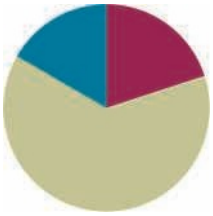
Lesson 1

Objective: Use metric measurement to model the decomposition of one whole into tenths.

Suggested Lesson Structure

Fluency Practice	(12 minutes)
Concept Development	(38 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

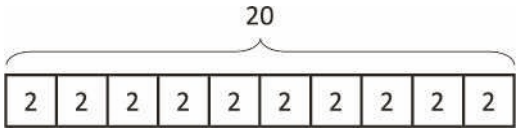
- Divide by 10 **3.4J** (4 minutes)
- Sprint: Divide by 10 **3.4J** (8 minutes)

Divide by 10 (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity prepares students for today's lesson.

T: (Project a strip diagram with a value of 20 partitioned into 10 units.) Say the whole.
S: 20.
T: How many units is 20 divided into?
S: 10.
T: Say the division sentence.
S: 20 ÷ 10 = 2.
T: (Write 2 inside each unit. Write 20 ÷ 10 = 2 beneath the diagram.)



20 ÷ 10 = 2

Continue with the following possible sequence: 200 ÷ 10, 240 ÷ 10, 400 ÷ 10, 430 ÷ 10, 850 ÷ 10, 8,500 ÷ 10, 8,570 ÷ 10, and 6,280 ÷ 10.

Sprint: Divide by 10 (8 minutes)

Materials: (S) Divide by 10 Sprint

Note: This Sprint prepares students for today's lesson.

Concept Development (38 minutes)

Materials: (T) Thousands place value chart (Template), 10 0.1-kilogram bags of rice, digital scale, 1-meter strip of paper, sticky notes, meter stick
(S) Thousands place value chart (Template), meter stick (1 per pair), blank 1-meter strips of paper (2 per pair), centimeter ruler, markers or crayons, blank paper

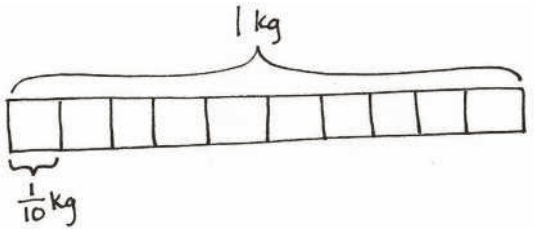
Note: In preparing this lesson's materials, consider the following. If a digital scale is not available, a pan balance can be used with 100-gram weights labeled as 0.1 kg. Cash register tape can be used to make meter strip papers. During Activity 2, use sticky notes to label each of the 10 1-meter strips of paper with one number: 0.1 m, 0.2 m, 0.3 m, …, 1.0 m.

NOTES ON TERMINOLOGY:

Throughout Grade 4 and Grade 5, the terms *decimal number, decimal fraction*, and *decimal* are used interchangeably. *Decimal number* is used to refer to any quantity that is represented by using powers of ten. *Decimal fraction* is used to help maintain student focus on the notion that while they might be learning a new system of notating these quantities, the knowledge that they've previously built to understand fractions applies directly to the quantities under study in this module.

Activity 1: Compose and decompose 1 kilogram, representing tenths in fraction form and decimal form.

T: (Place 10 bags of rice on the scale.) Here are 10 equal bags of rice. Together, all of this rice weighs 1 kilogram.
T: Let's draw a strip diagram to show the total amount of rice. Draw the strip as long as you can on your blank paper. What is our total amount?
S: 1 kilogram.
T: Let's write 1 kg above the strip diagram to show that the whole strip represents 1 kilogram.
T: How can we represent the 10 equal bags on the strip diagram?
S: Make 10 equal parts.
T: Partition your strip diagram to show 10 equal parts. Each of these parts represents what fraction of the whole?
S: 1 tenth! (Divide the strip diagram into 10 equal parts.)
T: (Remove all bags from the scale. Hold 1 bag in front of the class.) What fractional part of 1 kilogram is 1 bag? Point to the part this 1 bag represents on your strip diagram.



S: $\frac{1}{10}$. (Point to 1 part.)
T: Let's write the weight of this bag on your strip diagram. What is the weight of 1 bag?
S: $\frac{1}{10}$ kilogram.
T/S: (Write $\frac{1}{10}$ kg.)
T: (Place the second bag of rice in front of the class.) What is the weight of 2 bags?
S: $\frac{2}{10}$ kilogram.

Continue to count by tenths to compose 1 kilogram.

T: Let's make a number line the same length as the strip diagram, and mark the tenths to match the parts of the strip diagram. Label the endpoints 0 and 1.

T: Let's see what $\frac{1}{10}$ kilogram looks like on the scale. (Place 1 bag on the scale and display the weight as 0.1). This scale confirms that this bag weighs one-tenth kilogram. (Write $\frac{1}{10}$ = 0.1.) How is this way of writing one tenth the same and different from writing one tenth as a fraction? Turn and talk.

thousands	hundreds	tens	ones	.	tenths	hundredths

S: There is still 1 unit. → I see a "1" in both ways of writing. → The fraction form doesn't have a zero. → I don't see the tenths part in the way the scale shows the weight.

T: (Display 6 column place value chart with only ones, tens and hundreds labeled.) How could we show the weight of all ten bags of rice, 1 kg, on the place value chart?

S: Put a 1 in the ones place.

T: To show the weight of 1 bag of rice, $\frac{1}{10}$ kg, do you think that we will write the 1 to the right or the left of the weight of the 10 bags of rice on the place value chart? Explain your thinking.

S: It must be written to the right. It is a smaller amount. → The units to the left are 10 times as much, and tenths are smaller units than ones. → When we move to the right on the place value chart the units are smaller and smaller. Since tenths are smaller than ones, I think we will write tenths to the right of the ones. → We know that when you divide by 10, the digit moves to the right.

T: That's right. To show 1 tenth on the place value chart we must place the digit in the **tenths** column (Write tenths on the place value chart.)

T: How many tenths are in 1 one?

S: 10 tenths.

T: We know that each place value to the left is 10 times as much as the one on its right. When we divide a number by 10, how do the digits move on the place value chart? Explain your thinking.

S: The digits move to the right. → We unbundle the number for 10 of a smaller unit and then divide.

T: Draw 1 thousand disk on your place value chart. What is the result if we divide 1 thousand by 10? Show this on your chart and write a division sentence.

Continue this sequence until the tenths place is reached, emphasizing the unbundling for 10 of the smaller unit and then the division. Record the place values and equations (using unit form) on the board being careful to point out the *1 tenth as large* relationship.

1 thousand ÷ 10 = 1 hundred

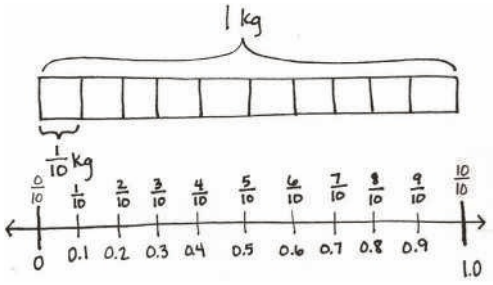
1 hundred ÷ 10 = 1 ten

1 ten ÷ 10 = 1 one

1 one ÷ 10 = 1 tenth

T: (Write 0.1 on the number line.) We call this way of writing one-tenth a **decimal number**. As we saw on the scale, we read this decimal as 1 **tenth**, just like the fraction $\frac{1}{10}$. The decimal form is written as zero point one. The zero shows that we have no ones. The dot in a decimal number is called a **decimal point**. The decimal point separates the wholes from the fractions.

(Write 1 tenth = $\frac{1}{10}$ = 0.1.) 1 tenth is written in unit form, as a **decimal fraction**, and as a decimal number. They are all equal and we read them all as *one-tenth*.



T: Write 1 tenth in decimal form on your number line, just like I did.

S: (Write 0.1 on the number line.)

T: Let's see how the number in decimal form changes as we add more bags or tenths of a kilogram.

T: We can express the weight of 1 bag two ways: zero point one kilogram, or 1 tenth kilogram. Tell me the weight of 2 bags using both ways. Start with the decimal point way.

S: Zero point two kilogram. 2 tenths kilogram.

T: (Invite a few students to the front of the room. Distribute two to three bags to each student.) As we add each bag, count and see how the scale shows the weight in decimal form, and record it on your number line.

S/T: Zero point two kilogram, 2 tenths kilogram, zero point three kilogram, 3 tenths kilogram, …, zero point nine kilogram, 9 tenths kilogram, one point zero kilogram, 1 kilogram!

T: Notice the scale uses decimal form for 10 tenths. 10 tenths is equal to how many ones and how many tenths?

S: 1 one and 0 tenths.

T: So, we record that as 1 point 0. Revise your number line.

T: (Take off 2 bags to show 0.8 kg.) How many tenths are on the scale now?

S: 8 tenths kilogram.

T: Record the weight of 8 bags in fraction form and decimal form. Use an equal sign.

S: (Write $\frac{8}{10}$ kg = 0.8 kg.)

T: I have 2 bags in my hand. Write the weight of this amount of rice in fraction form and decimal form. Use an equal sign.

S: (Write $\frac{2}{10}$ kg = 0.2 kg.)

T: When I put together $\frac{2}{10}$ kilogram and $\frac{8}{10}$ kilogram, I have…?

S: 1 kilogram!

T: (Write 0.2 kilogram + 0.8 kilogram = 1 kilogram.) What other pairs of tenths would make 1 kilogram when put together?

S: $\frac{3}{10}$ kilogram and $\frac{7}{10}$ kilogram. → $\frac{6}{10}$ kilogram and $\frac{4}{10}$ kilogram.

As students share out pairs, write the number sentences using decimal form.

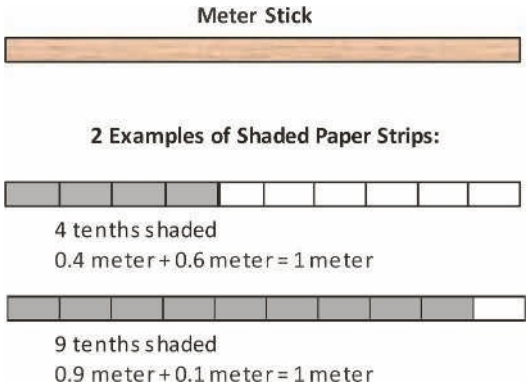
NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Students who are not invited to place weights on the scale may enjoy shading units or placing counters in the strip diagram for each bag placed on the scale.

English language learners will benefit from a posted place value chart with the words clearly visible.

Activity 2: Decompose 1 meter, representing tenths in fraction form and decimal form.

Give each pair of students a meter stick and two strips of paper that are each 1 meter long. Ask them to use their meter sticks to divide each paper strip into 10 equal parts. Have them then shade with markers or crayons to show different numbers of tenths. As they work, collect strips to make an ordered set on the board, starting with 1 meter to show 10 tenths, 9 tenths, etc. Generate and record the partner each strip needs to make 1 meter next to each strip (e.g., 0.9 meter + 0.1 meter = 1 meter). Have students then generate two or three equivalent number sentences showing the equality of fraction form and decimal form (e.g., $\frac{1}{10}$ meter = 0.1 meter).



Activity 3: Decompose 1 centimeter, representing tenths in fraction form and decimal form.

T: Now that we have practiced decomposing a meter into tenths, let's use that same thinking to decompose a centimeter into tenths.

T: Take out your centimeter ruler, and draw a 1-centimeter line on the blank paper.

S: (Draw.)

T: Each centimeter has been partitioned into equal parts. How many equal parts are there from 0 to 1 centimeter?

S: 10 parts.

T: What fraction of a centimeter is one part?

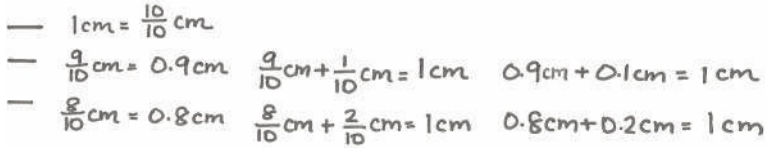
S: 1 tenth.

T: How many units of 1 tenth equal 1 centimeter?

S: 10 tenths.

T: Label your line. 1 cm = $\frac{10}{10}$ cm.

T: Below your line, make a line that measures $\frac{9}{10}$ centimeter. Label your line in fraction form and decimal form.



S: (Draw a line 0.9 cm in length. Write $\frac{9}{10}$ cm = 0.9 cm.)

T: How many more tenths of a centimeter do we need to have 1 centimeter?

S: We would need 0.1 cm more.

T: (Write $\frac{9}{10}$ cm + $\frac{1}{10}$ cm = 1 cm and 0.9 cm + 0.1 cm = 1 cm.)

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Students with low vision or other perceptual challenges may find drawing a 1-centimeter line and deciphering millimeters difficult. A centimeter stencil that students can easily trace may be beneficial. In addition to having students interact with a to-scale centimeter (such as a cube), it may help to project teacher modeling with an overhead projector or document camera, if available.

T: Now, draw a line below these lines that measures $\frac{8}{10}$ centimeter. Label this new line in fraction and decimal form. Write an addition sentence in both fraction and decimal form to show how many more tenths of a centimeter you need to get to 1 centimeter.

S: (Draw and label $\frac{8}{10}$ cm and 0.8 cm. Write $\frac{8}{10}$ cm + $\frac{2}{10}$ cm = 1 cm and 0.8 cm + 0.2 cm = 1 cm.)

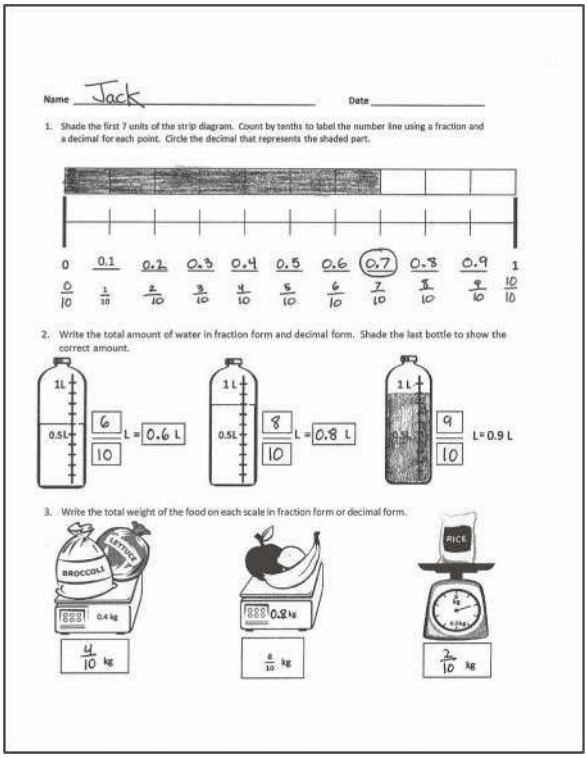
T: Continue writing more pairs as you work, making a line that is $\frac{1}{10}$ centimeter shorter each time.

Select students to share so that the fraction form and decimal form of the number sentence are presented to the class.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. Some problems do not specify a method for solving. This is an intentional reduction of scaffolding that invokes MPS(C). Students should solve these problems using the RDW approach used for Application Problems.

For some classes, it may be appropriate to modify the assignment by specifying which problems students should work on first. With this option, let the purposeful sequencing of the Problem Set guide the selections so that problems continue to be scaffolded. Balance word problems with other problem types to ensure a range of practice. Consider assigning incomplete problems for homework or at another time during the day.


Name Jack Date

1. Shade the first 7 units of the strip diagram. Count by tenths to label the number line using a fraction and a decimal for each point. Circle the decimal that represents the shaded part.

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

$\frac{0}{10}$ $\frac{1}{10}$ $\frac{2}{10}$ $\frac{3}{10}$ $\frac{4}{10}$ $\frac{5}{10}$ $\frac{6}{10}$ $\frac{7}{10}$ $\frac{8}{10}$ $\frac{9}{10}$ $\frac{10}{10}$

2. Write the total amount of water in fraction form and decimal form. Shade the last bottle to show the correct amount.

1 L, 0.5 L: $\frac{6}{10}$ L = 0.6 L; $\frac{8}{10}$ L = 0.8 L; $\frac{9}{10}$ L = 0.9 L

3. Write the total weight of the food on each scale in fraction form or decimal form.

BROCCOLI 0.4 kg $\frac{4}{10}$ kg; 0.8 kg $\frac{8}{10}$ kg; RICE $\frac{2}{10}$ kg

Student Debrief (10 minutes)

Lesson Objective: Use metric measurement to model the decomposition of one whole into tenths.

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

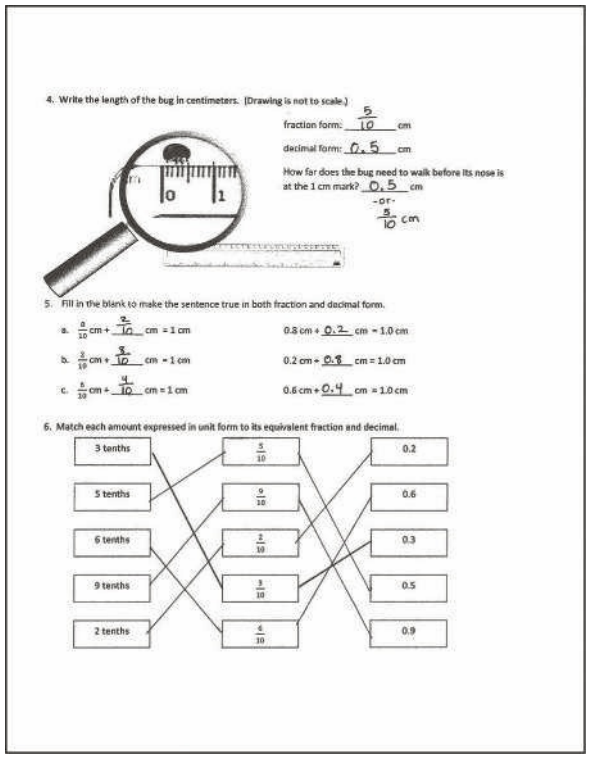
Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

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

- In Problem 2, 8 tenths liter was represented. How is that different from the 8 tenths kilogram in

Problem 3? How is representing 8 tenths liter similar to representing 8 tenths kilogram?

- In Problem 2, we measured liters of water. What other type of material might we be measuring when we measure 6 tenths of a liter? Where have you seen or used liters in your everyday life?
- Look at Problem 5. How is getting to 1 centimeter similar to getting to 10, as you did in earlier grades? How did getting to 10 help you in the past? How do you think getting to 1 might help you now?
- What relationship does 1 **tenth** have to 1?
- How did your work with **decimal fractions** like $\frac{3}{10}$, $\frac{7}{10}$, or $\frac{9}{10}$ prepare you for this lesson?
- Today, we studied **decimal numbers**, and we wrote them in fraction form and decimal form. How are the two forms alike? How are they different?
- What purpose does a **decimal point** serve?
- During Fluency Practice, you divided numbers by 10. How did today's work of dividing one whole into parts relate to your fluency work? When you divide 20 by 10, what is your equal unit? When you divide 1 into 10 equal parts, what is your equal unit?



Exit Ticket (3 minutes)

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