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

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.

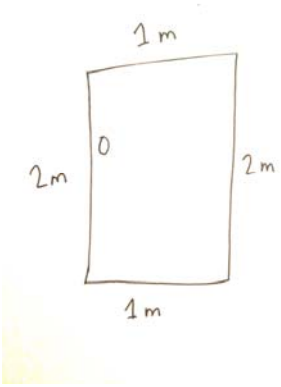
Extension: What would happen if Suzie's meter strip was torn and started at 1 centimeter instead of zero? Would she still be able to measure? (Students orally defend their reasoning.)

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?

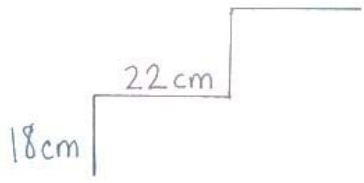


S: Figure out the length around the door using benchmarks like the height of the knob. → Measure around the door with a meter stick and make the ribbon the same length.

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 meters, 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?

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?

MP.2

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?

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 started at the beginning of our meter strip and counted on. → We lined up the meter strip with the lengths and subtracted 4 centimeters from where the object stopped.

T: What is the difference between the length of the table and the length of the cake? (For this example, assume the cake is 45 centimeters and the desk is 60 centimeters.)

S: 60 cm – 45 cm is 15 cm. → 45 cm + 15 more cm = 60 cm.

T: So we know it is long enough. Let's repeat the process to see if it is wide enough for the cake.

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

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

Otherwise, invite students to begin the Problem Set.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

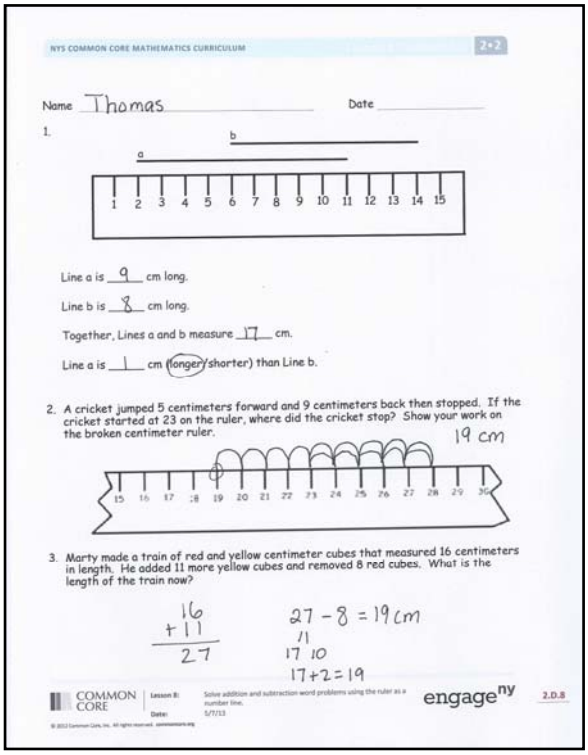
Invite students to come forward and model differing solution methods for Problem 5(c) on the chalkboard.

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

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

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.


NYS COMMON CORE MATHEMATICS CURRICULUM 2•2

Name Thomas Date

1.

Line a is 9 cm long.

Line b is 8 cm long.

Together, Lines a and b measure 17 cm.

Line a is 1 cm (longer/shorter) than Line b.

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

19 cm

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

16 + 11 = 27

27 − 8 = 19 cm

17 10

17 + 2 = 19

COMMON CORE Lesson 8: Solve addition and subtraction word problems using the ruler as a number line. Date: 5/7/13 engage^ny 2.D.8

Student Debrief (10 minutes)

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

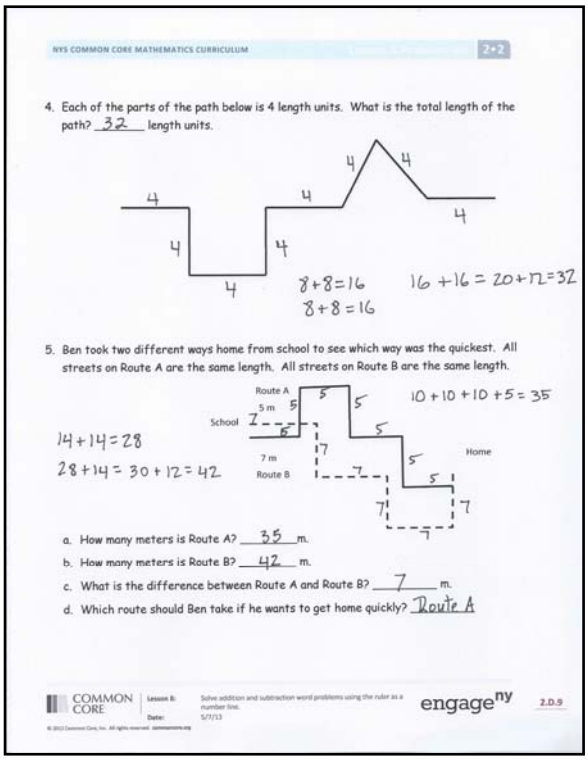
The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

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.

MP.2

- 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?



NYS COMMON CORE MATHEMATICS CURRICULUM 2•2

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

8+8=16 16+16=20+12=32
8+8=16

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

Route A 5 m
School
7 m Route B
Home
10+10+10+5=35
14+14=28
28+14=30+12=42

a. How many meters is Route A? 35 m.
b. How many meters is Route B? 42 m.
c. What is the difference between Route A and Route B? 7 m.
d. Which route should Ben take if he wants to get home quickly? Route A

COMMON CORE Lesson 8: Date: 5/7/13 Solve addition and subtraction word problems using the ruler as a number line. engage^ny 2.D.9

Exit Ticket (3 minutes)

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

A # Correct _____

Find the missing length to make 1 meter.

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

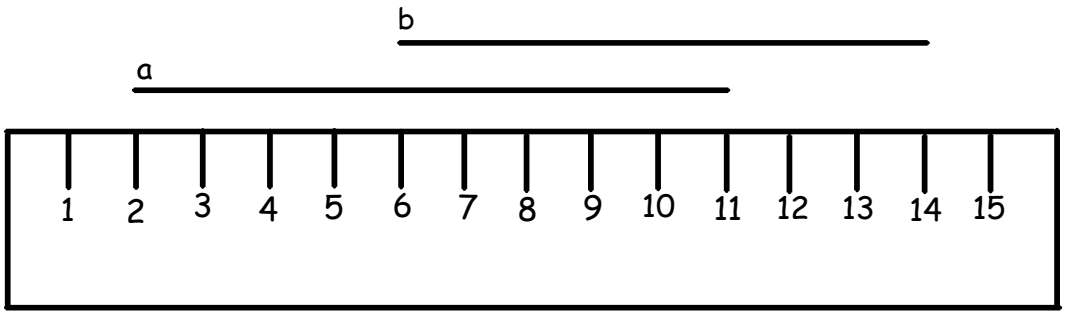
B # Correct _____

Find the missing length to make 1 meter.

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

Name _____ Date _____

1.



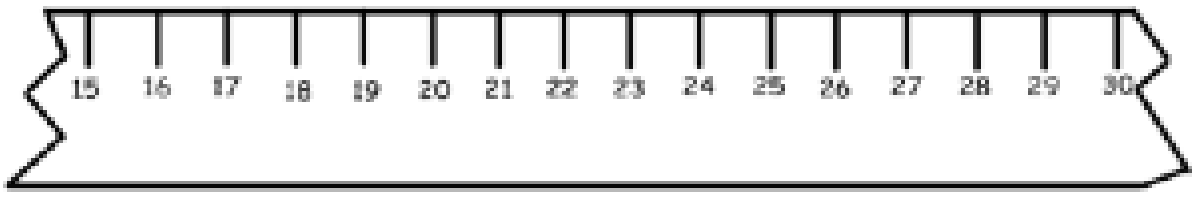
Line a is _____ cm long.

Line b is _____ cm long.

Together, Lines a and b measure _____ cm.

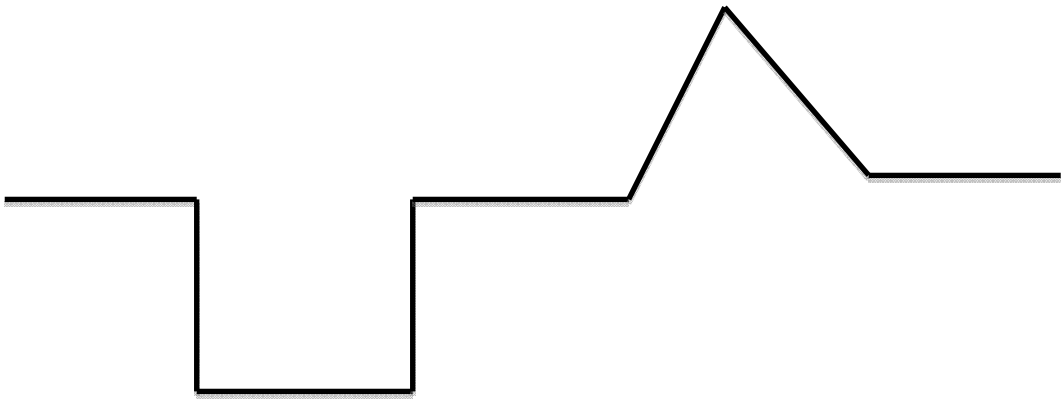
Line a is _____ cm (longer/shorter) than Line b.

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

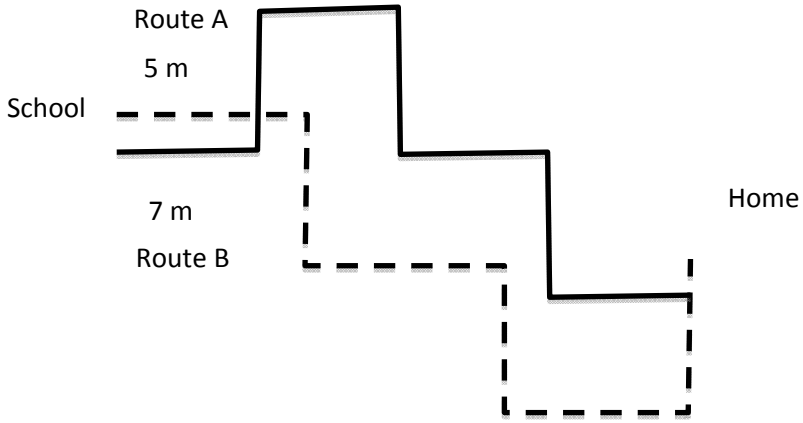


3. Marty made a train of red and yellow centimeter cubes that measured 16 centimeters in length. He added 11 more yellow cubes and removed 8 red cubes. What is the length of the train now?

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



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



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 _____

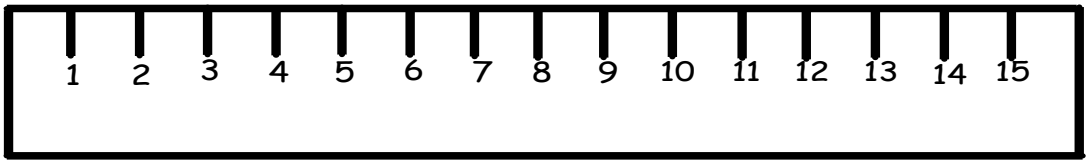
1. Using the ruler below draw one line that begins at 2 cm and ends at 12 cm. Label that line R. Draw another line that begins at 5 cm and ends at 11 cm. Label that line S.

   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.



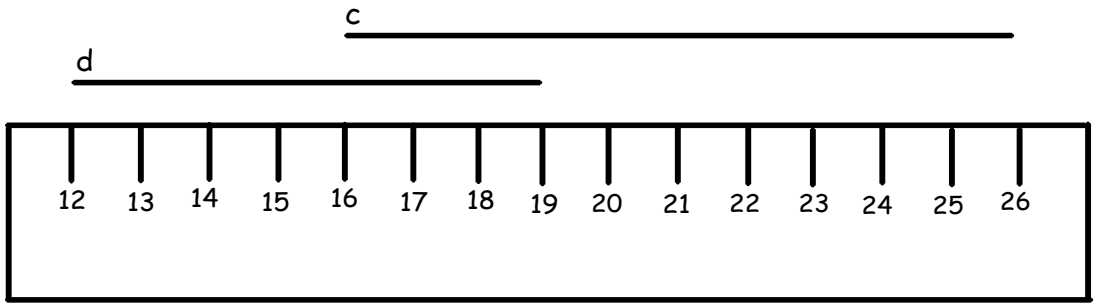
Name _____ Date _____

1. Line c is _____ cm.

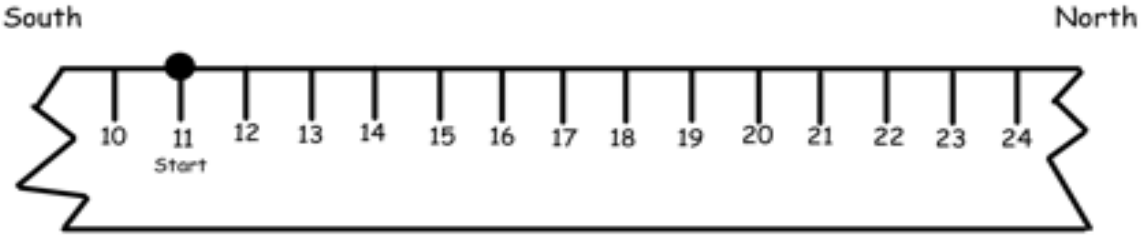
   Line d is _____ cm.

   Lines c and d are _____ cm.

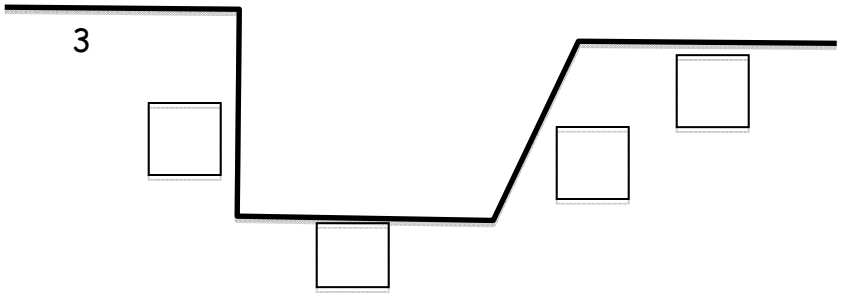
   Line c is _____ cm (longer/shorter) than Line d.



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



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



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?