada’s pet lizards, with labels indicating lengths.]

   c. Jada’s pet lizard is 81 cm long.
   Sample response: $62 + 19 = ?$, $62 + 10 = 72, 72 + 8 = 80$, $80 + 1 = 81$  

2. a. Diego’s snake is shorter.
   b. Circle

   ![Diagram of two rectangles representing Mai’s and Diego’s pet snakes, with labels indicating lengths.]

   lizards).

- 30 seconds: quiet think time
- 2 minutes: partner discussion
- Share and record responses.
- Reveal the question.
- 3rd Read: Read the entire problem, including the question aloud.
- “Lin’s pet lizard is 62 cm long. It is 19 cm shorter than Jada’s. How long is Jada’s pet lizard?”
- “What are different ways we could represent this problem?” (tape diagram, equations, base ten blocks)
- 30 seconds: quiet think time
- 1–2 minutes: partner discussion

**Activity**

- “Read each story with your partner. Then circle the diagram that matches on your own.”
- “When you have both selected a match, compare your choices and explain why the diagram matches the story.”
- “Then solve on your own.”
- 10 minutes: partner work time

**Synthesis**

- Invite students to share the correct diagram for the second problem.
- Display the diagram.
- Consider asking:
  - “How does the diagram match the story problem?” (You can see that Mai’s rectangle is longer and there is a question mark for Diego’s pet.)
  - “How did you know which pet was shorter?” (It said that Mai’s snake was 17 cm longer, so Diego’s is shorter.)
c. Diego’s pet snake is 54 cm long.
Sample response: 71 – 17 = 54,
71 = 60 + 11, 60 – 10 = 50,
11 – 7 = 4, 50 + 4 = 54

Activity 2
Guess My Reptiles

Standards Alignments
Addressing 2.MD.B.5, 2.OA.A.1

The purpose of this activity is for students to make sense of and solve Compare story problems involving length. Students use measurements provided for reptiles and create their own Compare problems to solve with a partner. Students must solve a Compare, Difference Unknown problem when creating their mystery problem. When they solve their partner’s mystery problem, they must solve a Compare, Bigger Unknown or Compare, Smaller Unknown problem. Encourage students to use diagrams or other drawings to show how they know which reptiles their partner picked. Some students may choose to use equations to represent the lengths.

Access for English Learners

MLR8 Discussion Supports. To support partner discussion about the comparisons they made, display the following sentence frames: “I compared ___ and ___ because . . . .”, “Our comparisons are the same because . . . .”, or “Our comparisons are different because . . . .” Encourage students to challenge each other when they disagree.  
Advances: Speaking, Conversing

Materials to Gather
Base-ten blocks
**Student-facing Task Statement**

<table>
<thead>
<tr>
<th>Partner A’s reptiles</th>
<th>Partner B’s reptiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. day gecko, 28 cm</td>
<td>1. ribbon snake, 83 cm</td>
</tr>
<tr>
<td>2. komodo dragon, 98 cm</td>
<td>2. gila monster, 55 cm</td>
</tr>
<tr>
<td>3. baby cobra, 46 cm</td>
<td>3. baby alligator, 71 cm</td>
</tr>
<tr>
<td>4. iguana, 65 cm</td>
<td>4. ringneck snake, 38 cm</td>
</tr>
</tbody>
</table>

1. Choose one reptile from your list and one reptile from your partner’s list.
2. Fill in the blanks to create a story problem using the lengths of the reptiles you picked. Then share your sentences with your partner.

   My reptile is __________ cm long.
   It is __________ cm ________________________(shorter/longer) than one of your reptiles.
3. Which reptiles did your partner pick? Show your thinking.

**Student Responses**

Answers vary. Sample response:

- Partner A: My reptile is 46 cm long. It is 9 cm shorter than one of your reptiles.
- Partner B: You picked a baby cobra and a

**Launch**

- Groups of 2
- Give students access to base-ten blocks.
- Assign students as Partner A and Partner B.

**Activity**

- “We are going to play a guessing game. You will choose one reptile from your list and one reptile from your partner’s list. Keep both reptiles a secret.”
- “Work independently to pick your reptiles and complete the sentences.”
- As needed, demonstrate as if you were Partner A with the class.
- 4 minutes: independent work time
- “Now, share your sentences with your partner. Then find which reptiles they picked. Draw a diagram or use equations to prove you are correct.”
- 6 minutes: partner work time
- Monitor for students who use tape diagrams to represent their partner’s reptiles.

**Synthesis**

- Invite previously identified students to share how they determined their partner’s reptiles.
- Consider asking:
  - “Which reptile was shorter? How does your diagram show this?”
  - “Did you add or subtract to find the other reptile? How did your diagram help you?”
gila monster.

- $46 + 9 = ?$
  - $46 + 9 = 55$

**Advancing Student Thinking**

If students find the correct difference between the reptiles they pick, but create a word problem that cannot be solved, consider asking:

- “How could you draw a diagram to represent the reptiles you picked?”
- “Does your diagram match the story problem you created? Why or why not?”
- “What word or numbers could you change to match the reptiles you chose?”

**Lesson Synthesis**

“How did the diagram help you think about which animal was longer?” (Once you label the rectangles, you can tell which one is longer because it had the longer rectangle.)

“How did the diagram help you decide if you would add or subtract?” (After seeing which animal had the longer rectangle, it was easy to see which length was longer. I could see if I needed to add to find the longer length or subtract to find the difference or the shorter length.)

**Suggested Centers**

- Estimate and Measure (1–4), Stage 1: Choose Your Unit (Addressing)
- Five in a Row: Addition and Subtraction (1–2), Stage 6: Add within 100 with Composing (Supporting)
In this section, we measured the length of objects using different length units. We learned that the **centimeter** is a standard length unit and we measured lengths in centimeters using base-ten blocks, rulers, and meter sticks. We learned that rulers represent length units using tick marks to show a length from zero.

We also learned that a meter is a length unit in the metric system that is longer than a centimeter. When measuring longer lengths, it is easier to use a meter stick. A meter has the same length as 100 centimeters.

### Complete Cool-Down

### Response to Student Thinking

Students believe that Kiran's pet is longer than Han's and find the difference instead of finding the sum.

This lesson builds on students' work with solving Compare problems in an earlier unit.

### Next Day Support

- Before the warm-up or first activity, highlighting the diagrams from previous lessons. Make connections between the diagrams and the language of the longer and shorter in the context of length.

### Prior Unit Support

Grade 2, Unit 1, Section C: Diagrams to Compare
Lesson 7: Center Day 1 (Optional)

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3, 2.NBT.B.5, 2.OA.A.1

Teacher-facing Learning Goals
- Estimate and measure objects and find the difference between their estimate and the actual measurement.
- Tell and solve story problems.

Student-facing Learning Goals
- Let's estimate the length of an object and then measure it.

Lesson Purpose
The purpose of this lesson is for students to practice estimating and measuring length as well as telling and solving math stories.

This lesson is optional because it is an opportunity for extra practice that not all classes may need. In the first activity, students learn stage 2 of the Estimate and Measure center, which was first introduced in grade 1. Students estimate and measure the length of objects and find the difference between their estimate and the actual measurement. In the second activity, students choose to continue working on Estimate and Measure or a previously introduced center focused on solving story problems.

Instructional Routines
Number Talk (Warm-up)

Materials to Gather
- Materials from previous centers: Activity 2
- Metersticks: Activity 1
- Objects of various lengths: Activity 1
- Rulers (centimeters): Activity 1

Materials to Copy
- Estimate and Measure Stage 2 Recording Sheet (groups of 1): Activity 1

Lesson Timeline
<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>20 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>20 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question
Who got to do math today in class and how do you know? Identify the norms or routines that allowed those students to engage in mathematics. How can you adjust these norms and routines so all students do math tomorrow?
Lesson Synthesis

Warm-up

Number Talk: Subtract from 37

Standards Alignments

Addressing 2.NBT.B.5

The purpose of this Number Talk is to elicit the ways students look for to use the structure of two-digit numbers to subtract (MP7). These understandings help students develop fluency and will be helpful later in this lesson when students will need to be able to find the difference between the estimate and actual measurement of an object.

Instructional Routines

Number Talk

Student-facing Task Statement

Find the value of each expression mentally.

- 37 – 20
- 37 – 21
- 37 – 17
- 37 – 16

Student Responses

- 17: if we take 2 tens away we are left with 17.
- 16: I took 1 more away from the first problem.
- 20: I took away 7 ones and got 30 and then took away 1 ten and got 20.

Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

Synthesis

- “How could you use 37 – 20 to help you with
Activity 1

Introduce Estimate and Measure

Standards Alignments

Addressing 2.MD.A.1, 2.MD.A.3

The purpose of this activity is for students to learn stage 2 of the Estimate and Measure center. Students estimate and measure the length of objects. This stage includes centimeters, inches, and feet. Students should only measure in centimeters at this point in the unit. In this activity, students also find the difference between their estimate and their measurement for extra practice.

Materials to Gather

Metersticks, Objects of various lengths, Rulers (centimeters)

Materials to Copy

Estimate and Measure Stage 2 Recording Sheet (groups of 1)

Required Preparation

• Gather or identify objects of various lengths (pencils, markers, books, glue, scissors, shoe, tape dispenser, side of desk, length of bulletin board).

Launch

• Groups of 2
• Give students access to centimeter rulers and meter sticks.
• Give each student a recording sheet.
• “We are going to learn a new center called Estimate and Measure. Today we are going to estimate and measure the length of different objects.”
• “First you and your partner will decide on an object in the room to measure. Then you will
decide what tool you will use to measure the object.”

- Choose an object to measure and hold it up for students to see.
- “What tool would you use to measure this object?”
- “Before measuring the object, you and your partner will both estimate the length of the object using the unit you chose. Your estimates do not have to be the same. Record your estimate.”
- Demonstrate estimating the length of your object and recording it on the recording sheet.
- “Now work with your partner to measure the object and record the actual measurement.”
- Demonstrate measuring the object, thinking aloud as you line up the endpoints and use the number on the tool to determine the length.
- Record the actual measurement on the recording sheet.
- “If you have time: Once you have estimated and measured the object, find the difference between your estimate and the actual length.”
- Demonstrate finding the difference.
- “Put your object back and choose another object to measure.”

**Activity**

- 10 minutes: partner work time

**Synthesis**

- Display a row of the recording sheet with this information:
  - Object: notebook
  - Estimate: 20 cm
  - Actual Measurement: 31 cm
- “How can we find the difference?” (We can
add on to 20 until we get to 31. We can subtract 20 from 31.)

Activity 2

Centers: Choice Time

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3, 2.NBT.B.5, 2.OA.A.1

The purpose of this activity is for students to choose from activities that focus on measurement or story problems. Students choose from any stage of previously introduced centers.

- Estimate and Measure
- Math Stories

Materials to Gather
Materials from previous centers

Required Preparation
Gather materials from:
- Estimate and Measure, Stage 2
- Math Stories, Stage 5

Student-facing Task Statement
Choose a center.

Estimate and Measure

Math Stories

Launch
- “Now you will choose from centers we have already learned. One of the choices is to continue with Estimate and Measure.”
- Display the center choices in the student book.
- “Think about what you would like to do first.”
30 seconds: quiet think time

**Activity**

- Invite students to work at the center of their choice.
- 8 minutes: center work time
- “Choose what you would like to do next.”
- 8 minutes: center work time

**Synthesis**

- “What did you like about the activity you worked on today?”

---

**Lesson Synthesis**

“Today we estimated and measured the length of objects. What strategy did you use to help you make an estimate that was close to the actual measurement?”
Section B: Customary Measurement

Lesson 8: What is an Inch?

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3

Teacher-facing Learning Goals
- Define an inch as a unit of measure.
- Use a ruler to measure length in inches.

Student-facing Learning Goals
- Let’s measure in inches.

Lesson Purpose
The purpose of this lesson is for students to learn that an inch is a standard length unit in the U.S. customary system and use it to measure length.

In previous lessons, students learned the importance of using standard length units to measure and compare lengths. They learned about length units from the metric system and measured the length of objects in centimeters and meters with different tools, including rulers and meter sticks.

In this lesson, students learn that an inch is a standard unit of measure in the U.S. customary system. They use inch tiles or rulers to measure the length of classroom objects and the sides of geometric shapes in inches (MP2, MP5). Students use their tools and their measurements of classroom objects to develop a benchmark for the length of an inch, which will support them with estimating in later lessons.

Students need access to inch tiles and rulers throughout the lesson, including the cool-down.

Access for:

Topics
- Students with Disabilities
  - Representation (Activity 1)

- English Learners
  - MLR8 (Activity 2)

Instructional Routines
Notice and Wonder (Warm-up)
Materials to Gather
- Inch tiles: Activity 1, Activity 2
- Objects of various lengths: Activity 1
- Rulers (inches): Activity 1, Activity 2

Lesson Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>25 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>10 min</td>
</tr>
<tr>
<td>Lesson Synthesis</td>
<td>10 min</td>
</tr>
<tr>
<td>Cool-down</td>
<td>5 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question
In Activity 2, students estimated the length of objects in inches. Did their previous work measuring and estimating with centimeters make working with a new length unit easier? How have you seen students making progress toward making more accurate estimates?

Cool-down (to be completed at the end of the lesson)  

Measure a Rectangle

Standards Alignments
Addressing 2.MD.A.1

Student-facing Task Statement
Measure the long and short sides of the rectangle in inches.

1. Long side: _________ in
2. Short side: _________ in
Warm-up

Notice and Wonder: Inches and Centimeters

The purpose of this warm-up is to elicit the idea that there is a unit of measure that is longer than a centimeter but is still small—an inch. This will be useful when students are introduced to customary units beginning with the inch tile and the inch ruler. While students may notice and wonder many things about these images, the difference in the length between tick marks on the rulers (the length-unit) is an important discussion point.

Instructional Routines

Notice and Wonder

Student-facing Task Statement

What do you notice? What do you wonder?

Launch

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.
They are both rulers.
They are both labeled 0, 1, 2, 3, 4, 5, 6.
The centimeter cube lines up with the top ruler from 0–1, but not the other.

Students may wonder:
- Why are the numbers more spread out in one ruler than the other?
- Is one ruler measuring in centimeters?
- What unit is the ruler with more space between the numbers?
- Does one ruler measure inches?

**Synthesis**
- “How are these images the same? How are they different?” (They both look like rulers. They both start with 0 and count up. One of the rulers lines up with the square from 0–1, but the other ruler does not show the same length unit.)
- “We have learned that there are different length units we can use to measure. We have measured with standard units from the metric system like centimeters and meters. In the next activity, we will learn more about a new standard unit that is longer than a centimeter, but much shorter than a meter.”

---

**Activity 1**

What is an Inch?

**Standards Alignments**

Addressing 2.MD.A.1

The purpose of this activity is to introduce the **inch** as a length unit in the U.S. customary system. In the launch, students use inch tiles and classroom objects that are “about an inch” to help them develop a benchmark for an inch. They may continue to use the inch tile to measure lengths in inches or as a tool for checking their measurements with a ruler throughout the lesson.

Although students have measured objects that are not a whole number of length units long in previous lessons, it will be more likely that students will measure lengths that are clearly not a whole number of inches long. Students should not record measurements to the half inch, but should instead discuss the reasoning they use to decide which whole number to use and the language they use to express that their measurement is not exactly that number of inches long (MP3, MP6).
Access for Students with Disabilities

*Representation: Internalize Comprehension.* Use multiple examples and non-examples to reinforce the importance of lining the objects up with zero appropriately. Encourage students to demonstrate the small errors that make a difference in the measurement to emphasize the importance of accuracy.

*Supports accessibility for: Attention, Memory*

Materials to Gather

- Inch tiles
- Objects of various lengths
- Rulers (inches)

Required Preparation

- Each group of 4 needs access to several objects between 1–11 inches long. Consider using classroom objects such as markers, colored pencils, 11 connecting cubes, books, or any other object with a length shorter than 12 inches.

Student-facing Task Statement

1. Find 2 items that are about an inch long.
   a. ____________________________
   b. ____________________________

2. Measure the length of each object.

<table>
<thead>
<tr>
<th>object to measure</th>
<th>length in inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>marker</td>
<td></td>
</tr>
<tr>
<td>colored pencil</td>
<td></td>
</tr>
<tr>
<td>11 connecting cubes</td>
<td></td>
</tr>
<tr>
<td>a book</td>
<td></td>
</tr>
</tbody>
</table>

Launch

- Groups of 4
- Give students access to inch tiles and 12-inch rulers.
- Display image of an inch tile and a ruler.

- “What do you notice about this image? What do you wonder?” (The square fits between the 0 and the 1 on the ruler. The length of the side is the same as the length from 0 to 1 on the ruler. What is the name of the length unit? Does the square have a special name like the centimeter cube did?)
- 1 minute: partner discussion
- Monitor for students who say the units don’t look like centimeters or who wonder if it’s an inch.
1. Answers vary. Sample responses: paper clip, quarter, eraser
2. Answers vary.

### Student Responses

<table>
<thead>
<tr>
<th>object to measure</th>
<th>length in inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>your choice objects:</td>
<td></td>
</tr>
</tbody>
</table>

- Share responses.
- “You have learned how important it is to have standard units of measure.”
- “We have been working with metric units—centimeters and meters—that are used around the world.”
- “In the U.S., our measurement system is called the customary system. An **inch** is the smallest unit for measuring length in our system.”
- Hold up an inch tile.
- “This is an inch tile. The length of each side of the square face is 1 inch.”
- As needed, invite students to use their rulers to verify that each side of the square face of the tile is 1 inch long.
- “What are some things you can think of that are about an inch?”
- 1 minute: quiet think time

### Activity

- “Use your tile to find 2 things around the classroom that are about an inch long and write them down.”
- 3 minutes: independent work time
- Share and record responses.
- “Now you are going to measure a few objects around the room using an inch ruler. For each item, record the length in inches.”
- 5 minutes: small-group work time
- Monitor for a student who measures an object that is not a whole number of inches.

### Synthesis

- Share a student’s object that is not a whole number of inches long.
- “How can we describe the length of the
____ when its end doesn’t line up with one of the inch marks on the ruler?” (If it is close to 3 inches, I can write “about 3 inches.”)

- 1 minute: quiet think time
- Share responses.

**Advancing Student Thinking**

Students may measure the correct number of length units, but record the length in centimeters or meters. Consider asking:

- “How long is the ___? How do you know?”
- “If I used the inch tiles to measure the __, would I find the same measurement?”
- “If I used centimeter cubes to measure the __, would I find the same measurement?”
- “How could you revise your measurement to show the accurate length?”

**Activity 2**

**Measure the Sides of Shapes**

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.A.3

The purpose of this activity is for students to estimate and measure in inches. Students first estimate the length of given sides of shapes and then measure the sides using inch rulers. In the activity synthesis, students share how they measured the different sides and continue to discuss how to communicate the measurement of lengths that are not clearly a whole number of units long (MP6). They also make sure to indicate that their measurements are in inches since students now have both centimeters and inches they can use to measure lengths.

In the lesson synthesis, students discuss how they might measure longer lengths in inches. The discussion is designed to elicit their experiences with centimeters and meters and build curiosity for the next lesson in which students measure in feet.
**Access for English Learners**

*MLR8 Discussion Supports.* Before partner work, remind students to use the words “inch” or “inches.” Invite students to chorally repeat phrases that include these words in context.

*Advances: Speaking*

---

**Materials to Gather**

Inch tiles, Rulers (inches)

**Student-facing Task Statement**

1. Here is a rectangle.

![Rectangle](image)

How long is the long side of the rectangle in inches?

Estimate: __________

Measure the long side of the rectangle.

Actual length: __________

2. Here is a square.

![Square](image)

How long is a side of the square in inches?

Estimate: __________

Measure one side of the square.

---

**Launch**

- Groups of 2
- Give students access to inch tiles and 12-inch rulers.

**Activity**

- “Now you will get a chance to practice measuring the sides of shapes.”
- “First, estimate the length of the side and record your estimate. Then, measure each side, and record your responses. Don’t forget to include the unit, inches.”
- 6 minutes: independent work time
- “Now compare your measurements with your partner’s.”
- 2 minutes: partner discussion
- Monitor for students who recognize that the third problem has a measurement that is more than 5, but not quite 6 inches.

**Synthesis**

- “I noticed that some students had different measurements for the longest side of the triangle. Why do you think that is?” (It was less than 6, but more than 5. It was in between 5 and 6 inches.)
- Invite previously identified students to share their reasoning for 6 inches.
3. Here is a triangle.

How long is the longest side of the triangle in inches?

Estimate: __________

Measure the longest side of the triangle.

Actual length: __________

Student Responses

1. ○ Sample estimate: 4–6 inches
   ○ Actual length: 5 inches
2. ○ Sample estimate: 2–3 inches
   ○ Actual length: 2 inches
3. ○ Sample estimate: 4–7 inches
   ○ Actual length: Students may write 5 inches or 6 inches.

Lesson Synthesis

“Today, we used inch tiles and rulers to measure the length of objects and sides of shapes in inches.”

“How was measuring in inches the same as measuring with centimeters? How was it different?” (It was the same as measuring with other units. We used our rulers the same way. If you used inch tiles, you lined them up from one end of the other with no gaps or overlaps like other units. It was different because an inch is longer than a centimeter. An inch tile is longer than a centimeter cube. Our measurements were smaller. It doesn’t take as many units to measure some of the same things we measured before.)

“How about how long do you estimate the bookshelf will be in inches?” (It would be a lot of inches—maybe 100.)

Choose a bookshelf or whiteboard in your classroom for students to base their estimates on. Student
estimates will vary based on the furniture available in your classroom.

**Suggested Centers**

- Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting)
- Math Stories (K–2), Stage 5: Tape Diagrams (Supporting)

---

**Response to Student Thinking**

Students find lengths other than 4 in and 1 in.

**Next Day Support**

- Encourage students to use inch tiles to check their measurements and build their understanding of the length of an inch.
Lesson 9: From Feet to Inches

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.2, 2.MD.A.3

Teacher-facing Learning Goals
- Compare measurements in feet and inches and describe the relationship between different measurements and the size of length units.
- Use rulers to measure length in feet and inches.

Student-facing Learning Goals
- Let’s measure longer lengths with customary units.

Lesson Purpose

The purpose of this lesson is for students to learn about a larger unit of customary measurement—the foot. Students measure in inches and feet, compare their measurements, and generalize about the relationship between the size of a length unit and the number of units needed to measure the length of an object.

In an earlier lesson, students were introduced to the inch as a length unit in the customary system. They developed a benchmark for an inch and measured objects with an inch ruler.

In this lesson, students use the length of a 12-inch ruler to develop an understanding of the length of 1 foot. They use a ruler as a benchmark for estimating the length of a foot. Throughout the lesson, students make decisions about which tools and which length units to use when measuring (MP5). They compare measurements for the same object in inches and feet and generalize that the more units are needed to measure the same length if you use a smaller length unit. This concept is a foundation for future work with measurement and their work with unit fractions in later grades.

Although the activities encourage students to notice that 1 foot is the same length as 12 inches, students are not expected to convert units in grade 2. Students express larger units in terms of smaller units in grade 4 and larger units in terms of smaller units in grade 5.

Access for:

☑️ Students with Disabilities
- Action and Expression (Activity 2)

🌐 English Learners
- MLR2 (Activity 1)
**Instructional Routines**

Estimation Exploration (Warm-up)

**Materials to Gather**

- Inch tiles: Activity 1, Activity 2
- Measuring tapes: Activity 2
- Objects of various lengths: Activity 2
- Rulers (inches): Activity 1, Activity 2
- Tape (painter’s or masking): Activity 1

**Lesson Timeline**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>20 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>15 min</td>
</tr>
<tr>
<td>Lesson Synthesis</td>
<td>10 min</td>
</tr>
<tr>
<td>Cool-down</td>
<td>5 min</td>
</tr>
</tbody>
</table>

**Teacher Reflection Question**

In Activity 1, students measured the same length of tape in both inches and feet. What evidence did you see of students’ understanding that the different measurements for each line relate to the size of the unit used to measure?

---

**Cool-down** (to be completed at the end of the lesson)  

Measure in Inches and Feet

**Standards Alignments**

Addressing 2.MD.A.3

**Student-facing Task Statement**
Tyler told Han that a great white shark is about 16 inches long, but Han disagrees. Han believes it would be about 16 feet long.

Who do you agree with? Explain.

**Student Responses**

Sample response: I think it is 16 feet long, because 16 inches would be way too small.

---

**Warm-up**

Estimation Exploration: Small Fry, Big Fish

**Standards Alignments**

Addressing 2.MD.A.3

The purpose of this Estimation Exploration is for students to practice the skill of estimating a reasonable length based on their experience and known information. They are given an illustration of a boy and a fish and are asked to give an estimate for the length of the fish in inches. This gives students an opportunity to share a mathematical claim including the assumptions they made when interpreting the image with limited information (MP3, MP4). After students are given more information, they have an opportunity to revise their estimates.

**Instructional Routines**

Estimation Exploration

**Student-facing Task Statement**

How long is this Cobia fish in inches?

**Launch**

- Groups of 2
- Display the image.
- “About how long do you think the fish in the picture is in inches?”
- “What is an estimate that's too high? Too low? About right?”
1. Record an estimate that is:

<table>
<thead>
<tr>
<th>too low</th>
<th>about right</th>
<th>too high</th>
</tr>
</thead>
</table>

2. Record an estimate that is:

<table>
<thead>
<tr>
<th>too low</th>
<th>about right</th>
<th>too high</th>
</tr>
</thead>
</table>

**Student Responses**

1. Sample responses:
   - Too low: 10 in–20 in
   - About right: 50 in–80 in
   - Too high: 81 in or more
2. Sample responses:
   - Too low: 50 in–69 in
   - About right: 70 in–85 in
   - Too high: 86 in or more

**Activity**

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.
- “We had a lot of different guesses, because we don’t have a lot of information.”
- “The boy is 7 years old. He is 48 inches tall.”
- “Based on this new information, do you want to revise or change your estimates?”
- 1 minute: quiet think time
- 1 minute: partner discussion
- Record responses.

**Synthesis**

- “How did you revise your estimate when you found out how old the boy was and his height?” (My first estimate was a lot higher, but it looks like if this fish was touching the ground too, they’d be closer to the same length. The fish looks about 20 inches higher or longer, but it isn’t touching the ground. I did 12 more inches, which is 60.)
- If it doesn’t come up, point out that the fish is not touching the ground.

**Activity 1**

Measure the Length of Fish

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.A.2
The purpose of this activity is to introduce the foot as a length unit in the U.S. customary system. Students learn that a foot is longer than an inch and is the same length as 12 inches. They use the length of 12-in rulers as a tool to measure lengths in feet by iterating the length of a ruler, or, more precisely, the length of 12 inches shown on the ruler. The experience iterating lengths of a ruler to measure a length in feet helps students build a mental benchmark for the approximate length of a foot that they can use to estimate lengths.

Students measure lengths of tape that represent realistic lengths of different types of fish. They measure each length to the nearest inch and to the nearest foot. In the synthesis, students discuss the difference in their measurements and relate the differences to the size of the length units.

Materials to Gather

- Inch tiles, rulers inches, Tape (painter's or masking)

Required Preparation

- Tape strips of these lengths on the floor. Label each strip with the letter and fish name. It may be helpful to make multiple sets of these lines to keep the groups small.
  - Strip A, largemouth bass: 2 feet
  - Strip B, spiny dogfish shark: 4 feet
  - Strip C, catfish: 3 feet
  - Strip D, koi: 2 feet and 6 inches

Student-facing Task Statement

1. Work with your group to measure the tape strips around the classroom in feet. Then measure the length in inches.

Launch

- Groups of 3–4
- Give each student an inch ruler and access to inch tiles.
- “You have measured the length of objects and the sides of shapes using inches. If you are measuring longer objects, like the fish...
Grade 2, Unit 3

Unit 3 Lesson 9

largemouth bass

Length in feet: _______
Length in inches: _______

spiny dogfish shark

Length in feet: _______
Length in inches: _______

Tape C

catfish

Length in feet: _______
Length in inches: _______

Tape D

koi

Length in feet: _______
Length in inches: _______

2. What did you notice about the number of feet compared to the number of inches when you measured the tape strips?

Student Responses

1. 
   a. largemouth bass: 2 feet, 24 inches
   b. spiny dogfish shark: 4 feet, 48 inches
   c. catfish: 3 feet, 36 inches
   d. koi: 2 feet or 2 feet 6 inches, 30 inches

2. Sample response: The number feet is less than the number of inches.

in the warm-up, you might want to use a different unit.”

• “A foot is a longer length unit in the U.S. Customary Measurement System. A foot is the same length as 12 inches.”

• “When we measure a length that starts at 0 on the ruler and ends at the 12, we can say the length is 12 inches or we can say the length is 1 foot.”

• “What are some things you see around the classroom that are about 1 foot long?”

• 30 seconds: quiet think time

• Share responses.

Activity

• Display the images of the fish.

• “In previous lessons, we measured the lengths of different kinds of reptiles. In this lesson, you will be measuring the lengths of fish. What do you know about fish?”

• Share responses.

• “Let’s imagine we work at the aquarium and need to measure the lengths of these fish. The tape on the floor represents their lengths.”

• “Look at the tape strips on the floor. Use your rulers to measure each length first in feet. Then measure the length in inches using the rulers or your inch tiles.”

• 10 minutes: group work time

• As needed, pause after students have measured their first fish in feet and invite students to share how they used their rulers to measure in feet.

Synthesis

• “What did you notice about your measurements when you switched from measuring in feet to measuring in inches?”

(The numbers are smaller for the number
of feet. I had to count more inches than feet.)

- “Why are our measurements in feet so much smaller than our measurements in inches?” (Feet are longer, so you don’t need as many to measure the length of the tape. It takes more inches to cover the same length.)

**Advancing Student Thinking**

If students measure lengths in feet by lining up multiple rulers or iterating the same ruler without considering gaps that may be caused by the lengths of the ruler before the 0 in or after the 12 in mark, point out these gaps on the ruler and consider asking:

- “Can you show me how you measured the length of the _____ in feet?”
- “Did you measure the length without any gaps? How do you know?”
- “How would you revise the way you measure to make sure you have no gaps or overlaps?”

---

**Activity 2**

Inches or Feet?

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.A.3

The purpose of this activity is for students to make decisions about the length units and tools they use when measuring the lengths of objects (MP5). Monitor for the reasons students give for choosing their length unit or tool based on the length of the object they are measuring. When measuring items that are not a whole number of feet long, encourage students to consider using feet and inches to build their understanding that the length units are part of the same system of measurement.

In addition to inch tiles and rulers, it is recommended that students use a retractable measuring tape (tape measure) that marks the length of each foot. If measuring tapes are not available, students may use yardsticks or other tools that are longer than 12-inches. Keep in mind that if
your “yardstick” is the same as your meterstick, it is longer than 36 inches and may not indicate the length of each foot. If these tools do not mark the length of each foot, take the time before measuring to show students how to use a ruler to check the length of each foot. If possible, label the length of each foot on the tool before students begin measuring.

Access for Students with Disabilities

Action and Expression: Internalize Executive Functions. Invite students to plan a strategy, including the tools they will use, for measuring items that may include feet and inches in the measurement. If time allows, invite students to share their plan with a partner before they begin.

Supports accessibility for: Organization, Conceptual Processing

Materials to Gather

Inch tiles, Measuring tapes, Objects of various lengths, Rulers (inches)

Required Preparation

- Each group of 4 needs a measuring tape (or retractable tape measure) that labels the length of each foot.

Student-facing Task Statement

1. Estimate the length of objects around the room. Say if you will measure in inches or feet.

<table>
<thead>
<tr>
<th>object to measure</th>
<th>my estimate</th>
<th>circle inches or feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>inches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>feet</td>
</tr>
</tbody>
</table>

Launch

- Groups of 2 and 4.
- Give each student an inch ruler and access to inch tiles.
- Give each group a measuring tape.
- “There are other tools you could use to measure even longer lengths in inches and feet.”
- Hold up a measuring tape.
- “A measuring tape can be used to measure longer lengths in inches. Some measuring tapes also show the length of each foot.”
- Point out the different labels that show inches and those that indicate feet.
- As needed, display the proper use of a retractable measuring tape (tape measure).
- As needed, display and describe the features of any other tools for measuring
2. Choose the best tool to measure each object. Complete the table to record your actual measurements.

<table>
<thead>
<tr>
<th>object to measure</th>
<th>measurement tool</th>
<th>actual length (include unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Student Responses**

1. Sample responses:

<table>
<thead>
<tr>
<th>object to measure</th>
<th>my estimate</th>
<th>circle inches or feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>glue stick</td>
<td>3</td>
<td>inches</td>
</tr>
<tr>
<td>student desk</td>
<td>3</td>
<td>feet</td>
</tr>
<tr>
<td>pencil</td>
<td>10</td>
<td>inches</td>
</tr>
<tr>
<td>a shelf</td>
<td>6</td>
<td>feet</td>
</tr>
</tbody>
</table>

2. Sample responses:

<table>
<thead>
<tr>
<th>object to measure</th>
<th>measurement tool</th>
<th>actual length (include unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>glue stick</td>
<td>ruler</td>
<td>4 inches</td>
</tr>
<tr>
<td>student desk</td>
<td>ruler</td>
<td>2 feet</td>
</tr>
<tr>
<td>pencil</td>
<td>ruler</td>
<td>8 inches</td>
</tr>
<tr>
<td>a shelf</td>
<td>tape measure</td>
<td>7 feet and 4 inches</td>
</tr>
</tbody>
</table>

that students may have access to for the activity (for example, yardsticks) and how they may be used to measure inches or feet.

**Activity**

- “Now you are going to measure a few objects around the room, but before measuring each item you will make an estimate in inches or feet.”
- “For each item, record your estimate, and circle inches or feet.”
- “After you and your partner have made your estimates, compare to see if you agree.”
- 5 minutes: partner work time
- “Now choose a measuring tool to measure each of the same objects and record the actual lengths. Don’t forget to include the unit.”
- 5 minutes: small-group work time
- Monitor for students who use measuring tape to measure in feet, inches, or both units.

**Synthesis**

- “After you picked an object to measure, how did you decide whether to measure in inches or feet?”
- “How did you decide what tool you would use to measure the length of the object?”
- Invite previously identified students who used feet and inches to measure a longer length with greater precision.

**Lesson Synthesis**

* 10 min
“Today, you practiced measuring in inches and feet. What did you notice about the number of feet in comparison to the number of inches when you measured the tape strips?” (There were more inches, because inches are a lot smaller than feet.)

“Do you think it will always be true that it takes more smaller units than larger units to measure length?” (Yes, because longer units get to the end of the object before the shorter ones. It happened with cm and meters and with in. and ft.)

Share and record responses.

**Suggested Centers**

- Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting)
- Math Stories (K–2), Stage 5: Tape Diagrams (Supporting)

---

**Response to Student Thinking**

Students believe that 16 inches is a reasonable length for a great white shark.

**Next Day Support**

- Before the first activity, pair students up to discuss their responses.
Lesson 10: Measure with a Torn Tape

Standards Alignments
Building On 1.OA.D.7
Addressing 2.MD.B.5, 2.OA.B.2
Building Towards 2.MD.B.6

Teacher-facing Learning Goals
● Determine the measurement of an object with a measuring tool when the endpoint does not line up with 0.

Student-facing Learning Goals
● Let’s measure without starting at 0.

Lesson Purpose
The purpose of this lesson is for students to measure objects without lining up the end with the 0 mark.

In earlier lessons, students used rulers, measuring tapes, yardsticks, and meter sticks to measure lengths in inches, feet, centimeters, and meters. They learned that length units are represented on these tools as the length between tick marks. They learned that if they line up the edge of an object with zero on their tools, they can easily read the measurement from the tool without counting each length unit.

In this lesson, students extend their experiences with measurement to include situations when they cannot use a tool to measure from 0. They know from prior experience that simply moving an object in space does not change its length (conservation of length). However, this understanding is challenged when students see an object that is not lined up with 0 on a measuring tool. Throughout the lesson, students are encouraged to make sense of and use equations that represent the measuring problems in each task (MP2). This understanding will support learning in future units with representing addition and subtraction on the number line.

Access for:

Students with Disabilities
● Action and Expression (Activity 1)

English Learners
● MLR2 (Activity 2)

Instructional Routines
True or False (Warm-up)
Materials to Gather
- Objects of various lengths: Activity 1
- Rulers (inches): Activity 1

## Lesson Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>15 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>20 min</td>
</tr>
<tr>
<td>Lesson Synthesis</td>
<td>10 min</td>
</tr>
<tr>
<td>Cool-down</td>
<td>5 min</td>
</tr>
</tbody>
</table>

## Teacher Reflection Question
What connections did students make between the different methods shared? What questions did you ask to help make the connections more visible?

## Cool-down (to be completed at the end of the lesson)

Torn Tape

## Standards Alignments

Addressing 2.MD.B.5

## Student-facing Task Statement

1. How long is the picture frame? Show your thinking.
The picture frame is ________ inches long.

2. Write an equation to represent the length of the picture frame.

**Student Responses**

1. 14 inches long. Sample response: I know because the frame starts at 13 in and ends at 27 in, so I found the difference to see how many inches. I counted on from 13 until I got to 27.

2. $27 - 13 = ?$ or $13 + ? = 27$

---

**Warm-up**

True or False: Constant Difference
The purpose of this True or False is to elicit insights students have about why two subtraction expression might have the same value. Students may notice a pattern in the expressions and express that if the two numbers in each expression change by the same amount, the value of the expression stays the same (MP7, MP8). The reasoning students do here helps develop fluency with subtraction within 100. They will build on this reasoning further in the lesson as they explore the conservation of length on different measuring tools. It may be helpful to represent student thinking shared in the synthesis on a measuring tape in preparation for the lesson activities.

### Instructional Routines

**True or False**

**Student-facing Task Statement**

Decide if each statement is true or false. Be prepared to explain your reasoning.

- $10 - 0 = 12 - 2$
- $8 - 4 = 10 - 6$
- $12 - 4 = 10 - 3$
- $15 - 2 = 13 - 0$

**Student Responses**

- True: $10 - 0 = 10$ and $12 - 2 = 10$.
- True: $8 - 4$ and $10 - 6$ are the same, because $10$ is $2$ more than $8$ and $6$ is two more than $4$.
- False: the numbers don't change by the same amount. $12 - 2 = 10$, but $4 - 2$ is not $3$.
- True: if I start at $0$ and count up to $13$, it is the same as starting at $2$ and counting up to $15$.

**Launch**

- Display one statement.
- “Give me a signal when you know whether the statement is true and can explain how you know.”
- 1 minute: quiet think time

**Activity**

- Share and record answers and strategy.
- Repeat with each statement.

**Synthesis**

- “How could we change the third equation to make it true?” (We could change the $3$ to a $2$ because the $12$ went down by $2$ and $4$ also went down by $2$. The difference would stay the same.)
Activity 1

The Notebook Problem

Standards Alignments
Addressing 2.OA.B.2  
Building Towards 2.MD.B.6

The purpose of this activity is for students to apply conservation of length by measuring with a tool that does not start at zero. Until now, students have focused on measuring by lining up the edge of an object with zero. In this activity, students consider how the units on a ruler, and in later lessons, a number line, can help us solve problems and measure even when we are not starting at zero. It is important for students to recognize that the tick marks show a consistent distance between numbers, so any part of the ruler can show a specific number of units. The synthesis focuses on how addition (counting on from the starting number) and subtraction can be used to find the length of an object. The teacher records students' thinking with an equation with a question mark for the unknown.

It is recommended that students use rulers to measure the length of smaller objects (2–10 inches) in this activity. This smaller number range helps students connect what they notice about measuring starting at different numbers on the ruler to familiar addition and subtraction equations within 20. However, this activity can be adapted to use measuring tapes or yardsticks to measure longer objects if they are available.

When students measure objects starting at different non-zero spots on the ruler and observe what stays the same (the difference) and what changes (the starting and ending spots) they observe a structure which repeats itself no matter which spot they on the ruler they begin the measurement (MP7, MP8).

Access for Students with Disabilities

Action and Expression: Develop Expression and Communication. Give students access to inch tiles to double check their measurement. Reiterate how the measurement is the same regardless of the whole inch they start at on the ruler.

Supports accessibility for: Conceptual Processing, Visual-Spatial Processing

Materials to Gather

Objects of various lengths, Rulers (inches)
Required Preparation

- Each group of 2 needs access to several objects between 2–10 inches long. Consider using classroom objects such as markers, colored pencils, paperclips, or other objects or images used in previous activities.

Student-facing Task Statement

Jada and Han used an inch ruler to measure the short side of a notebook.

Han says 8 inches. Jada says 8 inches.

1. How did Han and Jada get the same measurement?
2. Write an equation that could show Jada’s thinking.
3. Measure an object using Jada’s method.
   - I measured a ________________________.
   - I started with the number _________.
   - I ended with the number _________.
   - Equation: ________________________.
   - The length of my object is _________.
4. What do you notice about you and your partner’s measurements?

Student Responses

1. Sample responses:
   - Her tape is missing 0–2, so she starts at 2 and goes to 10. How did she get 8?

Launch

- Groups of 2
- Give each student a ruler.
- Display the image.

Activity

- “Han measured the same notebook as Jada. Jada’s measuring tape was torn, but she got the same answer. How did that happen?”
- 1 minute: quiet think time
- “Work with a partner to figure out how Jada got the same answer as Han. Be prepared to explain your thinking.”
- 3–4 minutes: partner discussion
- Monitor for a student who explains the problem as and one who explains the problem as.
- Share responses.
- “Now, using your ruler, you and your partner should find 1 thing in the classroom to measure without starting at zero. Each of you should start at a different number and compare your measurements.”
- “Don’t forget to include the unit with your measurement and to use a question mark for the unknown in your equation.”
- 5 minutes: partner work time
- Monitor for students who discuss:
  - that the length must be the same because the object doesn’t change
  - the equations they write have the same value or show the same
She started at 2, not 0, so she had to take 2 away from 10.

If you count from 0 up to 8, it is 8, and if you count from 2 up to 10, it is also 8.

2. Sample responses: \(10 - 2 = 8\) or \(2 + 8 = 10\).

3. Sample response: I measured a marker. I started with the number 3. I ended with the number 10. \(3 + ? = 10\) or \(10 - 3 = 7\). The length of my object is 7.

4. We both got 7 in. because 3 + 7 = 10 and 5 + 7 = 12.

relationship

○ the relationship between the numbers in their different expressions (for example, “the numbers I subtracted are two more than yours because I moved the object 2 inches over on the ruler. The difference is the same.”)

Synthesis

- Invite selected students to share their measurements and their reasoning.
- Write equations that correspond to the students’ thinking using a question mark to represent the unknown value.
- “Why do you think you get the same measurement each time, even if you measure starting from a different place?” (The object didn’t change, so the length has to stay the same. The total length in inches is still the same between the number that you start with and end with.)

Advancing Student Thinking

Students may find the correct length when counting length units on the measuring tool, but identify the length as the total number if they represent their measurement with an addition equation. (For example, they count on from 2 inches to 10 inches on the ruler and write \(2 + 8 = 10\), but say the length of the object is 10). Consider asking:

- “How did you measure the ___?”
- “What do the numbers in your equation represent?”

Activity 2

A Desktop to Measure
In this activity, students apply the methods they used in Activity 1 to solve a similar problem independently. They write equations to represent each problem. Students may write an equation with an unknown to represent the problem or a complete equation after they have solved. Students make connections to addition and subtraction as they count on or subtract to determine the length of objects when measuring with a torn tape measure. In the activity synthesis, students compare 2 different equations that could represent the problem.

**Access for English Learners**

MLR2 Collect and Display. Direct attention to words collected and displayed from the previous lesson. Invite students to borrow language from the display as needed, and update it throughout the lesson.

Advances: Conversing, Reading

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**Student-facing Task Statement**

Lin is measuring her desktop in inches.

1. What is the length of the long side of the desktop? Show your thinking using drawings, numbers, or words.

Equation: ______________________

The long side of the desktop is

---

**Launch**

- Groups of 2

**Activity**

- “Now that you have had some practice measuring without starting at zero, you will work on your own to help Lin solve her problem.”
- “Lin was trying to measure her desktop. Her measuring tape was tangled and she couldn’t start from the beginning of the tape. She decided to start measuring at 16 in.”
- “How long is each side of the desktop?”
- 8 minutes: independent work time
- “Now take a few minutes to discuss your solutions for Lin with your partner.”
- 2 minutes: partner discussion
- Monitor for students who write an addition
2. What is the length of the short side of the desktop? Show your thinking using drawings, numbers, or words.

Equation: __________________________

The short side of the desktop is ________.

**Student Responses**

1. The long side of the desktop is 24 inches.
   Sample response: $40 - 16 = ?$ or $16 + ? = 40$

2. The short side of the desktop is 18 inches.
   Sample response: $34 - 16 = ?$ or $16 + ? = 34$

**Synthesis**

- Invite previously selected students share the equations they used to find the length of the short side of the desk or display:
  - $34 - 16 = ?$
  - $16 + ? = 34$
- “Do both of these equations represent how Lin could find the length of the short side of her desk? How do you know?”

**Lesson Synthesis**

“Today, you learned that you can measure the length of objects using a measuring tool without starting at 0. We saw that you can always count the number of length units from one end of an object to the other. We also agreed that you could use addition or subtraction to find the difference when measuring by using the numbers on both ends of the length you measure.”

“What was your preferred method? Why?”
Suggested Centers
- Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting)
- Math Stories (K–2), Stage 5: Tape Diagrams (Supporting)

Response to Student Thinking
Students say the length is 27 inches or they find the length of the picture frame, but do not write an equation that matches.

Next Day Support
- Before the warm-up, have students work in partners to discuss strategies they used to find the correct response to this cool-down.
Lesson 11: Saree Silk Stories: Necklaces and Bracelets

Standards Alignments
Addressing 2.MD.B.5, 2.NBT.B.5, 2.OA.A

Teacher-facing Learning Goals
- Solve one-step story problems about length within 100.

Student-facing Learning Goals
- Let's solve story problems about length.

Lesson Purpose
The purpose of this lesson is for students to solve Take From story problems within 100 in the context of length.

In previous lessons, students learned how to measure lengths using different units of measure. In this lesson, students solve Take From problems involving length measured in inches. They use the context of length to make sense of tape diagrams that represent the part-part-whole relationships between the quantities in each story (MP2). They also continue to practice adding and subtracting within 100 with and without decomposing a ten.

Access for:

Students with Disabilities
- Representation (Activity 1)

English Learners
- MLR8 (Activity 2)

Instructional Routines
Notice and Wonder (Warm-up)

Materials to Gather
- Base-ten blocks: Activity 1, Activity 2

Lesson Timeline

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Teacher Reflection Question
In previous lessons, students used tape diagrams to represent Compare problems. How did you see students use the structure of part-part-whole tape diagrams to make sense of Take From problems? What connections did you
Cool-down (to be completed at the end of the lesson)

More Saree Ribbon

Standards Alignments
Addressing 2.MD.B.5, 2.NBT.B.5

Student-facings Task Statement

Priya had a piece of ribbon that was 74 inches long. She cut off 17 in. How long is Priya's ribbon now?

Show your thinking. Use a diagram if it helps. Don't forget the unit in your answer.

Student Responses

Priya's ribbon is 57 in long. Sample responses:

- $74 - 17 = ?, 74 - 10 = 64, 64 - 4 = 60, 60 - 3 = 57$
- Students draw a base-ten diagram that shows 5 tens and 7 ones. They show decomposing a ten and taking away 1 ten and 7 ones. They label to show the difference is 57.
Standards Alignments
Addressing  2.OA.A

The purpose of this warm-up is to elicit student ideas for how a tape diagram could be used to represent a Take From problem involving lengths. This will be useful when students solve story problems in the context of length in a later activity. While students may notice and wonder many things about these images, the connections students make between the image, the tape diagram, and the equation are the important discussion points.

Instructional Routines
Notice and Wonder

Student-facing Task Statement
What do you notice? What do you wonder?

Launch
- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

Activity
- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

Synthesis
- “What do you think the diagram and the ribbon could have in common?” (Maybe the 54 is cm or in, so 16 is how much of the ribbon is being cut off.)
- “What could the question mark represent?” (The longer part of the ribbon after it is cut. It represents the value of 54 — 16.)

Student Responses
Students may notice:
- The diagram and the equation have the same numbers.
- There is a dashed line through a part of the diagram.
- A ribbon is being cut.
Students may wonder:

- Why is there a picture of a ribbon?
- Is the ribbon 54 inches long?
- Does the diagram show that the ribbon was cut?
- Do the numbers represent inches or centimeters?

Activity 1

Saree Silk Ribbon Necklaces

Standards Alignments

Addressing 2.MD.B.5, 2.NBT.B.5

The purpose of this activity is for students to solve Take From problems and make sense of tape diagrams that represent this problem type. Students use the diagram to make sense of the context and help guide their calculations as they solve the problem (MP2).

Access for Students with Disabilities

Representation: Access for Perception. Use a strip of colored paper to demonstrate the length of the saree, as well as the tape diagram. Demonstrate “cutting off” part of the ribbon and label the parts to represent the story. Reiterate the context and connect to the idea of subtraction. Supports accessibility for: Conceptual Processing, Organization, Memory

Materials to Gather

Base-ten blocks

Student-facing Task Statement

Launch

- Groups of 2
- Give students access to base-ten blocks.
- Display the image.
- “What do you notice? What do you wonder?”
Priya had a ribbon that was 44 inches long. She cut off 18 inches. How long is Priya’s ribbon now?

Andre drew this diagram to help him think about the problem.

![Diagram](image)

1. What does the “?” represent in the story?
2. Why do you think there is a dotted line between the parts?
3. Find the unknown value. Show your thinking.
4. Priya’s ribbon is ____________ long.

**Student Responses**

1. The “?” represents the ribbon Priya has left.
2. The dotted line shows where the ribbon was cut. The part to the right is how much was cut from the end—18 inches.
3. 26 inches. Sample responses:
   - $44 - 18 = ?$, $44 - 10 = 34$, $34 - 4 = 30$, $30 - 4 = 26$
   - Students draw a base-ten diagram to show 3 tens and 14 ones. Students cross out 1 ten and 8 ones and label

**Activity**

- “Priya and her friends are planning to make saree silk ribbon necklaces. They want to make sure they get their measurements correct.”
- “Read the problem. Then look at Andre’s diagram and discuss the first two questions with a partner.”
- 1 minute: independent work time
- 3–4 minutes partner discussion
- “Work independently to find the unknown value and compare your answer with your partner. Don’t forget to include the units.”
- 4–5 minutes: independent work time
- 2 minutes: partner discussion

**Synthesis**

- “How did the tape diagram help you think about what you needed to do to find the unknown value?” (The diagram shows that 18 was being taken away, so I decided to subtract 18 from 44.)
to show they know the difference is 26.

4. Priya's ribbon is 26 inches long.

**Advancing Student Thinking**

If students add the known values instead of subtract, consider asking:
- “What is happening in this story?”
- “Should your answer be a length that is longer or shorter than 44 inches?”

---

**Activity 2**

**Saree Silk Ribbon Projects**

**Standards Alignments**

Addressing 2.MD.B.5, 2.NBT.B.5

The purpose of this activity is for students to solve Take From problems within 100 with the unknown in all positions. Students label tape diagrams and use them to make sense of the story problems before solving them (MP2). In Difference Unknown and Change Unknown problems, students may not be able to anticipate whether the unknown length will be longer or shorter than the length of the part they know. It is okay if they do not accurately label the smaller part of the tape diagram with the smaller length as long as they are accurately making sense of the problem.

Students are encouraged to use the Three Reads routine as a strategy for making sense of and persevering in solving problems (MP1).

**Access for English Learners**

MLR8 Discussion Supports. Synthesis: Provide students with the opportunity to rehearse what they will say with a partner before they share with the whole class.

Advances: Speaking

**Materials to Gather**

Base-ten blocks
Student-facing Task Statement

Label the diagram. Find the unknown value. Show your thinking and don't forget the units.

1. Elena started with 58 inches of ribbon. She gave Clare 27 inches of ribbon. How much ribbon did Elena keep for herself?

2. Han had a piece of ribbon that was 64 inches long. He cut off 28 inches to make a necklace for his sister. How much ribbon is left?

3. Priya cut off 25 inches of ribbon. She has 38 inches of ribbon left. How much ribbon did Priya start with?

Launch

- Groups of 2
- Give each group access to base-ten blocks.
- “The kids in Priya's class are all making saree silk ribbon necklaces, so they are cutting ribbons to share with each other.”

Activity

- “With your partner, you are going to read each story 3 times. First, read to understand what is happening in the story. Second, read to understand the math. Think about what is known and unknown. And third, read to make a plan by completing the diagram.”
- “Work together to label each diagram, and then find the unknown values on your own using any strategy that makes sense to you.”
- “After each problem, compare with your partner to see if you agree.”
- 10 minutes: partner work time
- Monitor for students who recognize they need to add to find the answer for the third problem.

Synthesis

- Invite selected students to share how they solved the last problem.
- “What was different about the last problem?” (Even though it was about cutting ribbon, I found the answer by adding.)

Student Responses

Sample responses:
1. \(58 - 27 = 31\). Elena kept 31 inches of ribbon.

2. \(64 - 28 = 36\). Han has 36 inches of ribbon left.

3. \(38 + 25 = 63\). Priya started with 63 inches of ribbon.

**Advancing Student Thinking**

If students subtract to find the solution for the Start Unknown problem, consider asking:

- “How long is the ribbon that Priya has left? Do you think her ribbon should have been longer or shorter than 38 inches before she cut it?”
- “Does your solution show that Priya's ribbon was longer or shorter before she cut it?”
- “How could you find out how long the ribbon was before any length was cut off?”

**Lesson Synthesis**

“Today, you solved story problems about ribbon lengths and used diagrams to help you think about how to find the unknown values.”

“How did the diagram help you decide if you would add or subtract?” (When I saw I knew both parts of the ribbon, but didn't know the total length, it was easy to see that I could add. When I knew the full length of the ribbon and just one of the parts, I knew I could subtract or I could add on to the length I knew. I usually chose to subtract because the stories were mostly about cutting or giving away ribbon.)
Suggested Centers

- Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting)
- Math Stories (K–2), Stage 5: Tape Diagrams (Supporting)

Response to Student Thinking

Students find a difference other than 57 inches.

Next Day Support

- During the warm-up, review the representation used to solve the problem. Consider asking students to identify parts of the problem in the representation.
Lesson 12: Saree Silk Stories: Friendship Bracelets

Standards Alignments
Building On 1.NBT.B.3
Addressing 2.MD.B.5, 2.NBT.B.5

Teacher-facing Learning Goals
- Solve two-step story problems about length within 100.

Student-facing Learning Goals
- Let's solve two-step story problems about length.

Lesson Purpose
The purpose of this lesson is for students to represent and solve one- and two-step story problems. Students use representations to make sense of problems, support their calculations, and explain their thinking.

In previous lessons, students represented and solved one- and two-step story problems in a way that made sense to them. They have used tape diagrams to represent comparisons and part-part-whole relationships.

Since students are familiar with centimeters and inches, the stories in this lesson include both. In the first activity, students hear the story read multiple times and make sense of the story without considering the question or necessary calculations. Then they work independently to solve, representing the story in whatever way is helpful to them. In the second activity, students work with a partner to read and interpret the stories and solve independently.

This lesson has a Student Section Summary.

Access for:

1. Students with Disabilities
   - Representation (Activity 1)

Instructional Routines
MLR6 Three Reads (Activity 1), True or False (Warm-up)
Lesson Timeline

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<tr>
<td>Cool-down</td>
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Teacher Reflection Question

Reflect on how comfortable your students are asking questions of you and of each other. What can you do to encourage students to ask questions?

Cool-down (to be completed at the end of the lesson)

Sharing Saree Silk Ribbon

Standards Alignments

Addressing 2.MD.B.5, 2.NBT.B.5

Student-facing Task Statement

1. Solve. Show your thinking. Use a diagram if it helps.
   a. Elena has 84 inches of ribbon. She gave a piece to Mai. Now Elena has 48 inches of ribbon. How long was the piece Elena gave to Mai?
   b. Mai found another ribbon in the bin that is 18 inches long. If she sews them together, how long will Mai's ribbon be?

Student Responses

1. a. Mai's piece is 36 inches long. $84 - 48 = 36$, $80 - 40 = 40$, $14 - 8 = 6$, $30 + 6 = 36$
b. Now Mai's ribbon is 54 inches long. $36 + 18 = 54$, $36 + 4 = 40$, $40 + 14 = 54$
The purpose of this True or False is to elicit strategies and understandings students have for using place value to compare numbers and determine if an equation is true. When students share how they know an equation is true or false based on looking at the total number of tens or total number of ones on each side, they look for and make use of the base-ten structure of numbers and the properties of operations (MP7).

**Instructional Routines**

**True or False**

**Student-facing Task Statement**

Decide if each statement is true or false. Be prepared to explain your reasoning.

- \(24 = 10 + 14\)
- \(15 + 12 = 27\)
- \(26 = 10 + 6 + 10\)
- \(58 = 20 + 20 + 8\)

**Student Responses**

- True: 24 is 2 tens and 4 ones.
- True: Both sides have 2 tens and 7 ones. They are equivalent.
- True: 26 has 2 tens and 6 ones.
- False: 58 has 5 tens, and \(20 + 20\) is only 4 tens.

**Launch**

- Display one statement.
- “Give me a signal when you know whether the statement is true and can explain how you know.”
- 1 minute: quiet think time.

**Activity**

- Share and record answers and strategy.
- Repeat with each statement.

**Synthesis**

- “How can you explain your answer for the last equation using what you know about tens and ones?” (There are only 4 tens on the right.)
The purpose of this activity is for students to interpret and solve two-step problems involving length. After reading each story problem, students consider what questions could be asked and what information will be needed in the second part of the problem. Students read each story with a partner, and then solve each story problem independently and compare their solutions.

Students begin the activity by looking at the first problem displayed, rather than in their books. Students represent the problem in a way that makes sense to them and share different representations during the synthesis, explaining how these representations helped solve the problem (MP1, MP2, MP3).

This activity uses *MLR6 Three Reads*. Advances: reading, listening, representing

### Access for Students with Disabilities

*Representation: Access for Perception*. Offer strips of colored paper to demonstrate the length of the ribbons, as well as the tape diagrams students create. Encourage students to cut the “ribbon” and label the parts to represent the story. Reiterate the context and connect to the idea of subtraction.

*Supports accessibility for: Conceptual Processing, Organization, Memory*

### Instructional Routines

MLR6 Three Reads

### Student-facing Task Statement

1. Solve. Show your thinking. Use a diagram if it helps. Don’t forget the units.
   
   a. Lin found a piece of ribbon that is 92 cm long. She cut a piece for Noah that is 35 cm. How much ribbon does Lin have left?
   
   b. Then, Lin cut off 28 cm of ribbon for

### Launch

- Groups of 2
- Give each group access to base-ten blocks.
- “The students in Priya’s class are sharing ribbons to make necklaces and bracelets for their friends and family members.”

### MLR6 Three Reads

- Display both parts of the story, but only the problem stems, without revealing the questions.
- “We are going to read this problem 3
Jada. How much ribbon does Lin have left now?

Student Responses

1.

a. Lin has 57 cm of ribbon left. Sample response: $92 - 35 = 57$,
   $92 - 30 = 62, 62 - 5 = 57$

b. Now Lin has 29 cm of ribbon left.
   Sample response: $57 - 28 = 29$,
   $57 - 7 = 50, 50 - 21 = 29$

 times.”

- 1st Read: “Lin found a piece of ribbon that is 92 cm long. She gave Noah a piece that is 35 cm. Then, Lin gave Jada 28 cm of ribbon.”
- “What is this story about?”
- 1 minute: partner discussion
- Listen for and clarify any questions about the context.
- 2nd Read: “Lin found a piece of ribbon that is 92 cm long. She gave Noah a piece that is 35 cm. Then, Lin cut off 28 cm of ribbon for Jada.”
- “Which lengths of ribbon are important to pay attention to in the story?” (length of ribbon Lin started with, length of ribbon given to Noah, length of ribbon given to Jada, length of ribbon Lin has in the end)
- 30 seconds: quiet think time
- 1–2 minutes: partner discussion
- Share and record all quantities.
- Reveal the questions.
- 3rd Read: Read the entire problem, including the questions, aloud.
- “What are different ways we could represent this problem?” (tape diagram, equations)
- 30 seconds: quiet think time
- 1–2 minutes: partner discussion

Activity

- “Read the story again with your partner. Then decide how to represent and solve it on your own.”
- “When you have both answered the questions, compare to see if you agree.”
- 10 minutes: partner work time
- Monitor for students who represent each part of the story with:
Synthesis

- Invite 2–3 previously identified students to display their work side-by-side for all to see.
- “How does each representation help you understand the problem?” (In the diagrams, they used labels to show what each part means. I can see how they used Lin's length of ribbon in both parts. In the equations, I can see the same numbers, but it's a little harder to tell what each part means. I can make sense of them by looking at the other diagrams people made.)

Activity 2

Friendship Bracelets and Gifts

Standards Alignments

Addressing 2.MD.B.5, 2.NBT.B.5

The purpose of this activity is for students to represent and solve two-step story problems. The story problems are presented in parts, and students are encouraged to represent each part in a way that makes sense to them. In the synthesis, students compare different ways they represent and solve the problem.
**Student-facing Task Statement**

1. Solve. Show your thinking. Don’t forget the units. Use a diagram if it helps.
   
   a. Han has 82 inches of ribbon. He only needs 48 inches. How much should he cut off?
   
   b. Han gives the ribbon he doesn’t need to Clare. Clare uses it to make her ribbon longer. Her ribbon was 27 inches. How long is Clare’s ribbon now?

2. Solve. Show your thinking. Don’t forget the units. Use a diagram if it helps.
   
   a. Andre’s ribbon is too short. He has 28 inches of ribbon, but he needs it to be 50 inches long. How much more ribbon does he need?
   
   b. Andre got the ribbon he needed from Mai. Mai now has 49 inches of ribbon left. How much ribbon did Mai start with?

**Student Responses**

1.
   
   a. Han needs to cut off 34 inches of ribbon. Sample response:
   
   \[82 - 48 = 34, \ 82 - 50 = 32, \ 32 + 2 = 34\]
   
   b. Clare’s ribbon is 61 inches long. Sample response:
   
   \[34 + 27 = 61, \ 30 + 20 = 50, \ 4 + 7 = 11, \ 50 + 11 = 61\]

2.
   
   a. Andre needs 22 inches of ribbon.

**Launch**

- Groups of 2
- Give students access to base-ten blocks.

**Activity**

- “Read each problem with your partner and solve it on your own. Show your thinking using diagrams, equations, or words.”
- 5 minutes: independent work time
- 5 minutes: partner discussion
- Monitor for students who use tape diagrams, base-ten diagrams, and equations to represent each part of the last problem.

**Synthesis**

- Invite previously identified students to share their diagrams and equations for each part of the problem.
- “How did _____ represent the problem? How does each representation show the story problem?”
Sample response: $50 - 28 = 22$ or $28 + 2 = 30$, $30 + 20 = 50$

b. Mai started with 71 inches of ribbon.
   Sample response: $22 + 49 = 71$, $49 + 1 = 50$, $50 + 21 = 71$

**Advancing Student Thinking**

Students may represent and solve the first part of each problem accurately, but see the second part as a problem with two unknowns. Consider asking:

- “What new information does the second part of the problem give you? What do you need to figure out? What do you already know?”
- “What happened in the first part of the story? What did you figure out? How could you use that in the second part of the problem?”

**Lesson Synthesis**

“Today you solved different kinds of story problems that had two parts.”

“How did you represent your thinking and keep track of your calculations? How did you keep up with the lengths you knew and what you needed to find out?” (I used diagrams to make sense of the story. I drew base-ten diagrams to help me solve. I put a circle around my answer so I could use it for the next problem.)

“What ideas for solving story problems have you learned from others?”

Share and record responses.

**Suggested Centers**

- Capture Squares (1–3), Stage 4: Subtract within 20 (Supporting)
- Math Stories (K–2), Stage 5: Tape Diagrams (Supporting)

**Student Section Summary**

In this section of the unit, we learned more about standard length units. We measured using inches and feet—two length units from the U.S. customary system. We also solved two-step story
problems about length and interpreted diagrams that represent taking a part away. This diagram shows that we know the length of the ribbon and how much was cut. The question mark represents the length of ribbon that is left.

Han had a piece of ribbon that was 64 inches long. He cut off 28 inches to make a necklace for his sister. How much ribbon is left?

Response to Student Thinking

Students need to keep track of what is happening in the story.

The work of this lesson builds on the work from previous units on adding and subtracting within 100.

Next Day Support

- Give students access to pre-made tape diagrams.

Prior Unit Support

Grade 1, Unit 2, Section D: All Kinds of Story Problems
Lesson 13: Center Day 2 (Optional)

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3, 2.MD.A.4, 2.NBT.B.5, 2.OA.B.2

Teacher-facing Learning Goals
- Determine the unknown number that makes an equation true.
- Estimate and measure objects.

Student-facing Learning Goals
- Let’s complete equations and continue to estimate and measure.

Lesson Purpose
The purpose of this lesson is for students to practice estimating and measuring lengths and adding and subtracting within 100.

This lesson is optional because it is an opportunity for extra practice that not all classes may need. In Activity 1, students learn a new center, Target Measurements. In this center, students practice estimating and measuring length in inches and centimeters. In Activity 2, students can choose to continue working on Target Measurements, or choose between a previously introduced center and a new stage of the Number Puzzles center. In this stage, called Within 100 with Composing, students work with sums and differences within 100 with composing and decomposing a ten.

Instructional Routines
Number Talk (Warm-up)

Materials to Gather
- Materials from previous centers: Activity 2
- Rulers (centimeters): Activity 1
- Rulers (inches): Activity 1
- Straightedges: Activity 1

Materials to Copy
- Target Measurement Stage 1 Recording Sheet (groups of 2): Activity 1
- Number Puzzles Addition Stage 4 Gameboard (groups of 2): Activity 2
- Number Puzzles Digit Cards (groups of 2): Activity 2

Lesson Timeline
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<tbody>
<tr>
<td>Activity 1</td>
<td>15 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question
As students worked in their centers today, whose ideas were heard, valued, and accepted? How can you use what you learned today about
Activity 2  
Lesson Synthesis

your students to inform how you will use centers in the future?

--- Begin Lesson ---

Warm-up  
Number Talk: Use Ten to Add

Standards Alignments

Addressing  2.NBT.B.5

This Number Talk encourages students to use what they know about place value and making a ten to find the value of sums mentally. The strategies elicited here will be helpful later in the lesson when students add two-digit numbers within 100. When students share how they look for ways to add by place and decompose addends to make a ten, they look for and make use of the base-ten structure of numbers and the properties of operations (MP7).

Instructional Routines

Number Talk

Student-facing Task Statement

Find the value of each expression mentally.

- 58 + 10
- 58 + 12
- 58 + 13
- 67 + 14

Student Responses

- 68: I just added 1 more ten.
- 70: 58 + 10 = 68 and 2 more is 70

Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.
71: 58 + 10 = 68 and 2 more is 70 and 1 more is 71
81: 67 + 10 = 77, 77 + 3 = 80, 80 + 1 = 81

**Synthesis**
- “How can you make a ten to find the value of 67 + 14?” (67 needs 3 more to make 10. That 3 can come from the 4 ones in 14.)

---

**Activity 1**
Introduce Target Measurements, Inches and Centimeters

**Standards Alignments**
Addressing 2.MD.A.1, 2.MD.A.3, 2.MD.A.4

The purpose of this activity is for students to learn the first stage of a new center activity, Target Measurements. In this stage, students try to draw a line segment as close as possible to the length of the target measurement in whole inches or centimeters.

**Materials to Gather**
Rulers (centimeters), Rulers (inches), Straightedges

**Materials to Copy**
Target Measurement Stage 1 Recording Sheet (groups of 2)

**Launch**
- Groups of 2
- Give each group a recording sheet and access to centimeter and inch rulers.
- “We are going to learn how to play a new center activity called Target Measurements.”
- “In this center, you and your partner work together to draw a line that is as close as possible to a target length.”
- “When it’s your turn to draw, choose a length in inches or centimeters. If you choose inches, you cannot choose a length longer than 10 inches. If you choose centimeters, you cannot choose a length longer than 30 centimeters.”
- Demonstrate choosing a length.
• “If you are not drawing, your job is to watch the line and tell your partner to stop when you think the line they are drawing is the same length as the target measurement.”

• Select a student volunteer, or ask the class to be your partner. Demonstrate drawing a line segment using a straightedge.

• “Then both of you will measure the length of the line and find the difference between the actual length and the target length. The value of the difference is the score for the partner who said ‘stop.’”

• Demonstrate measuring the line and recording the target length, actual length, and difference in the place for Partner B on the recording sheet.

• “Take turns drawing. After 8 rounds, add up your scores. The partner with the lowest score is the winner.”

**Activity**

• 10 minutes: partner work time

• Monitor for students who attempt longer lengths and come close to their target measurement.

**Synthesis**

• “Did anyone draw a line segment that was the same length as your target length? If not, how close did you get?”

• “What was your strategy when working with your partner to draw line segments that were as close as possible to your target length?”

**Activity 2**

Centers: Introduce Number Puzzles, Within 100 with Composing
Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3, 2.MD.A.4, 2.NBT.B.5, 2.OA.B.2

The purpose of this activity is for students to learn stage 4 of the Number Puzzles center. Students use digit cards to make addition and subtraction equations true. They work with sums and differences within 100 with composing and decomposing.

After they participate in the center, students can choose to continue to play Number Puzzles or choose one of the estimation and measurement centers.

- Estimate and Measure
- Target Measurements

Materials to Gather

Materials from previous centers

Materials to Copy

Number Puzzles Addition Stage 4 Gameboard (groups of 2), Number Puzzles Digit Cards (groups of 2)

Required Preparation

Gather materials from:
- Number Puzzles, Stages 4
- Estimate and Measure, Stage 2
- Target Measurements, Stage 1

Student-facing Task Statement

Choose a center.

Number Puzzles

14 = 8 + [ ]

Estimate and Measure

Launch

- Groups of 2
- Give each group a set of digit cards and a gameboard.
- “Now we are going to learn a new way to play the Number Puzzles center.”
- “In this stage, you use your digit cards to make each equation true. You may need to think about composing or decomposing a ten.”
Activity

- 10 minutes: partner work time
- “Now you can choose another center. You can also continue playing Number Puzzles.”
- 10 minutes: center work time

Synthesis

- “What did you like about the activities you worked on today?”

Lesson Synthesis

“Today we used digit cards to complete equations with missing numbers. Tell your partner something that helped you figure out how to complete the equation.”
Section C: Line Plots

Lesson 14: What is a Line Plot?

Standards Alignments
Addressing 2.MD.A.1, 2.MD.D.9
Building Towards 2.MD.D.9

Teacher-facing Learning Goals
- Interpret a line plot.
- Understand that a line plot is used to represent and interpret numerical data.

Student-facing Learning Goals
- Let's learn a new way to represent data.

Lesson Purpose
The purpose of this lesson is for students to learn about the ways a line plot can be used to represent data collected from measuring objects.

In a previous unit, students created and interpreted two representations of categorical data, bar graphs and picture graphs. In a previous lesson, students measured length using metric and customary units.

In this lesson, a line plot is defined as a way to show how many of each measurement using an x for each measurement. Students collect numerical data by measuring their hand spans and create a class line plot to display their measurements. Through the lesson activities, students learn that each x on the line plot represents one measurement. They learn that the scale of the line plot shows the length units used to measure and resembles the way length units are labeled on a ruler. Students notice that the length units on the scale of the line plot are not exactly the same length as the length units used to measure (inches), but that labels can help others know what length unit was used (MP2, MP6). Students will gain experience working with line plots throughout the rest of the section. Save the class line plot you create for reference in future lessons.

Access for:

🧓 Students with Disabilities
- Engagement (Activity 1)

🌐 English Learners
- MLR8 (Activity 2)
Instructional Routines

Notice and Wonder (Warm-up)

Materials to Gather

- Rulers (inches): Activity 1
- Sticky notes: Activity 1

Lesson Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>20 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>15 min</td>
</tr>
<tr>
<td>Lesson Synthesis</td>
<td>10 min</td>
</tr>
<tr>
<td>Cool-down</td>
<td>5 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question

In a future lesson, students will create their own line plots. What do students need to understand in order to be successful? How did this lesson prepare them to create their own line plots?

Cool-down (to be completed at the end of the lesson)  

Hand Spans

Standards Alignments

Addressing 2.MD.A.1, 2.MD.D.9

Student-facing Task Statement

1. Tyler collected data about the lengths of hand spans for students in his class.
   - Three students have a hand span of 6 inches.
   - Only 1 student has a hand span of 5 inches.
   - Three students have a hand span of 7 inches.
   - Two students have a hand span of 8 inches.
   a. Circle the line plot that could represent Tyler’s class’s hand spans.
b. Explain how you know.

**Student Responses**

1. a. Students circle the second line plot.

   b. Both match the first two statements, but the first line plot has 1 student with a hand span of 8 instead of 2.

---

**Warm-up**

**Notice and Wonder: “Handy” Graphs**

**Standards Alignments**

Building Towards 2.MD.D.9

The purpose of this warm-up is to have students consider a new type of data representation, the line plot. While students may notice and wonder many things about the two data representations, describing the differences between the data represented in a bar graph (categorical) and the data represented in a line plot (numerical) should be the focus. This warm-up will provide a foundation for discussions about the features of a line plot and an understanding of how data is represented in this type of graph.
Instructional Routines

Notice and Wonder

Student-facing Task Statement

What do you notice? What do you wonder?

Launch

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

Synthesis

- “What are these two graphs about? How do you know?” (One graph is about the size of gloves. The other graph is about hand spans. I can tell from the title and labels on the graphs.)
- As needed, clarify the meaning of hand span.
- “Today we are going to learn a new way to display data that is collected by measuring the lengths of objects. You are going to get a chance to measure your own hand spans and create a class data display.”

Student Responses

Students may notice:
- I notice the bar graph only has 3 bars.
- I notice the second one is like a picture graph.
- I notice they are about gloves and hand spans.
- I notice there are 14 Xs.
I notice the numbers are inches.

Students may wonder:

- Is the second graph a picture graph?
- What are all the Xs for?
- Why are the numbers at the bottom of the graph?

---

**Activity 1**

**Measure Our Hand Spans**

**Standards Alignments**

**Addressing** 2.MD.A.1

The purpose of this activity is for students to generate numerical data by measuring their hand spans in inches. Students trace their hands and measure their hand spans (the length from the tip of the pinky to the tip of the thumb). The student-generated data is used to demonstrate creating a line plot, as they work collectively to represent their hand spans measured in inches. Students add a representation of the length of their hand spans by drawing an x on a sticky note and adding it to the line plot. They make sense of the way the line plot represents a number of measurements and the size of each measurement (MP2). The class line plot will be used in the next activity to discuss the purpose and features of a line plot.

**Access for Students with Disabilities**

*Engagement: Provide Access by Recruiting Interest.* Provide choice and autonomy. Provide access to colored pencils, markers, colored paper, etc. for students.

*Supports accessibility for: Attention*

**Materials to Gather**

Rulers (inches), Sticky notes

**Required Preparation**

- Create a blank line plot with a scale from 0 to 10 for students to place their measurements on.
- Ensure the tick marks are equally spaced with enough room for students to place their sticky notes.
Student-facing Task Statement

1. Trace your hand. (Spread your fingers wide.)
2. Draw a line from your thumb to your pinky. This line represents your hand span. Measure the length of your hand span in inches.

My hand span is _________ inches.

Launch

- Groups of 2
- Give students 12-inch rulers.

Activity

- “We are going to continue measuring in inches. Each of you will measure your hand span.”
- Display the image of the traced hand.
- “You are going to measure your hand span, which is the length from your pinky to your thumb. First, you’ll trace your hand and then measure it to the nearest inch.”
- “After measuring your own hand span, check your partner’s measurements.”
- 6 minutes: partner work time
- “Now, we are going to make a representation to show everyone’s hand span measurements.”
- Give each student a sticky note that is the same size.
- “Now we need to represent the data we have collected. Draw a big x on your sticky note.”
- As needed, demonstrate drawing an x on a sticky note.
- Display the blank line plot.
- “If we want this display to show others the lengths of all our measurements, where do you think the length of your hand span should go?”
- 30 seconds: quiet think time
- 1 minute: partner discussion
- Invite students to come up to add their sticky notes to the chart above the corresponding measurement.
- Consider asking students to explain how they place their sticky notes.

Student Responses

Answers vary.
Synthesis

- “We just made a line plot. A line plot is a way to show how many of each measurement using an x for each measurement. The line and the numbers on it represent the units you used to measure. The line should look like the numbers on the tool you use to measure.”
- “What does each x on the line plot represent?” (Each x represents a measurement of a student hand span.)
- “What does the total number of Xs represent?” (Everybody’s measurement. It’s the same number as the number of people in our class today.)
- As needed, “The total number of Xs represents the total number of measurements. They don’t have to each be done by different people.”
- “How many measurements did we collect for our line plot? Explain how you see the data.”
- 1 minute: quiet think time
- 1 minute: partner discussion
- Share responses.

Activity 2

Interpret Our Numerical Data

Standards Alignments

Addressing 2.MD.D.9

The purpose of this activity is for students to interpret data represented in a line plot. They engage in a discussion about what they notice and how a line plot can be used to interpret data.
After highlighting the features of a line plot, students answer questions about the lengths of students’ hand spans. In the synthesis, the importance of making Xs the same size in order to accurately reflect our data is stressed (MP6), as students will create their own line plots in later lessons.

Access for English Learners

MLR8 Discussion Supports. Synthesis: Some students may benefit from the opportunity to rehearse what they will say with a partner before they share with the whole class.

Student-facing Task Statement

1. What was the longest hand span?
2. What was the shortest hand span?
3. Write another statement about our class’ hand spans based on the line plot.

Student Responses

These responses will vary based on the data collected from the class.

Launch

- Display the class line plot.
- “We just represented the data we collected, but if someone else looks at it, it is not clear what this line plot is about.”
- “We know graphs need a title. What could be a good title for this data?” (Class hand spans)
- 1 minute: quiet think time
- Share responses and record a title.
- “When we made picture graphs and bar graphs we labeled the categories so others would know what each group of pictures or each bar represented.”
- “What do the numbers on our line plot represent? What does the way the numbers are arranged remind you of?” (The numbers represent lengths in inches. It reminds of a ruler. It has tick marks and each tick mark is the same length apart.)
- “The line on a line plot represents the unit you use to measure. It shows numbers in order and the same length apart, just like on a ruler.”
- “What length unit do the numbers on our line plot represent? How could we label this?” (The lengths of our hand spans in inches. “measurement in inches”)
1 minute: quiet think time

Share responses and record a label.

“The length of the line between two numbers do not have to match the unit you used, so it’s important to label the line on the line plot with the unit.”

Activity

“We have used graphs to answer questions. Now, you will use this line plot to answer questions based on our class data representing hand spans. Think about what the Xs represent as you answer each question. Make sure you record the unit in your answers.”

3–4 minutes: independent work time

Synthesis

Invite students to share the longest and shortest hand span and how they used the line plot.

Invite 3–4 students to share the statements they wrote about the data.

Consider asking:

- “Which hand span length was most common?” (The measurement that has the most Xs represents the length that was most common in our class. This is different from having the most votes. ____ inches was the most common measurement.)

- “What is a measurement that no one in our class had for their hand span?” (Any number with no Xs.)

Advancing Student Thinking

If students count the number of Xs to determine the longest hand span, consider asking:
“Where do you see the lengths of hand spans in the line plot?”
“What does the number of Xs above a number tell us?”

**Lesson Synthesis**

“Today we learned a new way to display data—a line plot.”

Display the images from the warm up.

“How do you see the lengths of hand spans in the line plot?”
“How does the number of Xs above a number tell us?”

“What is the same and different about the bar graphs and line plots?”

“What do the numbers tell us in each graph?”
Sample Responses:

Same:

• Both are graphs and have numbers.
• Both give us information (data).
• The numbers go by ones.
• The bars or the Xs go up in the graphs.

Different:

• One graph is about glove sizes and the other is about hand span.
• One has bars and the other has Xs.
• The bar graph has 3 bars.
• There are Xs in five different numbers on the number line.
• In the bar graph, numbers are on the side. In the line plot, the numbers are on the bottom.

The numbers in the Glove Size graph tell us how many people have each of the glove sizes.

The numbers in the hand span line plot tell us the length in inches of people's hand spans.

Suggested Centers

• Number Puzzles: Addition and Subtraction (1–4), Stage 4: Within 100 with Composing (Addressing)
• Target Measurements (2–5), Stage 1: Inches and Centimeters (Addressing)

Response to Student Thinking

Students circle a line plot, but do not explain their reasoning in writing.

Next Day Support

• Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.
Lesson 15: Create Line Plots

Standards Alignments
Addressing 2.MD.A.1, 2.MD.D.9, 2.NBT.B.5

Teacher-facing Learning Goals
- Represent numerical data in a line plot.

Student-facing Learning Goals
- Let’s represent data in line plots.

Lesson Purpose
The purpose of this lesson is for students to create line plots to represent numerical data.

In an earlier lesson, students learned about the features of a line plot. They interpreted a line plot that represented data from measurements they made in inches.

In this lesson, students measure the lengths of pencils in centimeters and represent the data on their own in a line plot. In Activity 2, students make sense of line plots that do not start at 0. They choose an appropriate starting and ending number based on the data (MP6). In the lesson synthesis, students interpret the data presented in a line plot with a scale that does not start at 0.

Access for:

车内 Students with Disabilities
- Action and Expression (Activity 1)

Instructional Routines
MLR8 Discussion Supports (Activity 2), Number Talk (Warm-up)

Materials to Gather
- Objects of various lengths: Activity 1
- Rulers (centimeters): Activity 1

Materials to Copy
- Line Plot Template (groups of 1): Activity 1

Lesson Timeline
<table>
<thead>
<tr>
<th>Warm-up</th>
<th>10 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity 1</td>
<td>15 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question
What did you say, do, or ask to support students in creating a line plot based on an understanding of the representation, rather than following a procedure?
Cool-down (to be completed at the end of the lesson)  

Hand Spans of Mai’s Group

Standards Alignments
Addressing 2.MD.D.9

Student-facing Task Statement

1. Mai made these statements about the lengths of hand spans for students in her group.
   - Four students have a hand span of 18 cm.
   - Two students have a hand span of 16 cm.
   - Two students have a hand span of 19 cm.
   - One student has a hand span of 20 cm.

   Complete the line plot so it matches Mai’s data.

Hand Spans of Mai’s Group

   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
   |---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|
   | \(\times\) | \(\times\) | \(\times\) | \(\times\) | \(\times\) |

length (centimeters)

Student Responses

1.
Hand Spans of Mai’s Group

length (centimeters)

Warm-up

Number Talk: Subtraction within 50

Standards Alignments

Addressing 2.NBT.B.5

The purpose of this Number Talk is to activate students’ previous experiences with subtracting multiples of ten and subtracting by place. In previous lessons, students found the value of differences within 100 using base-ten blocks, tape diagrams, drawings, or equations. The ability look for ways to make use of the base-ten structure of numbers in expressions to find their values helps students build fluency (MP7).

Instructional Routines

Number Talk

Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

Student-facing Task Statement

Find the value of each expression mentally.

- 47 − 20
- 47 − 24
- 36 − 10
- 36 − 15
**Student Responses**
- 27: I counted back by ten.
- 23: I knew \(47 - 20 = 27\), so I took away 4 more.
- 26: I just subtracted 1 ten from 3 tens. The ones didn’t change.
- 21: I knew \(30 - 10 = 20\), then \(6 - 5 = 1\).

**Activity**
- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

**Synthesis**
- “How did the first expression help you find the value of the second expression?” (I already knew that \(47 - 20 = 27\), so I just took away 4 more.)
- Consider asking:
  - “Did anyone approach the problem in a different way?”
  - “Does anyone want to add on to ____’s strategy?”

---

**Activity 1**

**Measure and Plot Pencil Lengths**

**Standards Alignments**

**Addressing** 2.MD.A.1, 2.MD.D.9

The purpose of this activity is for students to generate measurement data and represent the data in a line plot. Students measure pencils in centimeters, check the accuracy of their measurements, and use a template to represent their data in a line plot. In the synthesis, students revisit the importance of labels on the line plot and also discuss the importance of keeping the Xs the same size and in rows to help make it easier to read the data (MP6).

Pencils are suggested for this activity because the measurements collected are likely to vary. Pencils could be substituted with other classroom items (for example, pipe cleaners, straws, or the sides of books) that might generate interesting measurement data for classroom discussion.

**Access for Students with Disabilities**

*Action and Expression: Develop Expression and Communication.* Give students access to grid paper to keep data organized and neat.

Supports accessibility for: Organization, Visual-Spatial Processing
Materials to Gather

Objects of various lengths, Rulers (centimeters)

Required Preparation

- Collect 10–12 pencils of varying lengths for each group of 4.

Student-facing Task Statement

1. Measure the pencils in centimeters. Work with a partner and check each other’s measurements. Record each measurement in the table.

<table>
<thead>
<tr>
<th>pencil length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>15</td>
</tr>
</tbody>
</table>

2. Create a line plot to represent the lengths of all the pencils in your group.

Student Responses

1. Sample response:

<table>
<thead>
<tr>
<th>pencil length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
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<td>13</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>15</td>
</tr>
</tbody>
</table>

Materials to Copy

Line Plot Template (groups of 1)

Launch

- Groups of 4
- Give each group a set of 10–12 pencils of various lengths.
- Give each student a centimeter ruler.

Activity

- “Today, you are going to collect measurement data and create a line plot. Your first job is to measure the length in centimeters of each of the pencils in your group. Two different people should measure each pencil to make sure your measurements are accurate.”
- 10 minutes: small-group work time
- “Now, use the data you collected to create a line plot. Try to make your Xs the same size.”
- 5 minutes: independent work time
- Monitor for students who write a title and labels on their line plot.

Synthesis

- Share the line plot of a student who wrote a title and labels.
- “Do we know what data _____’s line plot is representing? How do we know?”
- Share a line plot that uses same-size Xs arranged in rows.
- “What do you notice about the Xs in _____’s
2. Sample response:

```
Pencil Lengths

<table>
<thead>
<tr>
<th>Pencil length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>
```

- Why is it important to keep the Xs the same size and in rows? It can make it look like some measurements have more because the tower looks taller.

- As needed, draw or display an example of a line plot where the Xs are not in rows (for example, draw different-size Xs and/or draw with a different amount of space above and below each X).

---

**Activity 2**

Plot Pencil Lengths

**Standards Alignments**

Addressing 2.MD.D.9

The purpose of this activity is for students to represent measurement data in a line plot with a scale that does not start at 0. In the launch, students compare line plots that show the same data, but have line plots that start and end with different numbers. They learn that line plots do not have to start with 0, but that the numbers still represent lengths from 0, just like their work with torn tape measures in previous lessons.

When students represent measurement data in their own line plot, they use a template that does not have enough tick marks for students to start at 0 and represent each length in the data table. This encourages students to consider ways to label their line plot without starting at 0. Students may choose to use the least or greatest lengths to decide how to start or end their number line, but they do not need to. The synthesis discussion will focus on strategies they used to determine how to label, including how they used what they know about a ruler.

This activity uses *MLR8 Discussion Supports. Advances: Speaking*

**Instructional Routines**

MLR8 Discussion Supports
Use this data to create a line plot.

<table>
<thead>
<tr>
<th>Group C</th>
<th>pencil length (centimeters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andre</td>
<td>12</td>
</tr>
<tr>
<td>Clare</td>
<td>10</td>
</tr>
<tr>
<td>Diego</td>
<td>10</td>
</tr>
<tr>
<td>Elena</td>
<td>10</td>
</tr>
<tr>
<td>Han</td>
<td>13</td>
</tr>
<tr>
<td>Jada</td>
<td>12</td>
</tr>
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<td>Kiran</td>
<td>14</td>
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<tr>
<td>Noah</td>
<td>16</td>
</tr>
<tr>
<td>Priya</td>
<td>14</td>
</tr>
<tr>
<td>Tyler</td>
<td>13</td>
</tr>
</tbody>
</table>

**Student Responses**

<table>
<thead>
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<th>Group C's Pencils</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
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<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
</tbody>
</table>

**Launch**

- Groups of 2
- Display the image (2 line plots).
- “What is the same about these line plots? What is different?”
- 1 minute: quiet think time
- 2 minutes: partner discussion
- Monitor for a student who notices that the line plot for Group B doesn’t start at 0, but there are the same number of Xs.
- Share responses.
- “When we make a line plot, we can choose the number to start with, based on the data we have. Once we pick a starting number, we need to make sure we don’t skip any numbers, even if there’s no data there.”

**Activity**

- “You are going to create a line plot to represent some data given in a table. Think about how you want to label the marks with numbers. Be sure to include labels, and try to make your Xs the same size.”
- 10 minutes: independent work time

**MLR8 Discussion Supports**

- “Compare your line plot with your partner.”
- Display and review the following sentence frames to support partner discussion:
  - “_____ and _____ line plots are the same/alike because . . . .”
  - “_____ and _____ line plots are different because . . . .”
- 2 minutes: partner discussion
- Monitor for students who used two different start and end numbers.
Synthesis

- Show two line plots that use different start and end numbers.
- Consider asking each student:
  - “How did you decide which number to start with?”
  - “How did you use what you know about rulers to label your line plot and place each x?”
- “How are these line plots like a torn tape measure?” (They are missing 0 and some other numbers, but they still show numbers in order. There's still the same length between each number.)

Advancing Student Thinking

If students label their line plot using only the measurements in the table (for example, they only label 10, 12, 13, 14, 16 without labeling the numbers in between), ask students to look at the line plots from the launch. Consider asking:
- “How is a line plot like a ruler?”
- “How did you decide how to label the numbers on your line plot? How could you revise your line plot so that it represents lengths like a ruler?”

Lesson Synthesis

Display a completed student line plot from the second activity that starts with a number other than 0 or display:

Group C’s Pencils

```
10 11 12 13 14 15 16 17 18 19 20

|  |  | x |  | x |  | x |  | x |
```

“What did you learn about the lengths of the pencils based on the line plot?”
Share and record responses.

“Diego said that the most pencils were 10 cm long. Kiran said the longest pencil was 16 cm. Are they both correct?”

Consider asking:

- “How does the line plot help you see which lengths were measured more or less than others?”
- “How does the line plot help you see which lengths were shortest or longest?”

“How can I find out how many pencils were measured based on this line plot?” (If you count all of the Xs, that tells you how many pencils were measured.)

Suggested Centers

- Number Puzzles: Addition and Subtraction (1–4), Stage 4: Within 100 with Composing (Addressing)
- Target Measurements (2–5), Stage 1: Inches and Centimeters (Addressing)

Response to Student Thinking

Students represent the data with Xs, but some of the data points are missing or misrepresented.

Next Day Support

- Before the warm-up, have students compare their line plots from the previous activity. Discuss strategies for keeping track of the data and representing it in the line plot.
Lesson 16: Interpret Measurement Data

Standards Alignments
Addressing 2.MD.D.9, 2.NBT.B.5

Teacher-facing Learning Goals
- Interpret data presented in a line plot.
- Represent numerical data in a line plot using an appropriate scale.

Student-facing Learning Goals
- Let’s represent and make sense of data in line plots.

Lesson Purpose
The purpose of this lesson is for students to create and interpret a line plot.

The purpose of this lesson is for students to continue to consider what numbers to use to label the tick marks as they create line plots. Students will use data presented in a table to determine the longest and shortest length and then create a line plot and interpret the data to answer questions. When working with measurements with larger numbers, students learn to set up their number line to start with the shortest length. Students also answer questions that require calculations. This lesson has a Student Section Summary.

Access for:

Students with Disabilities
- Representation (Activity 1)

English Learners
- MLR8 (Activity 2)

Instructional Routines
Number Talk (Warm-up)

Materials to Copy
- Line Plot Template (groups of 1): Activity 1

Lesson Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>20 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question
In another unit, students are introduced to the number line. They learn how to represent numbers and equations on the number line.
Cool-down (to be completed at the end of the lesson)

Diego’s Art Project

Standards Alignments
Addressing 2.MD.D.9

Student-facing Task Statement
Diego collected sticks for an art project and measured them. His data is shown in this line plot.

Diego’s Sticks

![Line plot showing Diego's sticks]

Answer the questions based on Diego's line plot.

1. How many sticks collected were 22 cm?
2. How many sticks did Diego collect?
3. How long was the longest stick?
4. How many sticks were 21 cm?

Student Responses
1. 3 sticks were 22 cm long.
2. Diego collected 10 sticks.
3. 28 cm
4. 0. There are no Xs at 21, so none of the sticks measured 21 cm.
Warm-up
Number Talk: Addition within 50

Standards Alignments
Addressing 2.NBT.B.5

The purpose of this Number Talk is to activate students’ previous experiences with addition methods involving composing a ten. In previous lessons, students used their knowledge of making a ten to find sums within 20 and used methods based on place value to compose a ten when adding within 100. This string is designed to encourage these methods.

Instructional Routines
Number Talk

Student-facing Task Statement
Find the value of each expression mentally.
- 15 + 5 + 1
- 25 + 6
- 16 + 7
- 37 + 6

Student Responses
- 21: 15 + 5 = 20 plus 1 more is 21.
- 31: 25 + 5 = 30 plus 1 more is 31.
- 23: I took 4 from the 7 to make 20, and there were 3 left, so I knew it was 23.
- 43: I know 7 + 6 = 13, so its 30 + 13 = 43.

Launch
- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

Activity
- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

Synthesis
- "How do you think the third expression could help with finding the value of the fourth one?" (In the ones place there was a 6 and 7, so I knew that 6 + 4 = 10 and there were 3 left over. In the fourth expression the ones were switched, but it was still 10 with 3 left over.)
Activity 1

The Plant Project

Standards Alignments
Addressing 2.MD.D.9

The purpose of this activity is for students to create a line plot from data presented in a table. The table includes data with longer lengths and a greater difference between the shortest and longest lengths than the data used in previous lessons. Students make decisions about how to label the number line using what they have learned about the structure of line plots and how to represent and label measurement data. The synthesis discussion focuses on sharing and comparing the strategies students used to create their line plots, focusing on how they chose which numbers to use on their line plots (MP3).

Access for Students with Disabilities

Representation: Internalize Comprehension. Activate or supply background knowledge. Provide either a blank line plot on grid paper or a copy of a previously created line plot for students to use as a reference. The components of the line plot can be reviewed once again before getting to work. Supports accessibility for: Organization, Memory

Materials to Copy
Line Plot Template (groups of 1)

Student-facing Task Statement

Use the data in this table to create a line plot.

<table>
<thead>
<tr>
<th>Group B</th>
<th>plant heights (centimeters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andre</td>
<td>33</td>
</tr>
<tr>
<td>Clare</td>
<td>25</td>
</tr>
<tr>
<td>Diego</td>
<td>27</td>
</tr>
<tr>
<td>Elena</td>
<td>25</td>
</tr>
<tr>
<td>Han</td>
<td>35</td>
</tr>
<tr>
<td>Jada</td>
<td>33</td>
</tr>
<tr>
<td>Kiran</td>
<td>26</td>
</tr>
</tbody>
</table>

Launch

- Groups of 2
- Give each student the Line Plot Template.
- Display the table showing plant heights.
- “Second grade students were growing plants in science class. They each measured the height of their plants. Height tells us the length of the plant from the soil to the top of the stem.”
- “Here is how they represented their data.”
Grade 2

Activity

- “Your job is to create a line plot to represent this data. Think about how you want to label the tick marks with numbers. Be sure to include a title, label your units of measure, and think about how you are drawing your Xs so others can easily read your data.”
- 8 minutes: independent work time
- “Compare your line plot with your partner’s.”
- 2 minutes: partner discussion
- Monitor for students with clear and accurate line plots.

Synthesis

- Invite 2–3 students to display their line plots.
- Consider asking each student:
  - “How did you decide which numbers to start and end your line plot with?” (I looked at the table to find the shortest and longest lengths.)
  - “How are these line plots the same? How are they different?”
  - “What can you say about the height of their plants by looking at the line plot?” (There are 3 Xs over 33, so those plants all measured 33 cm. Only 1 plant was 27 cm.)
  - “How many students had a plant that measured more than 30 cm?” (4 because 3 had 33 and 1 had 35.)

### Group B

<table>
<thead>
<tr>
<th>Student</th>
<th>Plant Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noah</td>
<td>30</td>
</tr>
<tr>
<td>Priya</td>
<td>26</td>
</tr>
<tr>
<td>Tyler</td>
<td>33</td>
</tr>
</tbody>
</table>

### Student Responses

**Group B’s Plants**

![Line plot with Xs at 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 with one X at 33, one X at 27, and two Xs at 30 and 31.]

- 30 seconds: quiet think time
Activity 2

Interpret Measurement Data on a Line Plot

Standards Alignments
Addressing 2.MD.D.9

The purpose of this activity is to interpret measurement data represented by line plots. Students use the line plots they created in the previous activity and another line plot about plant heights to answer questions. In the activity synthesis, students share how they found the difference between two lengths using the line plot and discuss how the structure of the line plot helps to show differences (MP7).

Access for English Learners

MLR8 Discussion Supports. Activity: Display sentence frames to support small group discussion: “I agree because. . . .” and “I disagree because. . . .” Listen for the appropriate use of comparative words such as shortest and tallest.
Advances: Speaking, Conversing

Student-facing Task Statement

The Plant Project

Answer the questions based on your line plot.

1. What was the shortest plant height?
2. What was the tallest plant height?
3. What is the difference between the height of the tallest plant and the shortest plant? Write an equation to show how you know.

Launch
- Groups of 2

Activity
- “Now you are going to use the line plots you have created to answer questions about the measurement data.”
- “You will also answer a few questions based on a line plot created by Han.”
- 8 minutes: independent work time
- Monitor for students who notice they can count the length units on the line plot to find the difference between the tallest and shortest plant.
- “Check your answers with your partner and share what you learned about Han’s line
Answer the questions based on Han’s line plot.

Length (centimeters)

22 23 24 25 26 27 28 29 30 31 32

Plant Height

4. Han looked at this line plot and said that the tallest plant was 29 centimeters. Do you agree with him? Why or why not?
5. How many plants were measured in all?
6. Write a statement based on Han’s line plot.

Student Responses

1. The shortest plant was 25 cm.
2. The tallest plant was 35 cm.
3. The difference is 10 cm. $35 - 25 = 10$
4. No, I disagree with Han. 29 cm is the most common plant height, but the tallest plant is 32 cm. The tallest plant is 32 because it is the last plant height on the line plot.
5. 20 because there are 20 Xs in all.
6. Answers vary.

Lesson Synthesis

“Today you created line plots to represent measurement data about plant heights, answered questions about the data, and shared statements based on what you learned from the line plots.”

Display Han’s line plot:

3 minutes: partner discussion

Monitor for a variety of student statements about Han’s line plot to share in the lesson synthesis.

Synthesis

- Invite 1–2 students to share how they found the difference between the height of the tallest and shortest plants on their line plot.
- “How does the line plot help you see differences in the measurements that are collected?” (Each tick mark is the same length apart. You can count the distance between each. You can see if there’s a big or small difference between the measurements by how they are spread out.)
Invite previously selected students to share their statements based on Han’s line plot.

If time permits, share additional responses.

**Suggested Centers**
- Number Puzzles: Addition and Subtraction (1–4), Stage 4: Within 100 with Composing (Addressing)
- Target Measurements (2–5), Stage 1: Inches and Centimeters (Addressing)

**Student Section Summary**
In this section of the unit, we learned about a new kind of graph. A **line plot** is a way to show how many of each measurement using an x for each measurement. The line and the numbers on it represent the units used to measure. Line plots for length look like a ruler or parts of a tape measure. We made our own line plots and used them to answer questions about the data represented.

From this line plot, we learn that 4 teachers have a handspan of 8 inches because there are 4 Xs above the 8.
Response to Student Thinking

Students write 22 as the longest stick.

Next Day Support

- Before the warm-up, have students share the things that are helpful when representing and interpreting data in a line plot.
Lesson 17: Center Day 3 (Optional)

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.3, 2.MD.A.4, 2.MD.D.9, 2.NBT.B.5, 2.OA.B.2

Teacher-facing Learning Goals
• Add and subtract within 100.
• Estimate and measure length of objects.

Student-facing Learning Goals
• Let's measure to create line plots and add and subtract within 100.

Lesson Purpose
The purpose of this lesson is for students to practice adding, subtracting, and measuring length to create line plots.

This lesson is optional because it is an opportunity for extra practice that not all classes may need. In Activity 1, students learn stage 1 of the Creating Line Plots center. In this stage, called Inches and Centimeters, students Students measure up to 8 objects to the nearest centimeter or inch. They work with a partner to create a line plot to represent their measurement data. Then, they ask their partner 2 questions that can be answered based on their line plot. In Activity 2, students choose to continue working on Creating Line Plots, or choose between two previously introduced centers focused on estimation and measurement or a center focused on addition and subtraction.

Instructional Routines
Number Talk (Warm-up)

Materials to Gather
• Materials from previous centers: Activity 2
• Objects of various lengths: Activity 1
• Rulers (centimeters): Activity 1
• Rulers (inches): Activity 1

Materials to Copy
• Creating Line Plots Stage 1 Recording Sheet (groups of 1): Activity 1

Lesson Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>10 min</td>
</tr>
<tr>
<td>Activity 1</td>
<td>15 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>20 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question
How have centers helped deepen student understanding of the important mathematical ideas of this unit? Are there centers from this unit that students would continue to benefit from if extended into the next unit?
Lesson Synthesis

10 min

Warm-up

Number Talk: Subtract from a Multiple of 10

Standards Alignments

Addressing 2.NBT.B.5

This Number Talk encourages students to use what they know about place value and decomposing numbers to mentally find the value of each difference. The strategies elicited here will be helpful later in the lesson when students practice subtraction within 100.

Instructional Routines

Number Talk

Student-facing Task Statement

Find the value of each expression mentally.

- 60 – 10
- 60 – 11
- 60 – 21
- 70 – 32

Student Responses

- 50: there were 6 tens and I took one away.
- 49: I took one more away from the first one.
- 39: I took away 2 tens which gave me 40 and then I took away 1 more.
- 38: I took away 30 and then I had 40. I took 2

Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

Synthesis

- Consider asking:
  - “Who can restate _____’s reasoning in a
away and got 38.

different way?"
  ○ “Did anyone have the same strategy but would explain it differently?”
  ○ “Did anyone approach the problem in a different way?”
  ○ “Does anyone want to add on to ____’s strategy?”

---

Activity 1

Introduce Creating Line Plots, Inches and Centimeters

Standards Alignments
Addressing 2.MD.A.1, 2.MD.D.9

The purpose of this activity is for students to learn stage 1 of the Creating Line Plots center. In this stage, students measure up to 8 objects to the nearest centimeter or inch. They work with a partner to create a line plot to represent their measurement data. Then, they ask their partner 2 questions that can be answered based on their line plot.

Materials to Gather

Objects of various lengths, Rulers (centimeters), Rulers (inches)

Materials to Copy

Creating Line Plots Stage 1 Recording Sheet (groups of 1)

Required Preparation

• Gather collections of objects of various lengths. Collections could include pencils, crayons, math tools, or other classroom materials that have varying lengths.

Launch

• Groups of 2
• Give each group rulers and a line plot template.
• “We are going to learn a new center. The Creating Line Plots center.”
“You can measure up to 8 objects to the nearest centimeter or inch. Then work with your partner to create a line plot to represent your data. After that, you take turns asking your partner 2 questions that can be answered based on your line plot.”

**Activity**

- 15 minutes: partner work time
- Monitor for a variety of questions students ask their partners about their line plots.

**Synthesis**

- Display a student created line plot.
- “Work with your partner to come up with a question that can be answered based on this line plot.”
- Invite students to ask the class their question and have the class answer based on the line plot.

---

**Activity 2**

**Centers: Choice Time**

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.A.3, 2.MD.A.4, 2.NBT.B.5, 2.OA.B.2

The purpose of this activity is for students to choose from activities that focus on addition and subtraction within 100 and estimation and measurement. If students choose the Estimate and Measure center as their first choice, they may choose to represent their measurements in a line plot using the Creating a Line Plots center materials as their second choice.

Students choose from any stage of previously introduced centers.
- Estimate and Measure
Materials to Gather

Materials from previous centers

Required Preparation

Gather materials from:
- Estimate and Measure, Stage 2
- Number Puzzles, Stages 2–4
- Target Measurements, Stage 1

Student-facing Task Statement

Choose a center.

Estimate and Measure

Number Puzzles

14 = 8 + □

Target Measurements

Launch

- “Now you will choose from centers we have already learned.”
- Display the center choices in the student book.
- “Think about which activity you would like to do first. If you start with Estimate and Measure now, you can use your measurements in the Creating Line Plots center as your second choice.”
- 30 seconds: quiet think time

Activity

- Invite students to work at the center of their choice.
- 8 minutes: center work time
- “Choose what you would like to do next.”
- 8 minutes: center work time

Synthesis

- “What did you like about the activities you worked on today?”
Lesson Synthesis

“Today we had a chance to work on many different center activities. Tell your partner one thing they did really well during your work together today.”
Lesson 18: Make a Yard Stick (Optional)

Standards Alignments
Building On 2.MD.A.1
Addressing 2.MD.A.1, 2.MD.A.4, 2.MD.B.5, 2.MD.B.6, 2.MD.D.9, 2.OA.B.2

Teacher-facing Learning Goals
- Use addition and subtraction to mark the inch marks on a yardstick.
- Use a yardstick to measure objects and compare measurements.

Student-facing Learning Goals
- Let's make a yardstick.

Lesson Purpose
The purpose of this lesson is for students to apply their understanding of addition, subtraction, and measurement to build their own yardstick.

This lesson is optional because it does not address any new mathematical content standards. This lesson does provide students with an opportunity to apply precursor skills of mathematical modeling.

In previous lessons, students made their own centimeter ruler and used different measuring tools such as rulers, measuring tapes, and yardsticks to measure objects.

In this lesson, students make their own yardstick using only a 3-by-5 inch index card as a tool. They use addition and subtraction to make lengths between 1 and 36 inches and mark them on a 3-foot-long strip of butcher paper. They then use their yardstick to measure a common object, the height of their chairs in inches.

In an optional activity, students use their yardstick to measure the lengths of their hands and forearms. They write equations using the measurements and explain what the equations mean in the context of the situation (MP2).

In these activities, students attend to precision as they mark each inch on their yardstick. When students make their own unit markings, they discover that unequal placement will lead to errors in measurement. The task emphasizes that an inch, or any standard length unit, must be the same size and that there must not be gaps or overlaps between length units. After they create their yardsticks, they compare their yardsticks directly across groups and by measuring the same object. They get a chance to revise their yardsticks based on their observations, an important part of mathematical modeling (MP4, MP6).
Access for:

** Students with Disabilities
- Representation (Activity 1)

** English Learners
- MLR8 (Activity 1)

Instructional Routines

Number Talk (Warm-up)

Materials to Gather

- Chart paper: Activity 1
- Index cards: Activity 1
- Materials from a previous activity: Activity 2
- Sticky notes: Activity 2
- Tape: Activity 1

Lesson Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
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</tr>
<tr>
<td>Activity 1</td>
<td>20 min</td>
</tr>
<tr>
<td>Activity 2</td>
<td>15 min</td>
</tr>
<tr>
<td>Activity 3</td>
<td>15 min</td>
</tr>
<tr>
<td>Lesson Synthesis</td>
<td>10 min</td>
</tr>
</tbody>
</table>

Teacher Reflection Question

In what ways did you see students working together to make sense of problems and persevere in solving them? How were they able to engage in aspects of mathematical modeling as they created their yardsticks and revised their work?

---

Warm-up

Number Talk: Threes and Fives

Standards Alignments

Addressing 2.OA.B.2
The purpose of this Number Talk is to elicit strategies and understandings students have for addition and subtraction with 3 and 5. These understandings help students develop fluency and will be helpful later in this lesson when students will need to be able to create a yardstick with just the numbers 3 and 5.

**Instructional Routines**

Number Talk

**Student-facing Task Statement**

Find the value of each expression mentally.

- $3 + 5$
- $5 - 3$
- $5 - 3 + 5$
- $3 + 5 + 3 + 3$

**Student Responses**

- 8: I just know it.
- 2: I just know it.
- 7: $2 + 5$
- 14: $8 + 3 = 11$ and $11 + 3 = 14$

**Launch**

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

**Activity**

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

**Synthesis**

- “What other numbers can we make with 3 and 5? Think of two other numbers you can make. You can use as many threes and fives as you like and you may subtract and add.”

**Activity 1**

Make a Yardstick

**Standards Alignments**

- Building On: 2.MD.A.1
- Addressing: 2.MD.A.4, 2.MD.B.5, 2.MD.B.6
The purpose of this activity is for students to create and label the tick marks on a yardstick using what they know about length units, comparing length, and adding and subtracting length. They use the sides of a 3-by-5 inch index card to mark off all inch marks from 1 to 36. Students are invited to iterate the different sides of the index card along the paper forward and backwards. They look for ways to use what they know about the structure of a measuring tool, the known lengths of the index card, and what they know about adding and subtracting lengths to mark and label new tick marks (MP1, MP7).

### Access for Students with Disabilities

**Representation: Access for Perception.** Use 1 inch connecting cubes in two different colors to measure in chunks of 5 or 3. For example, use 5 red and 5 white cubes connected together to find where 5 and 10 are on the yardstick. This will also allow students to see each individual inch.  
*Supports accessibility for: Organization, Memory*

### Access for English Learners

**MLR8 Discussion Supports.** Synthesis: At the appropriate time, give groups 2–3 minutes to plan what they will say when they present to the class. “Practice what you will say when you share your strategies for marking inches on the yardstick. Talk about what is important to say, and decide who will share each step.”  
*Advances: Speaking, Conversing, Representing*

### Materials to Gather

- Chart paper, Index cards, Tape

### Required Preparation

- Cut the chart paper into strips. Each group of 2 needs a strip of paper that is at least 36 inches long and about 3 inches wide to make their yardstick.

### Student-facing Task Statement

Your teacher will give you a rectangle. The long side of the rectangle measures 5 inches and the short side measures 3 inches.

Use the card to make a yardstick that shows all inch marks from 1 to 36 inches.

### Student Responses

There are many different solutions. Here is one:

### Launch

- Groups of 2
- Give each group a strip of paper and an index card.
- “What do you know about a yardstick?”
- 30 seconds: partner discussion
- Share responses.
- Display a yardstick and highlight that:
  - a yardstick can be used to measure
• Use the 5 inch side of the index card to mark multiples of 5. (5, 10, 15, 20, 25, 30, 35)
• Use the 3 inch side of the index card to mark multiples of 3 (3, 6, 9, 12, 18, 21, 24, 27, 30, 33, 36)
• Use 3 inch and 5 inch sides to find the missing numbers from 1–6: 5 – 3 = 2, 6 – 5 = 1, 1 + 3 = 4.
• Iteratively mark all remaining numbers.

feet and inches
• a yardstick shows a total of 36 inches

Activity

• “Today you will use an index card to make a yardstick. The long side of the card measures 5 inches and the short side measures 3 inches.”
• “What numbers can you mark on the yardstick using the cards?”
• 30 seconds: quiet think time
• 1 minute: partner discussion
• “Tape the paper strip across your desk.”
• “One of you will hold the index card and the other will mark and label the units on the yardstick.”
• “Switch roles when you are about halfway done.”
• 5 minutes: partner work time
• Monitor for students with different strategies. For example:
  • students who initially use only one operation or number
  • students who look for ways to add or subtract lengths using the card
  • students who use the difference in the lengths of the short and long sides of the card
  • students who discuss and use patterns in the differences between the tick marks they have made to find and label new tick marks
• “Now discuss your method with another group.”
• 4 minutes: small-group discussion

Synthesis

• Invite students to share their methods.
Consider asking:

- “Which numbers did you mark first?”
- “Which numbers were easy to find?”
- “Which numbers were harder to find?”
- “Did you run into any problems? How did you solve them?”

### Activity 2

**Compare Yardsticks**

**Standards Alignments**

Addressing 2.MD.A.1, 2.MD.D.9

In this activity, students use their yardstick to measure a common object, the height of their desk. They write their measurement on a sticky note and add it to a class line plot. Students analyze the line plot and discuss why some students got different answers than others when they all measured the same object. Students compare their yardstick units and revise their markings to make more accurate yardsticks.

**Materials to Gather**

Materials from a previous activity, Sticky notes

**Required Preparation**

- Create a blank line plot with a scale that includes lengths longer, shorter, and equal to the height of student desks.

**Student-facing Task Statement**

Measure the height of your desk using your yardstick.

Draw an x on your sticky note and add your

**Launch**

- Groups of 2
- Give each student a sticky note.
- Display the blank line plot.
measurement to the class line plot.

Use the completed line plot to answer the following questions:

1. What do you notice? What do you wonder?
2. What is the tallest measurement for the desks in the room?
3. What is the shortest measurement?
4. Find the difference between the tallest and the shortest measurements. Show your thinking.

**Student Responses**

Sample response:

1. Students notice the different heights and wonder why they are different.
2. 27 inches
3. 25 inches
4. 2 inches. $27 - 25$

**Activity**

- “Now, let’s use the yardsticks we made to measure the height of our desks.”
- “Take turns measuring the height of your desk in inches. When you both agree, draw a big x on your sticky note and add your measurement to the class line plot.”
- 2–3 minutes: partner work time
- Invite students to add their sticky note to the line plot.
- “Now, work together to answer the questions about our measurement data.”
- 3–4 minutes: partner work time
- Monitor for students who notice the class got different measurements for the same object.
- Monitor for students who discuss reasons for the different measurements.

**Synthesis**

- Display a few student-created yardsticks next to each other for all to see.
- “What do you notice? What do you wonder?”
- If it does not come up, ask “How is it possible that different groups found different answers when they measured the same object?”
- “What could be a reason this happened?”
  - uneven markings
  - different use of yardsticks: straight, with slack, slanted
  - different location of zero
  - gaps or overlaps between inch marks
- Invite students to look at the displayed yardsticks and to see if they can see evidence for the reasons they gave.
- Highlight that it is important for a
measuring tool to have equal-size units.

- If there is time, invite students to revise their yardstick markings. Alternatively, students can discuss which markings need revision.
- Invite students to explain how they revised their yardsticks with another group.

Activity 3
Measure Your Arms

Standards Alignments
Addressing 2.MD.A.1, 2.MD.A.4, 2.MD.B.5, 2.MD.D.9

In this activity, students use the yardsticks they made to measure the length of parts of their arms. They then use the measurements to write equations and describe what information the equations give about the situation (MP2, MP4).

Student-facing Task Statement

1. Measure the length of your hands from the wrist to the top of your middle finger.
   a. hand length partner A: __________
   b. hand length partner B: __________
2. Measure the length of your forearms from the outside of your elbow to your wrist.
   a. forearm length partner A: __________
   b. forearm length partner B: __________
3. Write two equations using the measurements in your group and write two statements describing what the equations tell you.

Launch

- Groups of 2
- “You will use your yardsticks to measure parts of your partner’s hand and arm.”
- Demonstrate the two lengths they will measure.

Activity

- 10 minutes: partner work time
- Monitor for different equations using addition and subtraction.
a. Equation 1: _________________

Statement:

b. Equation 2: _________________

Statement:

Student Responses

Sample responses:

1. Mai’s hand length: 5 inches, Kiran’s hand length: 6 inches
2. Mai’s forearm length: 7 inches, Kiran’s forearm length: 8 inches
3. a. $5 + 7 = 12, 7 - 5 = 2$. The length from the tip of Mai’s middle finger to the outside of her elbow is 10 inches. Mai’s forearm is 2 inches longer than the length of her hand.

   b. $8 - 7 = 1, 5 + 6 = 11$: Mai’s forearm is 1 inch shorter than Kiran’s. Together, Mai’s and Kiran’s hands have a length of 11 inches.

Synthesis

- Invite students to share their equations and statements.
- For each student that shares, consider asking:
  - “Is there another way to describe what the equation tells us?”

Lesson Synthesis

“Today we made a measuring tool and used it to measure some objects around us. What are some important things we learned about how measuring tools are made?” (The units have to be equally spaced—every inch is the same length as every other inch. There are no gaps or overlaps between the length units. It is important to know where the zero is placed.)
Family Support Materials
Family Support Materials

Measuring Length

In this unit, students measure and estimate lengths in standard units, and solve measurement story problems within 100.

Section A: Metric Measurement

In this section, before learning to use a ruler, students use base-ten blocks, which have lengths of 1 cm and 10 cm, to measure objects in the classroom. Using these tools to measure the length of objects reinforces place value concepts. Students use metric units to create their own centimeter ruler to see the tick marks as noting the distance in centimeters from the 0 mark and the accumulation of length units as they move along the ruler. They learn the importance of placing the end of an object at the starting point of zero and discuss that the numbers on the ruler represent the distance from zero. Students learn about the meter, which is equivalent to 100 centimeters, further reinforcing place value concepts. They make estimations about metric units and measure shorter objects with centimeters and longer objects with decimeters and meters.

Section B: Customary Measurement

In this section, students learn about customary units of linear measurement (inches and feet). They apply length measurement concepts and skills from the previous section in order to measure and estimate with customary units. Students develop the generalization that when a unit of measure is longer, it requires fewer of those units to measure the length of the object. Students make choices about which tool would be appropriate based on the size of the object.
Section C: Line Plots

In this section, students represent their measurement data on a line plot. Students learn that the horizontal scale is marked off in whole number units that represent the counting sequence. Students use a template to create line plots and understand that each data point is represented by an x made above the number on the number line representing the length of the object. They label line plots with titles and the measurement unit used.

Try it at home!

Near the end of the unit, ask your student to measure objects around the house with a ruler or other measuring tool.

Questions that may be helpful as they work:

• Why did you choose to measure that object using _________ (feet, inches, centimeters, and so on)?

• If you measured it using _________ (feet, inches, centimeters, and so on) would there be more or fewer of those units needed?
In this section, students represent their measurement data on a line plot. Students learn that the horizontal scale is marked in whole number units that represent the counting sequence. Students use a template to create line plots and understand that each data point is represented by an 0 made above the number on the number line representing the length of the object. They label line plots with titles and the measurement unit used.

At the end of the unit, ask your student to measure objects around the house with a ruler or other measuring tool. Questions that may be helpful as they work:

- Why did you choose to measure that object using (feet, inches, centimeters, and so on)?
- If you measured it using (feet, inches, centimeters, and so on) would there be more or fewer of those units needed?
Assessment : Section A Checkpoint

Teacher Instructions
Give students access to centimeter rulers.

Problem 1

Goals Assessed
• Measure length in centimeters and meters.

Statement
Find the length of the rectangle with a centimeter ruler.

Solution
12 cm

Problem 2

Goals Assessed
• Represent and solve one-step story problems within 100.

Statement
Tyler and Noah both have pet guinea pigs. Noah's guinea pig is 13 cm longer than Tyler's. Noah's guinea pig is 37 cm long.

1. Draw a diagram that matches the problem.

2. How long is Tyler's guinea pig? Explain or show your thinking.

Solution
1. Sample response:
2. 24 cm. Sample response: $37 - 10 = 27$, $27 - 3 = 24$
Assessment: Section B Checkpoint

Teacher Instructions

Give students access to inch rulers.

Problem 1

Goals Assessed

- Measure length in feet and inches.

Statement

Find the length of the rectangle with an inch ruler.

Solution

5 inches

Problem 2

Goals Assessed

- Represent and solve one- and two-step story problems within 100.

Statement

1. A tomato plant was 8 inches tall at the beginning of the spring. By the end of summer, it grew 34 more inches. How tall was the plant by the end of the summer?
2. At the beginning of fall, Priya trimmed the plant and cut off 15 inches. How tall was the tomato plant after Priya trimmed it?

Solution

1. 42 inches. Sample response: \(8 + 4 = 12, 12 + 30 = 42\)
2. 27 inches. Sample response: \(42 - 10 = 32, 32 - 5 = 27\)
Assessment: Section C Checkpoint

Problem 1

Statement

Number of Pets at Home

The line plot shows how many pets Han's classmates have at home.

1. How many students took the survey? Explain or show your reasoning.
2. How many students have 1, 2, or 3 pets? Explain or show your reasoning.

Solution

1. 17 students: I counted the x's on the plot.
2. 10 students: $5 + 4 = 9, 9 + 1 = 10$

Problem 2

Statement

Kiran's class planted grass seeds as part of a science experiment. After 1 week, the class measured the height of their grass seedlings in centimeters. Here is their data:

3 2 1 4 2 3 2 1 1 2

Use this data to create a line plot. Make sure to label the line plot and give it a title.
Solution

Seedling Heights

height (cm)
Assessment: End-of-Unit Assessment

Teacher Instructions
Give students access to centimeter rulers.

Problem 1
The goal of this item is to assess familiarity with standard units of measure and estimating heights. Students who select A do not understand the size of a centimeter since 50 centimeters is between 1 foot and 2 feet. An answer of A is more reasonable, however, than an answer of C or D, both of which are much greater than the height of a person.

Statement
Which estimate makes the most sense for the height of a second grader?

A. 50 centimeters
B. 50 inches
C. 50 feet
D. 50 meters

Solution
B

Aligned Standards
2.MD.A.3

Problem 2
Students are asked to compare the length of the same object in two standard units of measure, centimeters and inches. They need to know that a centimeter is smaller than an inch. An additional layer of reasoning is that because centimeters are smaller than inches, it takes more of them to measure the same object, so the measurement in centimeters will be larger than the measurement in inches.

Statement
Jada measures the length of a pencil in centimeters and in inches. The two measurements are 6 and 15. Which measurement is in centimeters and which is in inches? Explain how you know.

Solution
The pencil is 6 inches or 15 centimeters in length. The length in centimeters is greater than the length in inches because centimeters are smaller than inches.
Aligned Standards

2.MD.A.2

Problem 3

Students add data to a line plot. The line plot has a label but no numbers have been recorded on the line, and students need to think strategically about which numbers to use on the line plot. The smallest height is 13 and the largest is 25, so they need to include these numbers.

Statement

Here are the heights of some dogs, measured in inches:

<table>
<thead>
<tr>
<th>20</th>
<th>13</th>
<th>16</th>
<th>25</th>
<th>20</th>
<th>19</th>
<th>20</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
</table>

```
20 13 16 25 20 19 20 14 16
```

dog heights (inches)

1. Label the line plot with numbers.
2. Use the dog heights to complete the line plot.

Solution

Sample response:

Aligned Standards

2.MD.D.9

Problem 4

Students measure and compare the lengths of two rectangles in centimeters. If they make a measurement error then their answer will reflect that. While both the measurement and arithmetic parts of the item are important, students will have many further opportunities to demonstrate arithmetic skill while this is their main work with measurement. Students need a centimeter ruler or measuring tape for this problem.

Statement

How many centimeters longer is rectangle A than rectangle B? Explain or show your reasoning.
Solution

Rectangle A is 16 cm long and rectangle B is 9 cm long. Since $16 - 9 = 7$ rectangle A is 7 cm longer than rectangle B.

Aligned Standards

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

Problem 5

Students solve a two-step addition problem with a measurement context. Because their answer to the second problem depends on the answer to the first problem, their work on this problem needs to be evaluated in light of their answer to the first problem. To solve the problems, students may draw pictures such as a tape diagram or they may write an equation. The units, inches, are an important part of the answer.

Statement

1. A frog jumped 37 inches. Then it jumped 25 more inches. How far did the frog jump altogether? Explain or show your reasoning.
2. Then the frog jumped 29 more inches. How far did the frog jump altogether now? Explain or show your reasoning.
Solution

1. 62 inches, $20 + 30 = 50$, $7 + 5 = 12$, and $50 + 12 = 62$.
2. 91 inches, $60 + 20 = 80$, $2 + 9 = 11$, $80 + 11 = 91$.

Aligned Standards

2.MD.B.5, 2.OA.A.1

Problem 6

Students solve a problem about distance estimates and how they differ from an actual value. Students may miscalculate one or both of the differences in the last problem. This will influence their answer to the question of whose estimate is closer and their answer to the question should be evaluated accordingly.

Statement

Jada estimates that the length of the hallway is 5 meters. Han estimates that the length of the hallway is 65 meters.

1. Whose estimate is greater, Jada's or Han's?
2. What is the difference between Jada's and Han's estimates? Explain or show your reasoning.
3. The actual length of the hallway is 78 meters. Whose estimate is closer? Explain or show your reasoning.

Solution

1. Jada's estimate is greater.
2. 30 meters, because 95 is 9 tens and 5 ones and 65 is 6 tens and 5 ones so there are 3 more tens in 95.
3. Han's estimate is closer.
   
   
   $78 - 65 = 13$ because I can subtract the ones and the tens.
   $95 - 78 = 17$ because $95 - 10 = 85$ and then I take away 5 more to get 80 and 2 more to get 78.

Aligned Standards

2.MD.B.5, 2.OA.A.1
Assessment Answer Keys

Check Your Readiness A, B and C

End-of-Unit Assessment
Teacher Instructions

Give students access to centimeter rulers.

Problem 1

**Goals Assessed**
- Measure length in centimeters and meters.

Find the length of the rectangle with a centimeter ruler.

Solution

12 cm

Problem 2

**Goals Assessed**
- Represent and solve one-step story problems within 100.

Tyler and Noah both have pet guinea pigs. Noah's guinea pig is 13 cm longer than Tyler's. Noah's guinea pig is 37 cm long.

a. Draw a diagram that matches the problem.

b. How long is Tyler's guinea pig? Explain or show your thinking.

Solution

a. Sample response:
b. 24 cm. Sample response: $37 - 10 = 27$, $27 - 3 = 24$
Assessment: Section B Checkpoint

Teacher Instructions

Give students access to inch rulers.

Problem 1

**Goals Assessed**

- Measure length in feet and inches.

Find the length of the rectangle with an inch ruler.

<p>| |</p>
<table>
<thead>
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<th></th>
</tr>
</thead>
</table>

Solution

5 inches

Problem 2

**Goals Assessed**

- Represent and solve one- and two-step story problems within 100.

a. A tomato plant was 8 inches tall at the beginning of the spring. By the end of summer, it grew 34 more inches. How tall was the plant by the end of the summer?

b. At the beginning of fall, Priya trimmed the plant and cut off 15 inches. How tall was the tomato plant after Priya trimmed it?

Solution

a. 42 inches. Sample response: \(8 + 4 = 12\), \(12 + 30 = 42\)

b. 27 inches. Sample response: \(42 - 10 = 32\), \(32 - 5 = 27\)
Assessment: Section C Checkpoint

Problem 1

Goals Assessed
- Represent numerical data in a line plot.

Number of Pets at Home

The line plot shows how many pets Han's classmates have at home.

a. How many students took the survey? Explain or show your reasoning.
b. How many students have 1, 2, or 3 pets? Explain or show your reasoning.

Solution

a. 17 students: I counted the x's on the plot.
b. 10 students: $5 + 4 = 9, 9 + 1 = 10$

Problem 2

Goals Assessed
- Represent numerical data in a line plot.

Kiran's class planted grass seeds as part of a science experiment. After 1 week, the class measured the height of their grass seedlings in centimeters. Here is their data:

3 2 1 4 2 3 2 1 1 2

Use this data to create a line plot. Make sure to label the line plot and give it a title.
Solution

Seedling Heights

height (cm)
Assessment: End-of-Unit Assessment

Teacher Instructions

Give students access to centimeter rulers.

Problem 1

Standards Alignments
Addressing 2.MD.A.3

Narrative

The goal of this item is to assess familiarity with standard units of measure and estimating heights. Students who select A do not understand the size of a centimeter since 50 centimeters is between 1 foot and 2 feet. An answer of A is more reasonable, however, than an answer of C or D, both of which are much greater than the height of a person.

Which estimate makes the most sense for the height of a second grader?

A. 50 centimeters
B. 50 inches
C. 50 feet
D. 50 meters

Solution

B

Problem 2

Standards Alignments
Addressing 2.MD.A.2

Narrative

Students are asked to compare the length of the same object in two standard units of measure, centimeters and inches. They need to know that a centimeter is smaller than an inch. An additional
Jada measures the length of a pencil in centimeters and in inches. The two measurements are 6 and 15. Which measurement is in centimeters and which is in inches? Explain how you know.

Solution

The pencil is 6 inches or 15 centimeters in length. The length in centimeters is greater than the length in inches because centimeters are smaller than inches.

Problem 3

**Standards Alignments**
Addressing 2.MD.D.9

**Narrative**
Students add data to a line plot. The line plot has a label but no numbers have been recorded on the line, and students need to think strategically about which numbers to use on the line plot. The smallest height is 13 and the largest is 25, so they need to include these numbers.

Here are the heights of some dogs, measured in inches:

```
20  13  16  25  20  19  20  14  16
```

**dog heights (inches)**

a. Label the line plot with numbers.

b. Use the dog heights to complete the line plot.

Solution
Problem 4

**Standards Alignments**
Addressing 2.MD.A.1, 2.MD.A.4

**Narrative**
Students measure and compare the lengths of two rectangles in centimeters. If they make a measurement error then their answer will reflect that. While both the measurement and arithmetic parts of the item are important, students will have many further opportunities to demonstrate arithmetic skill while this is their main work with measurement. Students need a centimeter ruler or measuring tape for this problem.

How many centimeters longer is rectangle A than rectangle B? Explain or show your reasoning.
Solution

Rectangle A is 16 cm long and rectangle B is 9 cm long. Since $16 - 9 = 7$ rectangle A is 7 cm longer than rectangle B.

Problem 5

**Standards Alignments**
Addressing 2.MD.B.5, 2.OA.A.1

**Narrative**

Students solve a two-step addition problem with a measurement context. Because their answer to the second problem depends on the answer to the first problem, their work on this problem needs to be evaluated in light of their answer to the first problem. To solve the problems, students may draw pictures such as a tape diagram or they may write an equation. The units, inches, are an important part of the answer.
a. A frog jumped 37 inches. Then it jumped 25 more inches. How far did the frog jump altogether? Explain or show your reasoning.

b. Then the frog jumped 29 more inches. How far did the frog jump altogether now? Explain or show your reasoning.

**Solution**

a. 62 inches, \(20 + 30 = 50, 7 + 5 = 12\), and \(50 + 12 = 62\).

b. 91 inches, \(60 + 20 = 80, 2 + 9 = 11\), \(80 + 11 = 91\).

**Problem 6**

**Standards Alignments**

Addressing 2.MD.B.5, 2.OA.A.1

**Narrative**

Students solve a problem about distance estimates and how they differ from an actual value. Students may miscalculate one or both of the differences in the last problem. This will influence their answer to the question of whose estimate is closer and their answer to the question should be evaluated accordingly.

Jada estimates that the length of the hallway is 95 meters. Han estimates that the length of the hallway is 65 meters.

a. Whose estimate is greater, Jada's or Han's?

b. What is the difference between Jada's and Han's estimates? Explain or show your reasoning.

c. The actual length of the hallway is 78 meters. Whose estimate is closer? Explain or show your reasoning.

**Solution**

a. Jada's estimate is greater.

b. 30 meters, because 95 is 9 tens and 5 ones and 65 is 6 tens and 5 ones so there are 3 more tens in 95.

c. Han's estimate is closer.

\[78 - 65 = 13\] because I can subtract the ones and the tens.

\[95 - 78 = 17\] because \(95 - 10 = 85\) and then I take away 5 more to get 80 and 2 more to get 78.
Lesson
Cool Downs
Lesson 1: Standard Units of Measure

Cool Down: Measure a Rectangle

1. How long is the rectangle?
   Use centimeter cubes to measure.

   __________ centimeter cubes

2. Clare got 6 when she measured the same rectangle.
   Why might her measurement be different?
Lesson 2: Measure in Centimeters

Cool Down: Measure with Centimeters

1. Measure the length of the reptiles in centimeters.

   a. 

   b. 

Lesson 3: Create and Use a Ruler

Cool Down: Use a Ruler

Use your ruler to find the length of each rectangle and figure out how much longer Rectangle B is than Rectangle A. Record any lengths in centimeters.

A

B


Lesson 4: Measure and Estimate in Centimeters

Cool Down: The Pencil

1. Estimate: I think the length of the pencil is about __________ cm.

2. Measure: The length of the pencil is actually __________ cm.
Lesson 5: Measure in Meters

Cool Down: Measure in Meters

Noah held a gecko at the zoo. The length of the gecko fit in his hands. He measured it and said it was about 13 meters long.

Do you think his measurement is correct? Why or why not?
Lesson 6: Compare Reptile Lengths in Story Problems

Cool Down: Kiran and Han Compare Pets

Kiran's pet snake is 47 cm long. It is 26 cm shorter than Han's pet snake. How long is Han's pet snake?

1. Circle the diagram that matches the story.

![Diagram of Kiran's and Han's pet snakes]

2. Solve. Show your thinking.

Han’s snake is ____________ cm long.
Lesson 8: What is an Inch?

Cool Down: Measure a Rectangle

Measure the long and short sides of the rectangle in inches.

1. Long side: ____________ in

2. Short side: ____________ in
Tyler told Han that a great white shark is about 16 inches long, but Han disagrees. Han believes it would be about 16 feet long.

Who do you agree with? Explain.
Lesson 10: Measure with a Torn Tape

Cool Down: Torn Tape

1. How long is the picture frame? Show your thinking.

The picture frame is __________ inches long.

2. Write an equation to represent the length of the picture frame.
Priya had a piece of ribbon that was 74 inches long. She cut off 17 in. How long is Priya’s ribbon now?

Show your thinking. Use a diagram if it helps. Don’t forget the unit in your answer.
Lesson 12: Saree Silk Stories: Friendship Bracelets

Cool Down: Sharing Saree Silk Ribbon

1. Solve. Show your thinking. Use a diagram if it helps.

   a. Elena has 84 inches of ribbon. She gave a piece to Mai. Now Elena has 48 inches of ribbon. How long was the piece Elena gave to Mai?

   b. Mai found another ribbon in the bin that is 18 inches long. If she sews them together, how long will Mai’s ribbon be?
Lesson 14: What is a Line Plot?

Cool Down: Hand Spans

1. Tyler collected data about the lengths of hand spans for students in his class.

   ◦ Three students have a hand span of 6 inches.
   ◦ Only 1 student has a hand span of 5 inches.
   ◦ Three students have a hand span of 7 inches.
   ◦ Two students have a hand span of 8 inches.

   a. Circle the line plot that could represent Tyler’s class’s hand spans.

   Class Hand Spans

   ![Line Plot 1]

   Class Hand Spans

   ![Line Plot 2]

   b. Explain how you know.
Lesson 15: Create Line Plots

Cool Down: Hand Spans of Mai’s Group

1. Mai made these statements about the lengths of hand spans for students in her group.

   ◦ Four students have a hand span of 18 cm.
   ◦ Two students have a hand span of 16 cm.
   ◦ Two students have a hand span of 19 cm.
   ◦ One student has a hand span of 20 cm.

Complete the line plot so it matches Mai’s data.

Hand Spans of Mai’s Group

length (centimeters)
Lesson 16: Interpret Measurement Data

Cool Down: Diego’s Art Project

Diego collected sticks for an art project and measured them. His data is shown in this line plot.

Answer the questions based on Diego’s line plot.

1. How many sticks collected were 22 cm?
2. How many sticks did Diego collect?
3. How long was the longest stick?
4. How many sticks were 21 cm?
## Instructional Masters for Measuring Length

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Puzzle 1
Make each equation true. Use number cards 0-9.

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Puzzle 2

Make each equation true. Use number cards 0-9.
Make each equation true. Use number cards 0–9.

Puzzle 3

Number Puzzles Addition Stage 4 Gameboard
Puzzle

Make each equation true. Use number cards 0–9.

Puzzle 4

Number Puzzles Addition Stage 4 Gameboard
Make each equation true. Use number cards 0–9.

Puzzle 5
Puzzle 1

Make each equation true. Use number cards 0–9.

63 = □ □ + 24

63 = □ □ + 52

63 = □ □ + 8

63 = □ □ + 25

63 = □ □ + 9

63 = □ □ + 3
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Make each equation true. Use number cards 0-9.
Puzzle 3
Make each equation true. Use number cards 0-9.
Make each equation true. Use number cards 0–9.

Puzzle 4

Number Puzzles Addition Stage 4 Gameboard
### Puzzle 5

Make each equation true. Use number cards 0-9.

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A. Jaragua dwarf gecko
B. Blue-tongued skink
C. Musk turtle
Directions:

- Measure up to 8 objects to the nearest inch or centimeter.
- Create a line plot of your measurement data. Don't forget to add a title and label.
- Ask your partner 2 questions that can be answered based on the data in your line plot.

Creating Line Plots Stage 1 Recording Sheet
Directions:

- Measure up to 8 objects to the nearest inch or centimeter.
- Create a line plot of your measurement data. Don't forget to add a title and label.
- Ask your partner 2 questions that can be answered based on the data in your line plot.
Centimeter Ruler Template
Directions:

- Partner A:
  ○ Choose a target length in inches (up to 10) or centimeters (up to 30).
  ○ Begin to draw a line with a straightedge.
  ○ Choose a target length in inches (up to 10) or centimeters (up to 30).

- Partner B:
  ○ Say "Stop!" when you think the length of the line is equal to the target measurement.
  ○ Both partners measure the line and find the difference between its length and the target measurement. The difference is Partner B's score for the round.

- Take turns. After 8 rounds, the player with the lowest total score wins.

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<th>Partner B</th>
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</table>
Directions:

- Partner A:
  - Choose a target length in inches (up to 10) or centimeters (up to 30).
  - Begin to draw a line with a straightedge.
  - Partner B: Say "Stop!" when you think the length of the line is equal to the target measurement.
  - Both partners measure the line and find the difference between its length and the target measurement. The difference is Partner B's score for the round.

- Take turns. After 8 rounds, the player with the lowest total score wins.

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Target Measurement Stage 1 Recording Sheet
Directions:

- Choose an object.
- Choose a unit to measure the length. (inches, feet, centimeters)
- Estimate how many units long your object is.
- Measure and record the actual measurement.

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<th>object</th>
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<th>estimate</th>
<th>actual measurement</th>
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<tr>
<td>example: crayon</td>
<td>inches</td>
<td>5 inches</td>
<td>3 inches</td>
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</table>
Directions:
- Choose an object.
- Choose a unit to measure the length. (inches, feet, centimeters)
- Estimate how many units long your object is.
- Measure and record the actual measurement.

<table>
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<th>estimate</th>
<th>actual measurement</th>
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</thead>
<tbody>
<tr>
<td>example: crayon</td>
<td>inches</td>
<td>5 inches</td>
<td>3 inches</td>
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Bearded Dragon
Target Numbers Stage 5 Recording Sheet

Directions:
● On your turn:
  ○ Start at 100. Roll 3 number cubes. Pick 1 number to represent the tens and 1 number to represent the ones.
  ○ Subtract the number you chose.
  ○ Write an equation to represent the difference.
● Take turns until you’ve played 6 rounds.
● Each round, the difference from the previous equation is the starting number in the new equation.
● The partner who gets a difference closest to 0 without going below 0 wins.

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<tr>
<th>roll and choose</th>
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<tr>
<td>____ ones</td>
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Directions: (two-digit plus two-digit)

- Partner A: Put a paper clip on 2 numbers in the grey rows. Cover the sum of the 2 numbers with a counter.
- Partner B: Move 1 of the paper clips, add the numbers, and cover the sum with a counter.
- Take turns. The first partner to cover 5 squares in a row wins.

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<th>27</th>
<th>25</th>
<th>34</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>19</td>
<td>57</td>
<td>26</td>
<td>48</td>
</tr>
</tbody>
</table>
Directions: (one-digit plus two-digit)
- Partner A: Put a paper clip on 2 numbers in the grey rows. Cover the sum of the 2 numbers with a counter.
- Partner B: Move 1 of the paper clips, add the numbers, and cover the sum with a counter.
- Take turns. The first partner to cover 5 squares in a row wins.

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<tbody>
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<td>75</td>
<td>64</td>
<td>24</td>
<td>26</td>
<td>63</td>
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<tr>
<td>65</td>
<td>25</td>
<td>22</td>
<td>31</td>
<td>55</td>
<td></td>
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<tr>
<td>58</td>
<td>30</td>
<td>67</td>
<td>32</td>
<td>66</td>
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<tr>
<td>72</td>
<td>56</td>
<td>54</td>
<td>34</td>
<td>71</td>
<td></td>
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<td>74</td>
<td>23</td>
<td>33</td>
<td>73</td>
<td>57</td>
<td></td>
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</tbody>
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<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>25</td>
<td>49</td>
<td>58</td>
<td>66</td>
<td></td>
</tr>
</tbody>
</table>
Directions:

- Choose an object.
- Choose a unit to measure the length. (paper clip, tiles, small cubes, connecting cubes.)
- Estimate how many units long your object is.
- Measure and record the actual measurement.

<table>
<thead>
<tr>
<th>object</th>
<th>unit</th>
<th>estimate</th>
<th>actual measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>example: crayon</td>
<td>connecting cubes</td>
<td>5 connecting cubes</td>
<td>4 connecting cubes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>object</th>
<th>unit</th>
<th>estimate</th>
<th>actual measurement</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
Math Stories Stage 5 Tape Diagrams

Math Stories Stage 5
A

Math Stories Stage 5
B

Math Stories Stage 5
C

Math Stories Stage 5
D

Math Stories Stage 5
E

Math Stories Stage 5
F

Math Stories Stage 5
G

Math Stories Stage 5
H
Math Stories Stage 5 Tape Diagrams

Math Stories Stage 5

I

Math Stories Stage 5

J

Math Stories Stage 5

K

Math Stories Stage 5

L
## Math Stories Stage 5 Recording Sheet

**Directions:**
- **Partner A:**
  - Choose one of the tape diagrams. (Don't tell your partner which one!)
  - Make up a story problem that the tape diagram could represent.
- **Partner B:** Solve the problem and draw a diagram that matches the story.
- Take turns.

<table>
<thead>
<tr>
<th>my tape diagram:</th>
<th>my answer: __________</th>
</tr>
</thead>
<tbody>
<tr>
<td>my tape diagram:</td>
<td>my answer: __________</td>
</tr>
<tr>
<td>my tape diagram:</td>
<td>my answer: __________</td>
</tr>
<tr>
<td>my tape diagram:</td>
<td>my answer: __________</td>
</tr>
</tbody>
</table>

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**Note:** Replace the placeholders with actual content as needed.
Capture Squares Stage 4 Gameboard

Directions:

- On your turn:
  - Spin the spinner and take 1 number card. Subtract the number on the card from the number on the spinner.
  - Choose a square on the gameboard that shows that number. Draw one line connecting any 2 dots around the number.
  - If you can't draw a line, spin again and take a new card.
  - If you draw a line that finishes a square around a number, shade in that box with your color.
- Take turns with your partner. The first player to shade in 3 boxes wins.
Capture Squares Stage 4 Spinner

- 16
- 17
- 18
- 19
- wild
- 20
Puzzle 1
Make each equation true. Use number cards 0–9.
Puzzle 2
Make each equation true. Use number cards 0–9.
Number Puzzles: Addition and Subtraction Stage 2 Gameboard

Make each equation true. Use number cards 0-9.

17 = \_
- 1

17 = \_
- \_

17 = \_
+ \_

17 = \_
+ 2

17 = \_

17 = \_
+ 1

17 = \_
- \_

17 = \_

Make each equation true. Use number cards 0–9.

**Puzzle 4**

Number Puzzles: Addition and Subtraction: Stage 2 Gameboard
<table>
<thead>
<tr>
<th>+</th>
<th>1 = 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 -</td>
<td>1 = 9</td>
</tr>
<tr>
<td>+</td>
<td>1 = 16</td>
</tr>
<tr>
<td>6 +</td>
<td>1 = 16</td>
</tr>
<tr>
<td>+</td>
<td>1 = 19</td>
</tr>
<tr>
<td>9 +</td>
<td>1 = 19</td>
</tr>
<tr>
<td>+</td>
<td>1 = 19</td>
</tr>
</tbody>
</table>

Make each equation true. Use number cards 0–9.
Puzzle 1
Directions: Make each equation true. Use number cards 0–5.

75 = □ + □ + 65

75 = □ + □ + □

75 = □ + □ + 70
Puzzle 2
Directions: Make each equation true. Use number cards 0–5.
Directions: Make each equation true. Use number cards 0–5.

| 46 + □ = 31 | □ + 42 = 46 |
| 0 + □ = 16 | □ + □ = 46 |

Puzzle 3
### Puzzle 4

**Directions:** Make each equation true. Use number cards 0–9.

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<thead>
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<td></td>
<td>+</td>
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<td>+</td>
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<td>22</td>
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<td>8</td>
</tr>
<tr>
<td>6</td>
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<tbody>
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<td>98</td>
<td>=</td>
<td>98</td>
<td>=</td>
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<tr>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>78</td>
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<td>58</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>2</td>
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</table>
Directions: Make each equation true. Use number cards 0-9.

<table>
<thead>
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<th>40</th>
<th>=</th>
<th>59</th>
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<td>33</td>
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<td>41</td>
<td>+</td>
<td>1</td>
<td>=</td>
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<tr>
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<td>55</td>
<td>+</td>
<td>55</td>
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<td>+</td>
<td>0</td>
<td>=</td>
<td>59</td>
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Core Knowledge Mathematics™

Editorial Director
Sally Guarino
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**Core Knowledge Mathematics™**

units at this level include:

- Adding, Subtracting, and Working with Data
- Adding and Subtracting within 100
- **Measuring Length**
- Addition and Subtraction on the Number Line
- Numbers to 1,000
- Geometry, Time, and Money
- Adding and Subtracting within 1,000
- Equal Groups
- Putting it All Together

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