In Topic D, students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies (e.g., the ruler as a number line, benchmarks for estimation, tape diagrams for comparison) to solve word problems (2.MD.5, 2.MD.6).

In Topic A, students had their first experience creating and using a ruler as a number line. Now, students solve addition and subtraction word problems using the ruler as a number line. This concept is reinforced and practiced throughout the module in the fluency activities that involve using the meter strip for counting on and counting back, and is incorporated into the accompanying Problem Sets. Students then progress in the second lesson from concrete to abstract by creating tape diagrams to represent and compare lengths. The third lesson culminates with students solving two-step word problems involving measurement using like units.
A Teaching Sequence Towards Mastery of Relating Addition and Subtraction to Length

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

**Objective 2:** Concrete to abstract: measure lengths of string using measurement tools; represent length with tape diagrams to represent and compare the lengths.  
(Lesson 9)

**Objective 3:** Apply conceptual understanding of measurement by solving two-step word problems.  
(Lesson 10)
Lesson 8

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

Suggested Lesson Structure

- Fluency Practice (12 minutes)
- Application Problems (6 minutes)
- Concept Development (32 minutes)
- Student Debrief (10 minutes)

Total Time (60 minutes)

Fluency Practice (12 minutes)

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

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

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

Continue with possible sequences: 20 cm, 90 cm, 10 cm, 9 cm, 11 cm, 50 cm, 49 cm, 51 cm

Sprint: Making a Meter (9 minutes)

Materials: (S) Making a Meter Sprint
Lesson 8

Application Problem (6 minutes)

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

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

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

Concept Development (32 minutes)

Materials: (T) 1 piece large construction paper (12” x 18” or 2 pieces of 8 ½” x 11” sheets taped together), torn meter strip (S) 1 meter strip per student torn or cut at different points (i.e., cut meter strip at 4 cm, 5 cm, or 1 cm), 1 piece of large construction paper per student, personal boards for each student

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

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

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

S: 6 m. → I added all 4 sides and got 6 meters. → I added 2 + 2 + 1 + 1 = 6.

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

T: There are 2 steps. (Draw the diagram labeling only the stair 18 cm and 22 cm.) How many centimeters of lights do I need to line the entire length of both steps? Put your finger on 0. Slide your finger up to 18 centimeters.

T: How much more do we need to add?

T: Now move up two. We are at 20 centimeters. How far should we move our finger on the meter strip?
Lesson 8

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

Date: 6/26/13

2.D.5

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

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

- Invite a student to begin at 4 and jump 25 length units. Students can count on chorally, starting at 4. Encourage them to add 1 to make 5; then, count up by 10s.
- Teacher asks: Do you notice a relationship between 0, 4, 25, 29?

S: We should move it 20 centimeters.
T: Where will our finger stop?
S: At 40 centimeters.
T: Where will we be on the meter strip when we add the second stair? How do you know?
S: We’ll be at 80 centimeters, because you need to add 18 + 22 again. We’ll be at 80 centimeters. You just have to double 40 centimeters.
T: I have a string of lights that is 1 meter long. Is it long enough to reach the top of the steps?
S: Yes, because a meter is longer than 80 centimeters. Yes, because 1 meter is 100 centimeters and you only need 80 centimeters. 100 cm – 80 cm = 20 cm left over.
T: Let’s suppose that I taped the meter strip directly onto the steps, with 0 at the bottom, to measure the length of the string of lights needed to reach the top. This time I decide to start the lights after the first 18 centimeters, but I don’t want to move the meter strip. How can I determine how long the string of lights should be now?
S: You can pretend that the 18 is 0 and count up 2 to 20, then count up by 10s to reach 80. You would need 62 centimeters of lights. You can subtract 80 – 18 to get 62 centimeters.
T: I also want to hang a party sign with this piece of string. I want to know the length of the string, but I tore my meter strip, and now it starts at 4 centimeters. (show students model of torn meter strip). How can I still use this torn strip to measure my piece of string?
S: Use it the same as usual. Start at the beginning of the meter strip and measure. Count the number of centimeters. We can start at 4 centimeters on our meter strip and subtract 4 from where the string ends on the meter strip.
T: Watch me as I line up the string with the torn meter strip. Where does the string end?
S: At 29 centimeters.
T: Now let’s take away 4 cm from 29 centimeters. What is the length of the string?
S: The string is 25 centimeters.
T: I ordered a cake and I want to make sure it will fit on the table. The cake is the same size as this piece of construction paper. The table is the same size as your desks. Can you figure out the length of the cake and the desk?
T: I have torn meter strips for you to measure with. With your partner, measure the length of the cake and desk. Record your answers on your personal white boards.

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

T: What strategy did you and your partner use to measure the lengths with the torn meter strip?
Solve addition and subtraction word problems using the ruler as a number line.

Date: 6/26/13

### Problem Set (10 minutes)

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

### Student Debrief (10 minutes)

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

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

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

**Exit Ticket (3 minutes)**

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Lesson 8: Solve addition and subtraction word problems using the ruler as a number line.

Date: 6/26/13

<table>
<thead>
<tr>
<th></th>
<th>Find the missing length to make 1 meter.</th>
<th># Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 cm + _____ = 100 cm</td>
<td>23 _____ + 62 cm = 1 m</td>
</tr>
<tr>
<td>2</td>
<td>30 cm + _____ = 100 cm</td>
<td>24 _____ + 72 cm = 1 m</td>
</tr>
<tr>
<td>3</td>
<td>50 cm + _____ = 100 cm</td>
<td>25 _____ + 92 cm = 1 m</td>
</tr>
<tr>
<td>4</td>
<td>70 cm + _____ = 100 cm</td>
<td>26 _____ + 29 cm = 1 m</td>
</tr>
<tr>
<td>5</td>
<td>90 cm + _____ = 100 cm</td>
<td>27 _____ + 39 cm = 1 m</td>
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<td>6</td>
<td>80 cm + _____ = 100 cm</td>
<td>28 _____ + 59 cm = 1 m</td>
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<td>7</td>
<td>60 cm + _____ = 100 cm</td>
<td>29 _____ + 89 cm = 1 m</td>
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<tr>
<td>8</td>
<td>40 cm + _____ = 100 cm</td>
<td>30 _____ + 88 cm = 1 m</td>
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<tr>
<td>9</td>
<td>20 cm + _____ = 100 cm</td>
<td>31 _____ + 68 cm = 1 m</td>
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<td>10</td>
<td>21 cm + _____ = 100 cm</td>
<td>32 _____ + 18 cm = 1 m</td>
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<td>36 55 cm + _____ = 1 m</td>
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<td>37 88 cm + _____ = 1 m</td>
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<td>16</td>
<td>39 cm + _____ = 100 cm</td>
<td>38 1 m = _____ + 33 cm</td>
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<td>17</td>
<td>49 cm + _____ = 100 cm</td>
<td>39 1 m = _____ + 66 cm</td>
</tr>
<tr>
<td>18</td>
<td>50 cm + _____ = 100 cm</td>
<td>40 1 m = _____ + 99 cm</td>
</tr>
<tr>
<td>19</td>
<td>52 cm + _____ = 100 cm</td>
<td>41 1 m - 11 cm = _____</td>
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<tr>
<td>20</td>
<td>56 cm + _____ = 100 cm</td>
<td>42 1 m - 15 cm = _____</td>
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<tr>
<td>21</td>
<td>58 cm + _____ = 100 cm</td>
<td>43 1 m - 17 cm = _____</td>
</tr>
<tr>
<td>22</td>
<td>62 cm + _____ = 100 cm</td>
<td>44 1 m - 19 cm = _____</td>
</tr>
</tbody>
</table>
Lesson 8: Solve addition and subtraction word problems using the ruler as a number line.

Date: 6/26/13

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

Name ___________________________ Date ______________

1.  

\[ \begin{array}{l}
\text{Line } a \text{ is _____ cm long.} \\
\text{Line } b \text{ is _____ cm long.} \\
\text{Together, Lines } a \text{ and } b \text{ measure _____ cm.} \\
\text{Line } a \text{ is _____ cm (longer/shorter) than Line } b.
\end{array} \]

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

3. Marty made a train of red and yellow centimeter cubes that measured 16 centimeters in length. He added 11 more yellow cubes and removed 8 red cubes. What is the length of the train now?
4. Each of the parts of the path below is 4 length units. What is the total length of the path? ________ length units.

```
__________________________
                   |
__________________________
                   |
__________________________
                   |
__________________________
```

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

```
School

5 m

Route A

7 m

Route B

Home
```

a. How many meters is Route A? ________ m.
b. How many meters is Route B? ________ m.
c. What is the difference between Route A and Route B? ________ m.
d. Which route should Ben take if he wants to get home quickly? ________
Name ___________________________ Date ______________

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

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

   b. How long is the new line extended from R? ______ cm

   c. How long is the new line extended from Line S? ______ cm

   d. The new line extended from Line S is _____ cm (shorter/longer) than the new line extended from Line R.
Lesson 8 Homework

Name ________________________________ Date ________________

1. Line c is _____ cm.
   Line d is _____ cm.
   Lines c and d are _____ cm.
   Line c is _____ cm (longer/shorter) than Line d.

   
   c
   
   d

   12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

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

   South North

   10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

   Start
3. All of the sides of the line below are equal length units.

\[ \begin{array}{c}
3 \\
\end{array} \]

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

b. The line is _____ length units.

c. How many lines would you need to add for the line to be 21 length units? _____ lines

4. The length of a picture is 67 centimeters. The width of the picture is 48 centimeters. How many more centimeters is the length than the width?
Objective: Concrete to abstract: measure lengths of string using measurement tools; represent length with tape diagrams to represent and compare the lengths.

**Suggested Lesson Structure**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluency Practice</td>
<td>10 mins</td>
</tr>
<tr>
<td>Application Problems</td>
<td>6 mins</td>
</tr>
<tr>
<td>Concept Development</td>
<td>34 mins</td>
</tr>
<tr>
<td>Student Debrief</td>
<td>10 mins</td>
</tr>
<tr>
<td><strong>Total Time</strong></td>
<td>60 mins</td>
</tr>
</tbody>
</table>

**Fluency Practice (10 minutes)**

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

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

Materials: (S) Meter strips (as pictured)

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

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

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

S: (Students slide their fingers to 30.)

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

S: 40 centimeters.

Continue with the following possible sequence: 45 cm, 51 cm, 63 cm, 76 cm, 87 cm, and 98 cm. As your students show mastery, advance to adding 20 centimeters.
Happy Counting by Centimeters (4 minutes)

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

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

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

T: Excellent! Try it for 30 seconds with your partner starting at 80 centimeters. Partner B, you are the teacher today.

Application Problem (6 minutes)

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

Note: This add to with start unknown situation may be challenging for students. After students share their solutions, the teacher may wish to model problem solving using a tape diagram. This is in anticipation of today’s lesson, where students will be representing length using tape diagrams.

Concept Development (34 minutes)

Materials: (T) 2 lengths of string in 2 different colors (3 meters red and 5 meters blue), meter stick (S) 1 meter tape and 50-cm piece of string per pair of students, masking tape

T: (Use masking tape to make two lines on the floor before class begins. Make one line squiggly, that measures 3 meters, and one line zigzag that measures 5 meters. Convene students on the carpet, perhaps seated in a U-shape.)

T: Make an estimate, how long is the zigzag line?
S: (Students share estimates.)
T: Make an estimate, how long is the squiggly line?
S: (Students share estimates.)
T: Which line do you think is longer?

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

To support ELLs, treat the student’s first language as a resource. When drawing tape diagrams, students need to understand comparative language in order to represent and compare various lengths. The teacher can use the student’s first language to foster understanding. For example,
- In Spanish, shorter = mas corto.
- In Spanish, longer = mas largo.
Lesson 9: Concrete to abstract: measure the lengths of string using measurement tools; represent length with tape diagrams to represent and compare the lengths.

Date: 6/26/13

S: We don’t know because they aren’t straight. → The squiggly line because it starts at the wall and goes past the rug. The other line starts at the wall and doesn’t reach the rug. → You need to measure both to know.

T: How can I find out the actual length of each line to check our estimates?

S: Measure each part and add them together. → Measure each part and count on as you go.

T: That may work for the zigzag line, but that won’t work for the squiggly line.

T: I have some string here. How do you think this string could help me measure both lines?

S: Take the string and trace it along the line. → Hold it down with one hand and lay it down along the tape.

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

T: Now, how can I compare the lengths of the lines?

S: Measure the strings.

T: These strings are very long. Let’s tape them on the floor and see how long they are.

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

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

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

S: A meter tape. → A meter stick. (Call two volunteers to measure.)

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

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

S: Draw a picture. → Write the numbers.

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

S: Stop!

T: Why should I stop here?

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

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

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

S: 3 + 5 = □

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

S: 5 – 3 = □

T: This is called a tape diagram. It is helpful because I can draw a small picture to represent any length.

T: Let’s practice making a tape diagram.

T: What is the measurement around my wrist? (Demonstrate wrapping the string around your wrist and pinching the end point, then lay the string along a meter stick to determine the length.) S: 16 centimeters.

T: Let’s compare the length around my wrist to the length around my head. What’s the length around my
head? (Repeat the demonstration process and record the length on the board.)

S: 38 centimeters.

T: Draw along with me as I draw the first bar on the board to represent my wrist measurement. We’ll label this 16 centimeters. (Students draw.)

T: Right below that, draw the second bar to show my head measurement. Should the bar be longer or shorter?

S: Longer. (Students draw and label the second bar 38 centimeters.)

T: Look at your diagram. Talk with your neighbor: What is this open space between the end of the first and second bars?

S: It’s how much longer 38 centimeters is than 16 centimeters. → It’s the difference between 16 centimeters and 38 centimeters. → It’s the difference between the measurement of your wrist and your head.

T: What number sentences can we use to find the difference between 16 centimeters and 38 centimeters?

S: 38 − 16 = □ → 16 + □= 38.

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

Problem Set (10 minutes)

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

Student Debrief (10 minutes)

Lesson Objective: Measure lengths of string and use tape diagrams to represent and compare lengths.

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

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson. You may choose to use any combination of the questions below to lead the discussion.
Lesson 9: Concrete to abstract: measure the lengths of string using measurement tools; represent length with tape diagrams to represent and compare the lengths.

Date: 6/26/13

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:
As students return to the application problem, adjust the difficulty level of the extension:
Choose challenging problem types, such as, “How would your tape diagram change if Mei’s frog leaped x centimeters more than Anthony’s?”
Invite students to write their own comparison word problem with an accompanying tape diagram.

Exit Ticket (3 minutes)
After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.
Lesson 9: Concrete to abstract: measure the lengths of string using measurement tools; represent length with tape diagrams to represent and compare the lengths.

Date: 6/26/13

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

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Body Part Measured</th>
<th>Estimated Measurement in Centimeters</th>
<th>Actual Measurement in Centimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neck</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrist</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Head</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

2. Use a string to measure all three lines.

Which line is the longest? _____
Which line in the shortest? ______

Draw a tape diagram to compare two of the lengths.

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

The line is about ______ cm.

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

The actual length of the line is ______ cm.

Draw a tape diagram to compare your estimation and the actual length of the line.
Name ___________________________________________  Date ____________

1. **Measure the two lines by using your string. Write the length in centimeters.**

   ![String Measurement Diagram]

   Line M is _____ cm long.
   Line N is _____ cm long.

2. **Mandy measured the lines and said both lines are the same length.**
   Is Mandy’s answer correct? Yes or no. _______
   Explain why or why not.
   _____________________________________________________________________
   _____________________________________________________________________

3. **Draw a tape diagram to compare the two lengths.**
Name ___________________________  Date ______________

1. Find the measurement around three round objects in your house. Complete the chart below.

<table>
<thead>
<tr>
<th>Object Name</th>
<th>Estimated Measurement in Centimeters</th>
<th>Actual Measurement in Centimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
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</tr>
</tbody>
</table>

a. What is the difference between the greatest and shortest measurements? ___________cm.

b. Draw a tape diagram comparing the estimated measurements.

c. Draw a tape diagram to compare the actual measurements.
2. Measure the two lines below.

line A_________________________

line B

a. Line A is ___ cm.

b. Line B is ___ cm.

c. Together, lines A and B measure ____ cm.

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

3. Kim is decorating a table for a party. Measure the ribbon she is using to decorate.

The ribbon is _____ cm long.

Kim needs 1 meter of ribbon.

How much more ribbon does Kim need than what she has? _______ cm.
4. Shawn and Steven had a contest to see who could jump the furthest. Shawn jumped 75 centimeters. Steven jumped 23 more centimeters than Shawn.

   a. How far did Steven jump? __________ centimeters
   b. How won the jumping contest? __________
   c. Draw a tape diagram to compare the lengths that Shawn and Steven jumped.
Lesson 10

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

Suggested Lesson Structure

- Fluency Practice: 12 minutes
- Concept Development: 38 minutes
- Student Debrief: 10 minutes
- Total Time: 60 minutes

Fluency Practice (12 minutes)

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

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

Materials: (S) Meter strips (as pictured)

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

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

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

S: (Students slide their fingers to 30.)

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

S: 20 centimeters.

Continue with the following possible sequence: 45cm, 52cm, 64cm, 74cm, 82cm, 91cm, 99 cm. Repeat the sequence but sliding back 20.
Take From Ten (3 minutes)

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

T: For every number sentence I say, you will give a subtraction number sentence that takes from the ten first. When I say 12 - 3, you say 12 - 2 - 1. Ready?
T: 12 - 3.
S: 12 - 2 - 1.
T: Answer.
S: 9.

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

Relate Subtraction to Addition (3 minutes)

Note: The review of Module 1 activity challenges students to mentally subtract the ones and add the difference to 10. Draw a number bond for the first example to support student answers. (Students may answer verbally or on their personal boards.)

T: 2 - 1.
S: 1.
S: 10 + 1.
T: 3 - 1.
S: 2.
T: 13 - 1.
S: 10 + 2.
T: Answer.
S: 12.


Concept Development (38 minutes)

Materials: (S) Personal white boards

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

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

T: Let’s read Problem 1 together. (Read number one chorally.)
T: (Draw a bar on the board under Step 1 and label it morning.)
T: How many meters did Mr. Peterson decorate in the morning?
S: 15 meters.
T: When did he decorate again?
S: In the afternoon.
T: Did he decorate more or less meters in the afternoon?
S: More!
T: How many more meters?
S: 8 more meters.
T: Tell me when to stop drawing. (Start to draw a second bar under the first bar to represent the afternoon meters.)
S: Stop!
T: What is this measurement here, the difference between his ribbon in the morning and afternoon?
S: 8 meters.
T: And what is this length? (Point to the part of the bar directly below the morning measurement.)
S: 15 meters.
T: (Draw a line to separate that part and label the question mark below.)
T: What is the length of the ribbon Mr. Peterson decorated in the afternoon?
S: 23 meters.
T: What do we still need to find out?
S: Figure out how many meters in the morning AND in the afternoon. → Add the morning meters and the afternoon meters.
T: This is Step 2. (Redraw the same model with the 23 meters recorded and the question mark to the right as shown to the right.)
T: How many meters in the morning and afternoon did Mr. Peterson decorate? Turn and talk.
S: 38 because 15 and 23 makes 38. → 10 + 20 = 30 and 5 + 3 = 8, 30 + 8 = 38.
T: (Cross out the question mark and write 38 to show the solution.) You just solved Step 2.
Problem 2

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

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

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

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

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

Problem Set (10 minutes)

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

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

While students are completing the Problem Set, check frequently for understanding by saying, “Show me,” with concrete models or tape diagrams. Modify two-step word problems so that they only involve single-digit addends. Assign struggling students to a buddy to clarify processes.
Student Debrief (10 minutes)

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

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

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

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

Exit Ticket (3 minutes)

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

<table>
<thead>
<tr>
<th>Subtract</th>
<th># Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 53 - 2 =</td>
<td>23 84 - 40 =</td>
</tr>
<tr>
<td>2 65 - 3 =</td>
<td>24 80 - 50 =</td>
</tr>
<tr>
<td>3 77 - 4 =</td>
<td>25 86 - 50 =</td>
</tr>
<tr>
<td>4 89 - 5 =</td>
<td>26 70 - 60 =</td>
</tr>
<tr>
<td>5 99 - 6 =</td>
<td>27 77 - 60 =</td>
</tr>
<tr>
<td>6 28 - 7 =</td>
<td>28 80 - 70 =</td>
</tr>
<tr>
<td>7 39 - 8 =</td>
<td>29 88 - 70 =</td>
</tr>
<tr>
<td>8 31 - 2 =</td>
<td>30 48 - 4 =</td>
</tr>
<tr>
<td>9 41 - 3 =</td>
<td>31 80 - 40 =</td>
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<tr>
<td>10 51 - 4 =</td>
<td>32 81 - 40 =</td>
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<tr>
<td>11 61 - 5 =</td>
<td>33 46 - 3 =</td>
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<tr>
<td>12 30 - 9 =</td>
<td>34 60 - 30 =</td>
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<tr>
<td>13 40 - 8 =</td>
<td>35 68 - 30 =</td>
</tr>
<tr>
<td>14 50 - 7 =</td>
<td>36 67 - 4 =</td>
</tr>
<tr>
<td>15 60 - 6 =</td>
<td>37 67 - 40 =</td>
</tr>
<tr>
<td>16 40 - 30 =</td>
<td>38 89 - 6 =</td>
</tr>
<tr>
<td>17 41 - 30 =</td>
<td>39 89 - 60 =</td>
</tr>
<tr>
<td>18 40 - 20 =</td>
<td>40 76 - 2 =</td>
</tr>
<tr>
<td>19 42 - 20 =</td>
<td>41 76 - 20 =</td>
</tr>
<tr>
<td>20 80 - 50 =</td>
<td>42 54 - 6 =</td>
</tr>
<tr>
<td>21 85 - 50 =</td>
<td>43 65 - 8 =</td>
</tr>
<tr>
<td>22 80 - 40 =</td>
<td>44 87 - 9 =</td>
</tr>
</tbody>
</table>

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

Date: 6/26/13

<table>
<thead>
<tr>
<th>Subtract</th>
<th>Improvement</th>
<th># Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 43 - 2 =</td>
<td>23 94 - 50 =</td>
<td></td>
</tr>
<tr>
<td>2 55 - 3 =</td>
<td>24 90 - 60 =</td>
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<tr>
<td>3 67 - 4 =</td>
<td>25 96 - 60 =</td>
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<td>4 79 - 5 =</td>
<td>26 80 - 70 =</td>
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<tr>
<td>5 89 - 6 =</td>
<td>27 87 - 70 =</td>
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<tr>
<td>6 98 - 7 =</td>
<td>28 90 - 80 =</td>
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<td>7 29 - 8 =</td>
<td>29 98 - 80 =</td>
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<td>8 21 - 2 =</td>
<td>30 39 - 4 =</td>
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<td>9 31 - 3 =</td>
<td>31 90 - 40 =</td>
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<td>10 41 - 4 =</td>
<td>32 91 - 40 =</td>
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<tr>
<td>11 51 - 5 =</td>
<td>33 47 - 3 =</td>
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<tr>
<td>12 20 - 9 =</td>
<td>34 70 - 30 =</td>
<td></td>
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<tr>
<td>13 30 - 8 =</td>
<td>35 78 - 30 =</td>
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<td>14 40 - 7 =</td>
<td>36 68 - 4 =</td>
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<tr>
<td>15 50 - 6 =</td>
<td>37 68 - 40 =</td>
<td></td>
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<tr>
<td>16 30 - 20 =</td>
<td>38 89 - 7 =</td>
<td></td>
</tr>
<tr>
<td>17 31 - 20 =</td>
<td>39 89 - 70 =</td>
<td></td>
</tr>
<tr>
<td>18 50 - 30 =</td>
<td>40 56 - 2 =</td>
<td></td>
</tr>
<tr>
<td>19 52 - 30 =</td>
<td>41 56 - 20 =</td>
<td></td>
</tr>
<tr>
<td>20 70 - 40 =</td>
<td>42 34 - 6 =</td>
<td></td>
</tr>
<tr>
<td>21 75 - 40 =</td>
<td>43 45 - 8 =</td>
<td></td>
</tr>
<tr>
<td>22 90 - 50 =</td>
<td>44 57 - 9 =</td>
<td></td>
</tr>
</tbody>
</table>

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Lesson 10 Problem Set

Name ___________________________ Date ______________

Draw a tape diagram for each step.

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

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

   \[
   \begin{align*}
   &\text{26 cm} \\
   &? \quad \text{14 cm shorter}
   \end{align*}
   \]

   Step 2: Find the length of both ribbons.

   \[
   \begin{align*}
   &\text{26 cm} \\
   &? \quad \text{14 cm shorter}
   \end{align*}
   \]

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

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

   \[
   \begin{align*}
   &? \quad \text{9 cm shorter}
   \end{align*}
   \]

   Step 2: Find the length of both dolls.
3. Steven has a black leather strip that is 13 centimeters long. He cut off 5 centimeters. His teacher gave him a brown leather strip that is 16 centimeters long. What is the total length of both strips?

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

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

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

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

   Step 2: Find the total measurement of all four wrists.
Name __________________________________________  Date ________________

The length of a crayon is 9 centimeters. A pencil is 11 centimeters longer than the crayon. What is the total length of both the crayon and the pencil?
Draw a tape diagram for each step.

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

   **Step 1:** Find the length of blue ribbon.

   ![](image1)

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

   ![](image2)

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

   **Step 1:** Find the length of Lisa’s line.

   ![](image3)

   **Step 2:** Find the total length of their lines.
1. Use your ruler to find the length of the pencil and the crayon.

   a. How long is the crayon? _______ centimeters

   b. How long is the pencil? _______ centimeters

   c. Which is longer? pencil crayon

   d. How much longer? _______ centimeters
2. Samantha and Bill are having a bean bag throwing contest and need to measure each of their throws.

a. Circle the most appropriate tool to measure their throws.
   - ruler
   - paper clips
   - meter stick
   - centimeter cubes

b. Explain your choice using pictures or words.

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

d. Sarah threw her bean bag 3 meters farther than Bill. Who won the contest? How do you know?
3. Use the broken centimeter ruler to solve the problem.

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

4. Vanessa’s Ribbons

Ribbon A

Ribbon B

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

______ centimeters

______ paper clips

b. Explain why the number of centimeters is larger than the number of paper clips. Use pictures or words.
c. Estimate the length of Ribbon B in paper clips.
   ______paper clips

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

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

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

Standards Addressed

Measure and estimate lengths in standard units.

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

2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

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

2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Relate addition and subtraction to length.

2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

2.MD.6 Represent whole numbers as lengths from 0 on a number line diagrams with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole number sums and differences within 100 on a number line diagram.

Evaluating Student Learning Outcomes

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

<table>
<thead>
<tr>
<th>Assessment Task Item</th>
<th>STEP 1</th>
<th>STEP 2</th>
<th>STEP 3</th>
<th>STEP 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Little evidence of reasoning without a correct answer.</td>
<td>Evidence of some reasoning without a correct answer.</td>
<td>Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer.</td>
<td>Evidence of solid reasoning with a correct answer.</td>
</tr>
<tr>
<td></td>
<td>(1 Point)</td>
<td>(2 Points)</td>
<td>(3 Points)</td>
<td>(4 Points)</td>
</tr>
<tr>
<td>1</td>
<td>The student is unable to answer either question correctly.</td>
<td>The student measures the length of the two objects correctly or determines that the pencil is longer.</td>
<td>The student correctly: ▪ Measures the length of the crayon and pencil. ▪ Determines that the pencil is longer. ▪ Makes an error in determining the difference in length.</td>
<td>The student correctly: ▪ Measures the crayon and the pencil. ▪ Determines that the pencil is longer. ▪ Determines the difference in length between the pencil and crayon.</td>
</tr>
<tr>
<td>2.MD.1 2.MD.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The student is unable to answer any question correctly.</td>
<td>▪ The student is not able to choose an appropriate tool for measurement but can accurately depict the two throws with a picture. ▪ Student chooses an appropriate strategy for solving but makes an error in computation.</td>
<td>▪ The student selects an appropriate tool for measurement but cannot explain why or the student selects ruler as the measuring tool. ▪ Student accurately represents the comparison of the throws with a picture. ▪ Correctly identifies contest winner.</td>
<td>The student correctly: ▪ Identifies meter stick as the tool for measurement and defends reasoning. ▪ Student accurately represents the comparison of the throws with a picture. ▪ Correctly identifies contest winner.</td>
</tr>
<tr>
<td>2.MD.1 2.MD.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>▪ The student shows no movement on the ruler. ▪ The student is unable to answer the question correctly.</td>
<td>▪ The student shows only one movement on the ruler. ▪ Student correctly adds 7 but does not subtract 4.</td>
<td>▪ The student shows only one movement on the ruler. ▪ Student correctly identifies where the grasshopper stops.</td>
<td>The student correctly: ▪ Uses centimeter ruler as a number line, showing movement forward and backward as adding and subtracting. ▪ Correctly identifies where the grasshopper stops.</td>
</tr>
<tr>
<td>2.MD.6</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
### A Progression Toward Mastery

<table>
<thead>
<tr>
<th>4</th>
<th>The student gets no or one question correct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.MD.1</td>
<td></td>
</tr>
<tr>
<td>2.MD.2</td>
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<td>2.MD.3</td>
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<td>2.MD.4</td>
<td></td>
</tr>
<tr>
<td>2.MD.5</td>
<td></td>
</tr>
<tr>
<td>2.MD.7</td>
<td>The student gets two to three of the six questions correct.</td>
</tr>
<tr>
<td></td>
<td>The student:</td>
</tr>
<tr>
<td></td>
<td>- Correctly measures length of Ribbon A in either centimeters or paper clips.</td>
</tr>
<tr>
<td></td>
<td>- Provides an explanation of why there is a larger number of centimeters.</td>
</tr>
<tr>
<td></td>
<td>- Makes an error in computation when adding the length of the two ribbons together.</td>
</tr>
<tr>
<td></td>
<td>- Miscalculates the difference in length between the two ribbons.</td>
</tr>
<tr>
<td>2.MD.4</td>
<td>The student:</td>
</tr>
<tr>
<td></td>
<td>- Correctly measures length of Ribbon A in both centimeters and paper clips.</td>
</tr>
<tr>
<td></td>
<td>- Provides accurate explanation of why there is a larger number of centimeters.</td>
</tr>
<tr>
<td></td>
<td>- Correctly estimates Ribbon B in paper clips.</td>
</tr>
<tr>
<td></td>
<td>- Correctly measures Ribbon B key in centimeters.</td>
</tr>
<tr>
<td></td>
<td>- Identifies that Ribbon A is 4 longer than Ribbon B.</td>
</tr>
<tr>
<td></td>
<td>- Determines total length of both ribbons taped together.</td>
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Name: Josh

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

   a. How long is the crayon? 9 centimeters

   b. How long is the pencil? 11 centimeters

   c. Which is longer? Pencil

   d. How much longer? 2 centimeters
2. Samantha and Bill are having a bean bag throwing contest and need to measure each of their throws.

a. Circle the most appropriate tool to measure their throws.
   - ruler
   - paper clips
   - meter stick
   - centimeter cubes

b. Explain your choice using pictures or words.
   Samantha and Bill threw far and a meter stick is the longest tool.

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

   Bill
   Sarah

   3 meters

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

   5 + 3 = 8
   Sarah won because 8 is more than 5.
3. Use the broken centimeter ruler to solve the problem.

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

21 cm.

4. Vanessa’s Ribbons

Ribbon A

Ribbon B

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

11 centimeters

3 paper clips

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

A paperclip is longer than a centimeter, so you need less paperclips.
c. Estimate the length of Ribbon B in paper clips.

2 paper clips

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

\[ 11 - 5 = 6 \text{ cm} \]

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

16 cm

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

\[ 20 - 16 = 4 \text{ cm} \]