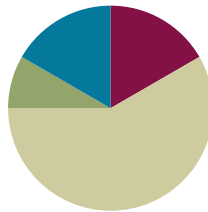


Lesson 9

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)

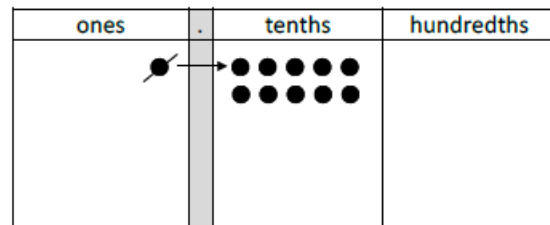
- Decompose Larger Units **4.NF.5** (3 minutes)
- Decimal Fraction Equivalence **4.NF.5** (5 minutes)
- Rename the Decimal **4.NF.5** (2 minutes)

Decompose Larger Units (3 minutes)

Materials: (S) Personal white board, place value chart (Lesson 7 Template)

Note: This fluency activity reviews 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 (Lesson 7 Template)

Note: This fluency activity reviews 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 $2.3 = \underline{\quad} \text{—.}$) 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

Note: This fluency activity reviews 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 sequence: 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.

- Order the weight of the dogs in grams from least to greatest.
- How much more does the heaviest dog weigh than the lightest dog?

Handwritten student work:

K 14 Kg 24g

M 14 kg 205g

HJ 4,720g

a) $4,720g < 14,024g < 14,205g$

b)
$$\begin{array}{r} 0^{13} \quad 11^{10} \\ 14,205g \\ - 4,720g \\ \hline 9,485g \end{array}$$
 Mary's dog weighs 9,485g more than Hae Jung's dog.

Note: This Application Problem reviews decomposition of a number with mixed units. Students 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.

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 record (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 and label four graduated cylinders with water measuring 0.3 liter (Cylinder A), 0.15 liter (Cylinder B), 0.29 liter (Cylinder C), and 0.09 liter (Cylinder D). Use food coloring to help students read the measurements.

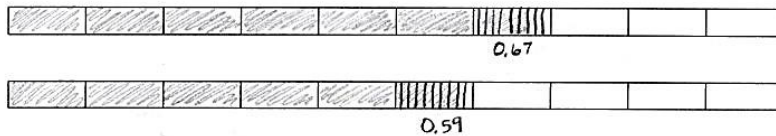


NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

If a document camera, overhead projector, interactive white board, or other means of magnifying the 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. A meter tape template is also available in Grade 2 Module 2 Lesson 6.

Problem 1: Compare pairs of decimal numbers representing length.

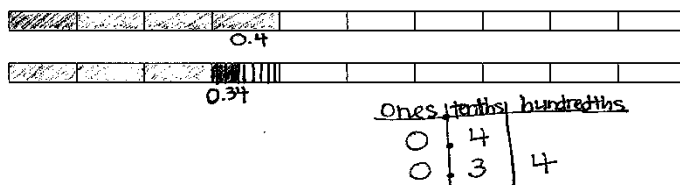
- T: (Hold up the meter stick with the yellow tape that measures 0.67 m, and then place it under the document camera.) Express the length of this yellow tape as a fraction of a meter.
- S: $\frac{67}{100}$ meter.
- T: On the measurement record, shade the tape diagram to represent the length of the yellow 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, and then project the portion of the meter stick that shows the length of the blue tape under the document camera.) Express the length of this blue tape as a fraction of a meter.
- S: $\frac{59}{100}$ meter.
- T: On the measurement record, shade the 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 the 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 above process.



Problem 2: Compare pairs of decimal numbers representing mass.

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

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

T: Record the mass in the table on the measurement record.

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. \rightarrow 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.

\rightarrow I looked 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 kilogram is lighter than 0.7 kilogram.
 \rightarrow 0.7 kilogram is heavier than 0.65 kilogram.

T: How do you know?

S: I could just see that the bag was fuller and feel that the bag has more mass. \rightarrow 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. \rightarrow 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?

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

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 in mathematics at this time.

Mass of Rice Bags (kilograms)

Rice Bag	ones	.	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

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. $\rightarrow \frac{30}{100}$ liter.

T: Record this volume in the table on the measurement record.

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 the measurement record. (Circulate to encourage use of the place value chart as students compare the measurements.)

S: (Complete the task.)

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

T: How did you determine the order?

S: The place value chart made it easy to compare the decimals. \rightarrow We compared the digits in the largest place first. That was the tenths. \rightarrow 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!

Volume of Liquid (liters)

Cylinder	ones	.	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 should solve these problems using the RDW approach used for Application Problems.

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.

Any combination of the questions below may be used 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.

Mass of Fruit (kilograms)			
Fruit	ones	tenths	hundredths
avocado	0	2	
apple	0	1	2
bananas	0	6	
grapes	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 bunch of grapes.

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

Volume of Water (liters)			
Cylinder	ones	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. $0.9\text{ L} > 0.6\text{ L}$
 b. $0.48\text{ L} < 0.6\text{ L}$
 c. $0.3\text{ L} > 0.19\text{ L}$

d. Write the volume of water in each graduated cylinder in order from least to greatest.
 $0.19\text{ L}, 0.3\text{ L}, 0.48\text{ L}, 0.6\text{ L}, 0.9\text{ L}, 0.97\text{ L}$

EUREKA MATH Lesson 9: Use the place value chart and metric measurement to compare decimals and answer comparison questions. engage^{ny} 11
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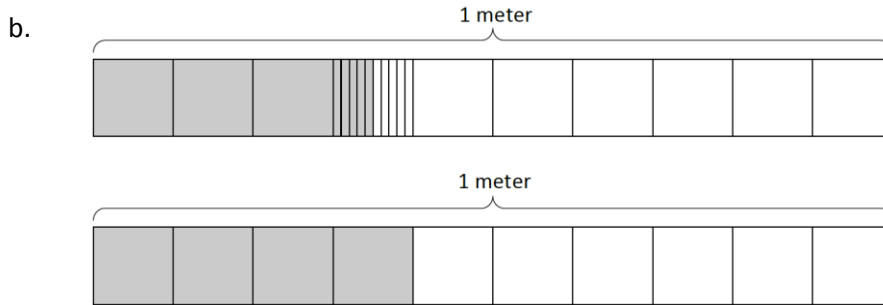
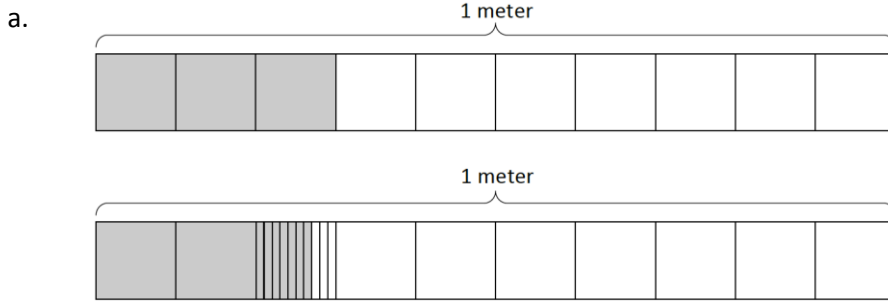
Exit Ticket (3 minutes)

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.

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.



- c. List all four lengths from least to greatest.

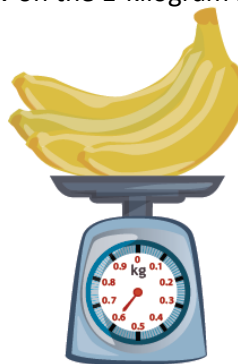
2. a. Examine the mass of each item as shown below on the 1-kilogram scales. Put an X over the items that are heavier than the avocado.



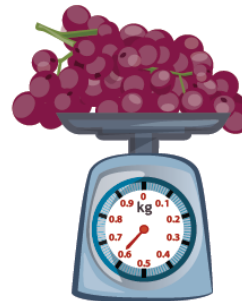
0.2 kg



0.12 kg



0.6 kg



0.61 kg

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

Mass of Fruit (kilograms)

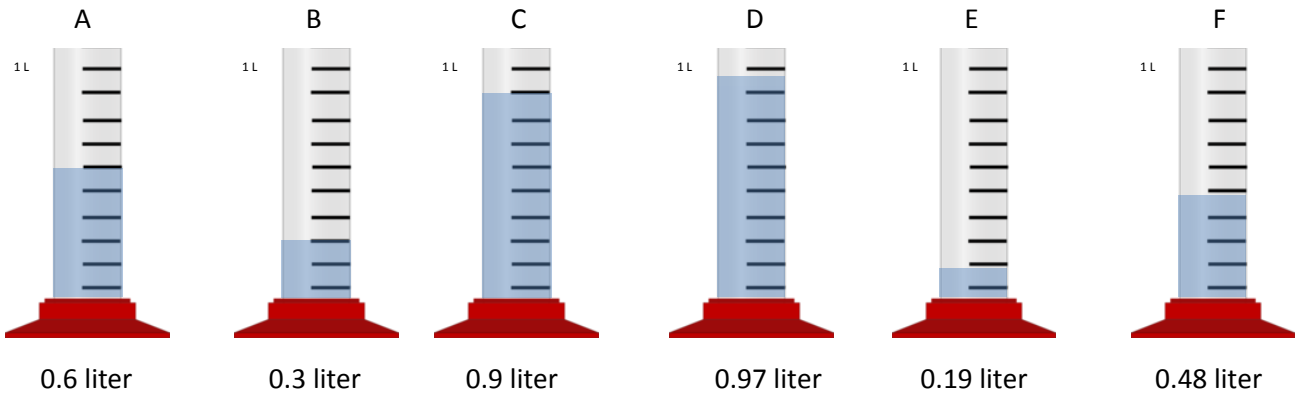
Fruit	ones	.	tenths	hundredths
avocado				
apple				
bananas				
grapes				

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 bunch of grapes.

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



Volume of Water (liters)

Cylinder	ones	.	tenths	hundredths
A				
B				
C				
D				
E				
F				

Compare the values using $>$, $<$, or $=$.

a. $0.9\text{ L} \underline{\hspace{1cm}} 0.6\text{ L}$

b. $0.48\text{ L} \underline{\hspace{1cm}} 0.6\text{ L}$

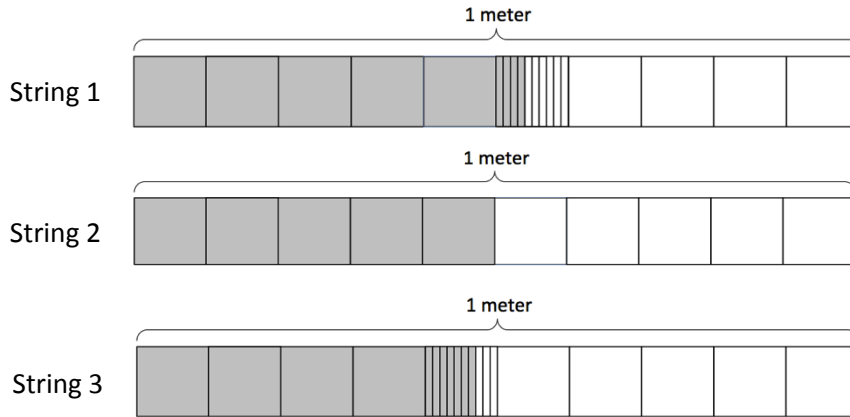
c. $0.3\text{ L} \underline{\hspace{1cm}} 0.19\text{ L}$

d. Write the volume of water in each graduated cylinder 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 show 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. $0.8 \text{ kg} \underline{\hspace{1cm}} 0.6 \text{ kg}$

b. $0.36 \text{ kg} \underline{\hspace{1cm}} 0.5 \text{ kg}$

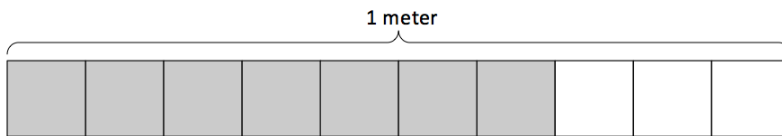
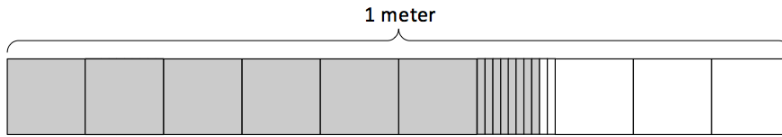
c. $0.4 \text{ kg} \underline{\hspace{1cm}} 0.47 \text{ kg}$

Name _____

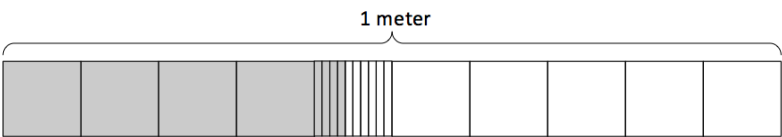
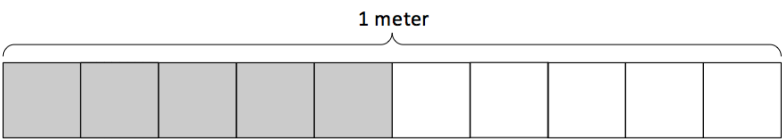
Date _____

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.

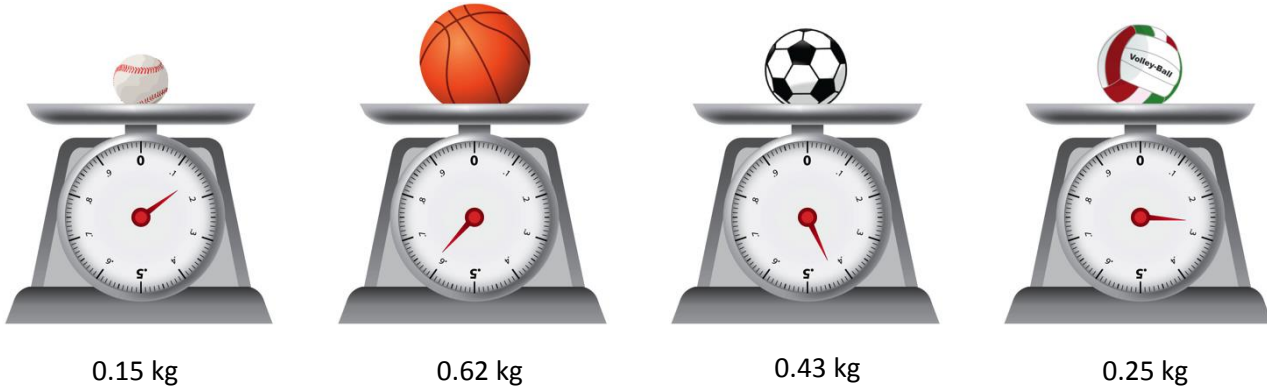


b.



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



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

Mass of Sport Balls (kilograms)

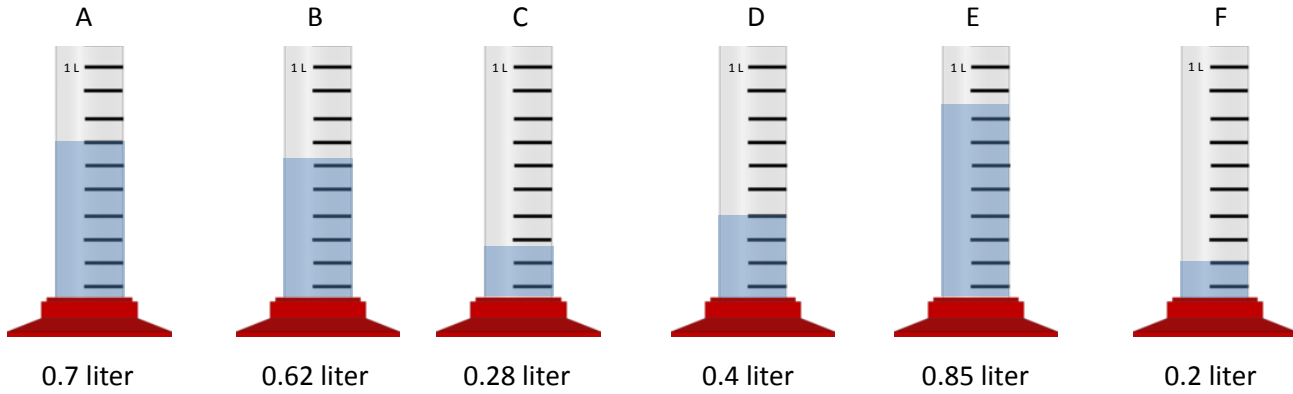
Sport Balls	ones	.	tenths	hundredths
baseball				
volleyball				
basketball				
soccer ball				

- 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 graduated cylinder on the place value chart below.



Volume of Water (liters)

Cylinder	ones	.	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 graduated cylinder in order from least to greatest.

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Mass of Rice Bags (kilograms)

Rice Bag	ones	.	tenths	hundredths
A				
B				
C				
D				

Volume of Liquid (liters)

Cylinder	ones	.	tenths	hundredths
A				
B				
C				
D				

_____ measurement record