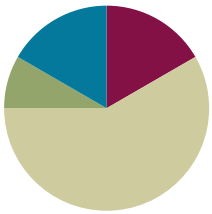
Lesson 9

Objective: Use the place value chart and metric measurement to compare decimals and answer comparison questions.

Suggested Lesson Structure



Fluency Practice	(10 minutes)
Application Problem	(5 minutes)
Concept Development	(35 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**

Fluency Practice (10 minutes)

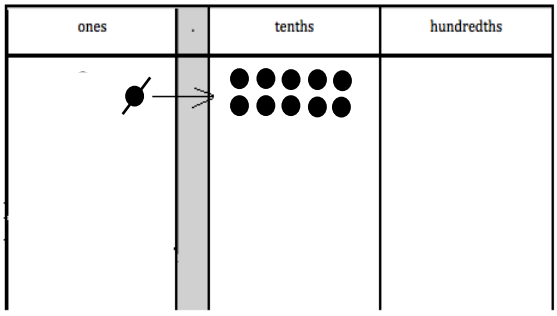
- Decompose Larger Units **4.NF.5** (3 minutes)
- Decimal Fraction Equivalence **4.NF.5** (5 minutes)
- Rename the Decimal **4.NF.5** (2 minutes)

Decompose Larger Units (3 minutes)

Materials: (S) Personal white board, place value chart

Note: This fluency activity reviews G4–M6–Lesson 8.

T: (Write 1.) Say the number in unit form.
S: 1 one.
T: Draw 1 one on your place value chart.
S: (Draw 1 one disk.)
T: (Write 1 one = __ tenths.) Rename 1 one for tenths.
S: (Cross out the one disk and draw 10 tenth disks.)



1 one = 10 tenths

Continue this process using the following possible sequence:

- Rename 1 one 2 tenths for tenths.
- Rename 1 tenth for hundredths.
- Rename 1 tenth 2 hundredths for hundredths.
- Rename 2 ones 3 tenths for tenths (leads into the next fluency activity).

Decimal Fraction Equivalence (5 minutes)

Materials: (S) Personal white board, place value chart

Note: This fluency activity reviews G4–M6–Lesson 8. For 4 ones 23 hundredths, 1 ten 7 tenths, and 3 tens 4 ones 12 hundredths, have the students express their answers in tenths and hundredths.

T: (Write 2 ones and 3 tenths.) Write the number in digits on your place value chart.

S: (Write the digit 2 in the ones place and the digit 3 in the tenths place.)

T: (Write 2.3 = ___ —.) Write the number as a mixed number.

S: (Write 2.3 = $2\frac{3}{10}$.)

T: (Write 2.3 = $2\frac{3}{10} = \frac{\quad}{10}$.) Write the number as a fraction greater than 1.

S: (Write 2.3 = $2\frac{3}{10} = \frac{23}{10}$.)

Ones	.	Tenths	Hundredths
2	.	3	

$2.3 = 2\frac{3}{10} = \frac{23}{10}$

Continue this process for the following possible sequence: 4 ones 23 hundredths, 1 ten 7 tenths, and 3 tens 4 ones 12 hundredths.

Rename the Decimal (2 minutes)

Materials: (S) Personal white board, place value chart

Note: This fluency activity reviews G4–M6–Lesson 8.

T: (Write 3.1.) Write the decimal as a mixed number.

S: (Write $3\frac{1}{10}$.)

T: (Write 3.1 = $3\frac{1}{10} = \frac{\quad}{10}$.) Complete the number sentence.

S: (Write 3.1 = $3\frac{1}{10} = \frac{31}{10}$.)

T: (Write 3.1 = $3\frac{1}{10} = \frac{31}{10} = \frac{\quad}{100}$.) Complete the number sentence.

S: (Write 3.1 = $3\frac{1}{10} = \frac{31}{10} = \frac{310}{100}$.)

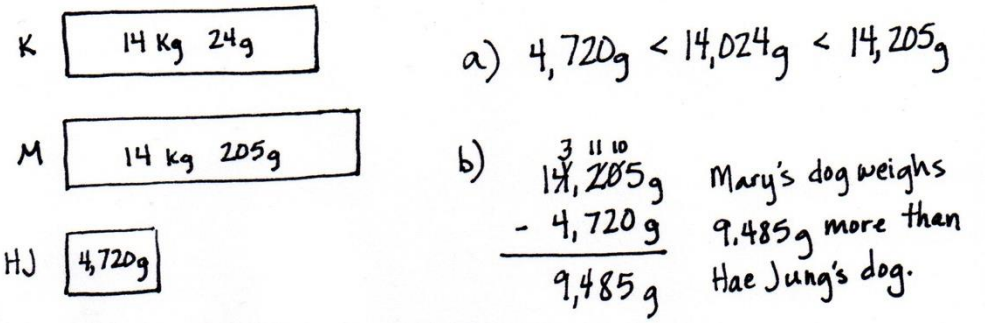
Continue this process for the following possible suggestions: 9.8, 10.4, and 64.3.

Application Problem (5 minutes)

Kelly's dog weighs 14 kilograms 24 grams. Mary's dog weighs 14 kilograms 205 grams. Hae Jung's dog weighs 4,720 grams.

a. Order the weight of the dogs in grams from least to greatest.

b. How much more does the heaviest dog weigh than the lightest dog?



Note: This Application Problem reviews decomposition of a number with mixed units. Students will need to convert the weight of Kelly's dog to 14,024 grams. The weight of Mary's dog may help them avoid the common error of 1,424 grams because of its inclusion of 205 grams. If there is time, you might show a place value chart from ten thousands to hundredths to model the whole number conversion of the weights to grams and to then compare it to the conversion of ones to tenths and tenths to hundredths that was just revisited during Fluency Practice.

Concept Development (35 minutes)

Materials: (T) 2 meter sticks, 2 rolls of different color masking tape (e.g., yellow and blue), metric scale, 4 graduated cylinders, bags of rice, water, food coloring, document camera (S) Personal white board, measurement recording template

Materials Note:

- Prepare 2 meter sticks by taping colored masking tape onto the edge of each meter stick to the following lengths: 0.67 m (yellow tape), 0.59 m (blue tape). Do not cover the hash marks or the numbers on the meter sticks.
- Prepare and label 4 bags of rice weighing 0.10 kg (Bag A), 0.65 kg (Bag B), 0.7 kg (Bag C), and 0.46 kg (Bag D).
- Prepare 4 graduated cylinders with water measuring 0.3 liters, 0.15 liters, 0.29 liters, and 0.09 liters.

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

If a document camera, overhead projector, SMART board, or other tool that allows you to present a magnified image of the meter stick is not available, consider having students use pre-marked meter sticks at their desks. Certain hardware and home furnishings stores and websites offer meter sticks or tape for free.

Use food coloring to ease in the reading of the measures.

Problem 1: Compare pairs of decimal numbers representing length.

T: (Hold up the meter stick with the yellow tape that measures 0.67 m, then place it under document camera.) Express the length of this yellow tape as a fraction of a meter.

S: $\frac{67}{100}$ meter.

T: On your template, shade in your tape diagram to represent the length of the yellow tape on the meter stick. Write the length of the tape in decimal form.

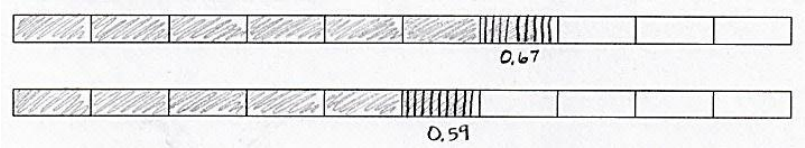
T: (Hold up the meter stick with blue tape that measures 0.59 m, then project the portion of the meter stick that shows the length of the blue tape under document camera.) Express the length of this blue tape as a fraction of a meter.

S: $\frac{59}{100}$ meter.

T: On your template, shade in your tape diagram to represent the length of the blue tape on the meter stick. Write the length of the tape in decimal form. Record both lengths in a place value chart. (Allow students time to complete task.)

T: Use the words *longer than* or *shorter than* to compare these two lengths of tape.

S: 0.67 meter is longer than 0.59 meter. → 0.59 meter is shorter than 0.67 meter. → 67 centimeters is longer than 59 centimeters, so I know 0.67 meter is longer than 0.59 meter.

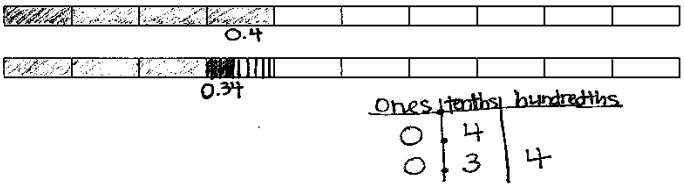


T: Share with a partner. How can the place value chart help you compare these numbers?

S: We can compare the digits in the largest place first. Both measures have 0 in the ones place, so we move to the tenths place. The first tape has 6 tenths. That's greater than 5 tenths. → You don't even need to look at the hundredths place. Once you see that 6 tenths is greater than 5 tenths, you know that the first tape is longer.

ones		tenths	hundredths
0	.	6	7
0	.	5	9

Remove enough tape from each meter stick to create the following lengths: 0.4 m and 0.34 m. Repeat the process.



Problem 2: Compare pairs of decimal numbers representing mass.

T: (Place Rice Bag A on scale.) What is the mass of this bag of rice?

S: Zero point one kilogram. → $\frac{1}{10}$ kilogram. → $\frac{10}{100}$ kilogram (see image below).

T: Record the mass in the table on your template.

Repeat this process for the remaining bags.

T: (Leave Bag D, weighing 0.46 kg, on the scale.) Which bags are heavier than Bag D? How do you know?

S: Bags B and C were heavier than Bag D. → Bag B was 0.65 kg and Bag C was 0.7 kg. Those numbers are both larger than 0.46 kg, so the bags are heavier. → I look at my chart, from left to right. In the tenths column, I could see that Bag A was lighter. It had only 1 tenth. Bags B and C were heavier than D because they both had more tenths.

T: Let's look at Bags B and C. Make a statement comparing their mass.

S: 0.65 kilograms is lighter than 0.7 kilograms. → 0.7 kilograms is heavier than 0.65 kilograms.

T: How do you know?

S: I could just see that the bag was fuller and feel that the bag has more mass. → At first I thought 65 hundredths was more because it looks like you are comparing 65 and 7 and 65 is greater than 7. But, then we saw that it was 7 tenths, which is more than 6 tenths. → I realized that 7 tenths is 70 hundredths and that is greater than 65 hundredths.

T: With your partner, make another statement to compare the bags. You can compare just two items, or you can compare more than two items.

S: (Responses will vary.)

T: Based on these comparisons, what is the mass of the bags in order from heaviest to lightest?

Rice Bag	ones (kilograms)	.	tenths	hundredths
A	0	.	1	0
B	0	.	6	5
C	0	.	7	
D	0	.	4	6

0.7 kg, 0.65 kg, 0.46 kg, 0.1 kg

S: 0.7 kg, 0.65 kg, 0.46 kg, 0.1kg.

T: (Select a student volunteer.) Arrange the bags from heaviest to lightest. Looking at the bags, does it *appear* that we have properly ordered the bags from heaviest to lightest? Do they match the order we determined?

S: Yes.

NOTES ON TERMINOLOGY:

Mass is a fundamental measure of the amount of matter in an object. While weight is a measurement that depends upon the force of gravity (one would weigh less on the moon than one does on earth), mass does not depend upon the force of gravity. Both words are used here, but it is not important for students to recognize the distinction at this time.

Problem 3: Compare pairs of decimal numbers representing volume.

T: (Place all four graduated cylinders in front of the class.) Express the volume of the liquid in tenths or hundredths liter. (Use the document camera to project the side of Cylinder A so students can see the liter measurements. If this is not possible, select a student to read the volume aloud.)

S: $\frac{3}{10}$ liter. → $\frac{30}{100}$ liter.

T: Record this volume in the table on your template.

Repeat the process for the remaining water samples.

T: If we want to order these samples from least volume to greatest volume, what would the order be? Talk with your partner, and record your thinking on your template. (Circulate to encourage use of the place value chart as students compare the measurements.)

S: (Complete the task.)

S: 0.09 liters, 0.15 liters, 0.29 liters, 0.3 liters.

T: How did you determine the order?

S: The place value chart made it easy to compare the decimals. → We compared the digits in the largest place first. That was the tenths. → In 0.3, there are 3 tenths. That is more than the others. 0.29 comes next followed by 0.15 and 0.09.

T: (Select a student volunteer to order cylinders from least volume to greatest volume.) Let's look at the cylinders. Do they appear to match the order we determined?

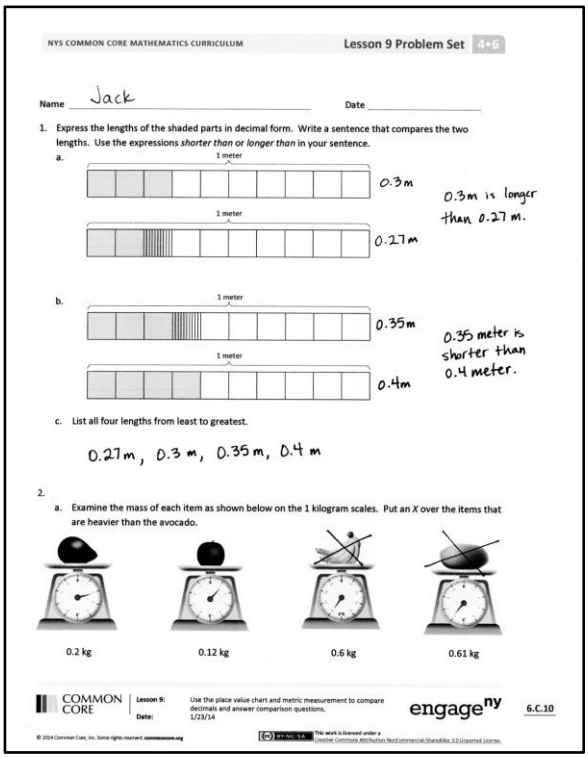
S: Yes!

Cylinder	ones (liters)	.	tenths	hundredths
A	0	.	3	
B	0	.	1	5
C	0	.	2	9
D	0	.	0	9

0.09 L, 0.15 L, 0.29 L, 0.3 L

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 Lesson 9 Problem Set 4•6

Name Jack Date

1. Express the lengths of the shaded parts in decimal form. Write a sentence that compares the two lengths. Use the expressions *shorter than* or *longer than* in your sentence.

a. 1 meter — 0.3m; 1 meter — 0.27m. 0.3m is longer than 0.27 m.

b. 1 meter — 0.35m; 1 meter — 0.4m. 0.35 meter is shorter than 0.4 meter.

c. List all four lengths from least to greatest.

0.27m, 0.3 m, 0.35 m, 0.4 m

2. a. Examine the mass of each item as shown below on the 1 kilogram scales. Put an *X* over the items that are heavier than the avocado.

0.2 kg 0.12 kg 0.6 kg 0.61 kg

COMMON CORE | Lesson 9: Date: | Use the place value chart and metric measurement to compare decimals and answer comparison questions. 1/23/14 | engage^ny | 6.C.10

Student Debrief (10 minutes)

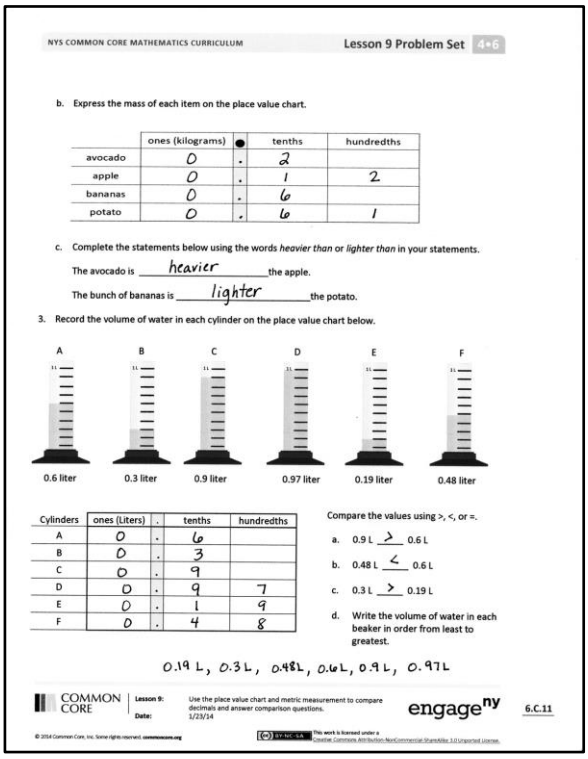
Lesson Objective: Use the place value chart and metric measurement to compare decimals and answer comparison questions.

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 do the tape diagrams in Problem 1 support your statements? Make a statement comparing a length from Part (a) to a length from Part (b).
- Share one of your statements for Problem 2(c). Explain your reasoning.
- How did the place value chart help to compare and order the different measurements in Problem 3?
- How is comparing decimal measurements of length, mass, and volume similar? How is it different?
- How did the Application Problem connect to today's lesson?



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 9 Problem Set 4•6

b. Express the mass of each item on the place value chart.

	ones (kilograms)	●	tenths	hundredths
avocado	0	.	2	
apple	0	.	1	2
bananas	0	.	6	
potato	0	.	6	1

c. Complete the statements below using the words *heavier than* or *lighter than* in your statements.

The avocado is heavier than the apple.

The bunch of bananas is lighter than the potato.

3. Record the volume of water in each cylinder on the place value chart below.

A B C D E F

0.6 liter 0.3 liter 0.9 liter 0.97 liter 0.19 liter 0.48 liter

Cylinders	ones (Liters)	.	tenths	hundredths
A	0	.	6	
B	0	.	3	
C	0	.	9	
D	0	.	9	7
E	0	.	1	9
F	0	.	4	8

Compare the values using >, <, or =.

a. 0.9 L > 0.6 L

b. 0.48 L < 0.6 L

c. 0.3 L > 0.19 L

d. Write the volume of water in each beaker in order from least to greatest.

0.19 L, 0.3 L, 0.48 L, 0.6 L, 0.9 L, 0.97 L

COMMON CORE Lesson 9: Use the place value chart and metric measurement to compare decimals and answer comparison questions. Date: 1/23/14 engage^ny 6.C.11

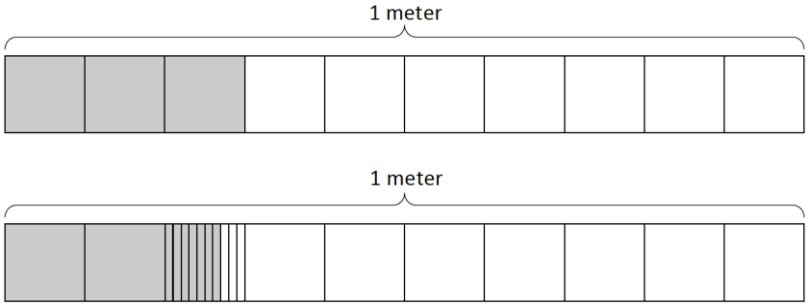
Exit Ticket (3 minutes)

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.

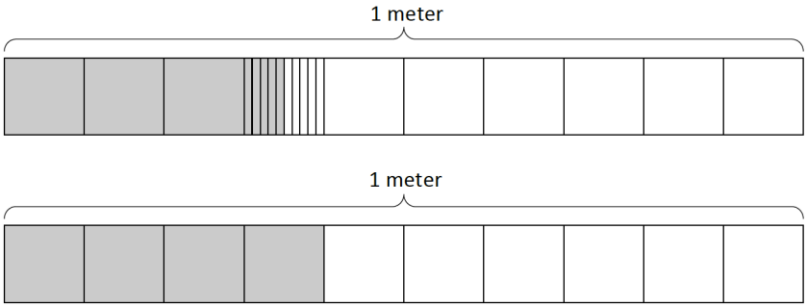
Name _____ Date _____

1. Express the lengths of the shaded parts in decimal form. Write a sentence that compares the two lengths. Use the expression *shorter than* or *longer than* in your sentence.

a.



b.



c. List all four lengths from least to greatest.

2.

a. Examine the mass of each item as shown below on the 1 kilogram scales. Put an X over the items that are heavier than the avocado.

0.2 kg

0.12 kg

0.6 kg

0.61 kg

b. Express the mass of each item on the place value chart.

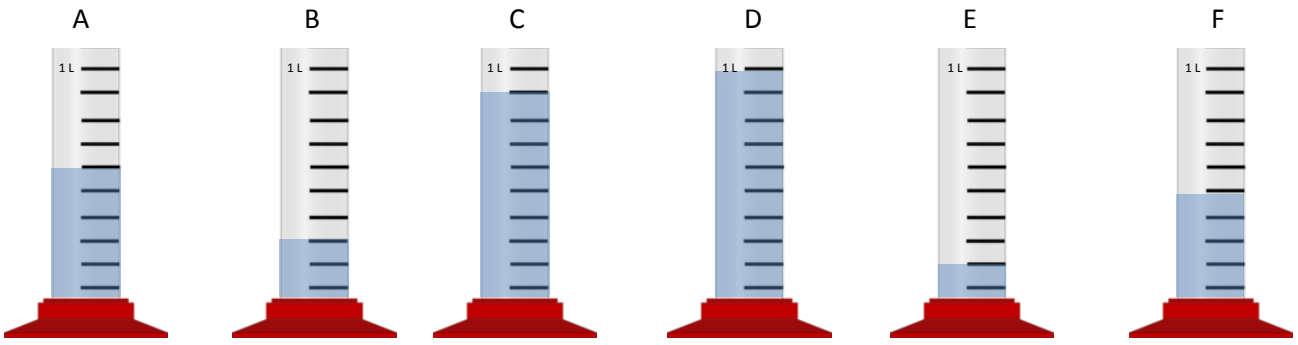
	ones (kilograms)	●	tenths	hundredths
avocado				
apple				
bananas				
potato				

c. Complete the statements below using the words *heavier than* or *lighter than* in your statements.

The avocado is _____ the apple.

The bunch of bananas is _____ the potato.

3. Record the volume of water in each cylinder on the place value chart below.



0.6 liter 0.3 liter 0.9 liter 0.97 liter 0.19 liter 0.48 liter

Cylinders	ones (Liters)	.	tenths	hundredths
A				
B				
C				
D				
E				
F				

Compare the values using >, <, or =.

a. 0.9 L _____ 0.6 L

b. 0.48 L _____ 0.6 L

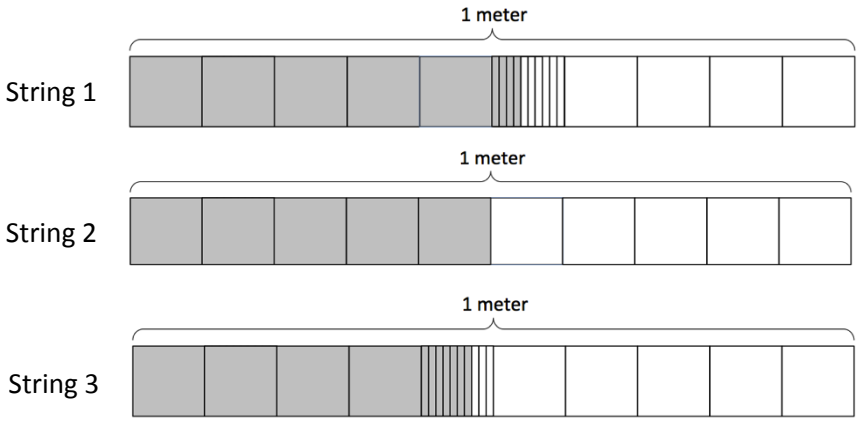
c. 0.3 L _____ 0.19 L

d. Write the volume of water in each beaker in order from least to greatest.

Name _____ Date _____

1.

a. Doug measures the lengths of three strings and shades tape diagrams to represent the length of each string, as shown below. Express, in decimal form, the length of each string.



b. List the lengths of the strings in order from greatest to least.

2. Compare the values below using >, <, or =.

a. 0.8 kg _____ 0.6 kg

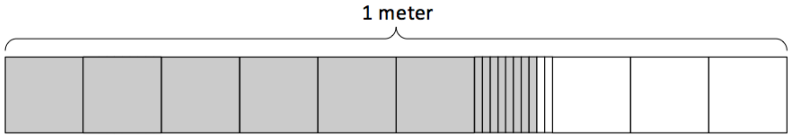
b. 0.36 kg _____ 0.5 kg

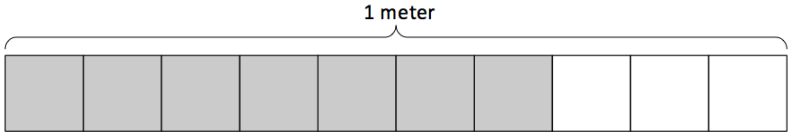
c. 0.4 kg _____ 0.47 kg

Name _____ Date _____

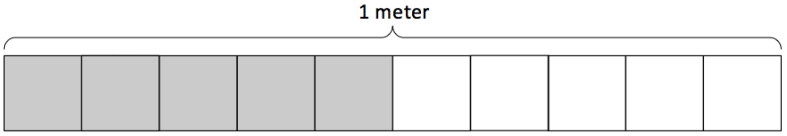
1. Express the lengths of the shaded parts in decimal form. Write a sentence that compares the two lengths. Use the expression *shorter than* or *longer than* in your sentence.

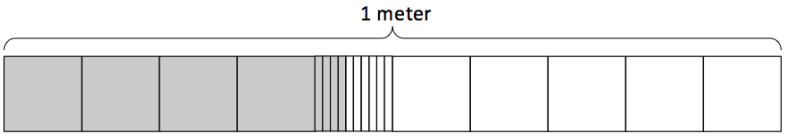
a.





b.





c. List all four lengths from least to greatest.

2.

a. Examine the mass of each item as shown below on the 1 kilogram scales. Put an X over the items that are heavier than the volleyball.

0.15 kg

0.62 kg

0.43 kg

0.25 kg

b. Express the mass of each item on the place value chart.

	ones (kilograms)	●	tenths	hundredths
baseball				
volleyball				
basketball				
soccer ball				

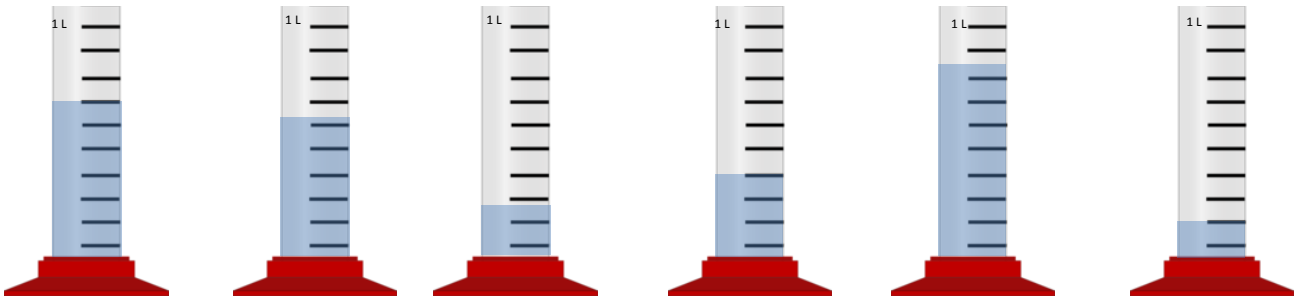
c. Complete the statements below using the words *heavier than* or *lighter than* in your statements.

The soccer ball is _____ the baseball.

The volleyball is _____ the basketball.

3. Record the volume of water in each cylinder on the place value chart below.

A B C D E F



0.7 liter 0.62 liter 0.28 liter 0.4 liter 0.85 liter 0.2 liter

Cylinder	ones (liters)	.	tenths	hundredths
A				
B				
C				
D				
E				
F				

Compare the values using >, <, or =.

a. 0.4 L _____ 0.2 L

b. 0.62 L _____ 0.7 L

c. 0.2 L _____ 0.28 L

d. Write the volume of water in each beaker in order from least to greatest.

Measurement Recording Template

Rice Bag	ones (kilograms)	.	tenths	hundredths
A				
B				
C				
D				

Cylinder	ones (liters)	.	tenths	hundredths
A				
B				
C				
D				