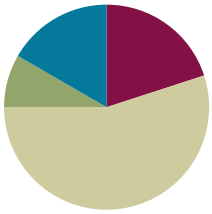
Lesson 6

Objective: Use the area model and number line to represent mixed numbers with units of ones, tenths, and hundredths in fraction and decimal forms.

Suggested Lesson Structure

Fluency Practice	(12 minutes)
Application Problem	(5 minutes)
Concept Development	(33 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (12 minutes)

- Count by Hundredths **4.NF.6** (5 minutes)
- Write the Decimal or Fraction **4.NF.5** (4 minutes)
- Break Apart Hundredths **4.NF.5** (3 minutes)

Count by Hundredths (5 minutes)

Note: This fluency activity reviews Lessons 4–5.

T: Count by fives to 30, starting at zero.

S: 0, 5, 10, 15, 20, 25, 30.

T: Count by 5 hundredths to 30 hundredths, starting at 0 hundredths. (Write as students count.)

$\frac{0}{100}$	$\frac{5}{100}$	$\frac{10}{100}$	$\frac{15}{100}$	$\frac{20}{100}$	$\frac{25}{100}$	$\frac{30}{100}$
$\frac{0}{10}$		$\frac{1}{10}$		$\frac{2}{10}$		$\frac{3}{10}$

S: $\frac{0}{100}, \frac{5}{100}, \frac{10}{100}, \frac{15}{100}, \frac{20}{100}, \frac{25}{100}, \frac{30}{100}$.

T: 1 tenth is the same as how many hundredths?

S: 10 hundredths.

T: (Beneath $\frac{10}{100}$, write $\frac{1}{10}$.)

Continue the process for $\frac{2}{10}$ and $\frac{3}{10}$.

T: Let's count by 5 hundredths again. This time, when you come to a tenth, say the tenth. Try not to look at the board.

S: $\frac{0}{100}, \frac{5}{100}, \frac{1}{10}, \frac{15}{100}, \frac{2}{10}, \frac{25}{100}, \frac{3}{10}$.

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T: Count backward by 5 hundredths, starting at 3 tenths.

S: $\frac{3}{10}, \frac{25}{100}, \frac{2}{10}, \frac{15}{100}, \frac{1}{10}, \frac{5}{100}, \frac{0}{100}$.

T: Count by 5 hundredths again. This time, when I raise my hand, stop.

S: $\frac{0}{100}, \frac{5}{100}, \frac{1}{10}, \frac{15}{100}$.

T: (Raise hand.) Say 15 hundredths using digits.

S: Zero point one five.

T: Continue.

S: $\frac{2}{10}, \frac{25}{100}, \frac{3}{10}$.

T: (Raise hand.) Say 3 tenths in digits.

S: Zero point three.

T: Count backward starting at 3 tenths.

S: $\frac{3}{10}, \frac{25}{100}$.

T: (Raise hand.) Say 25 hundredths in digits.

S: Zero point two five.

T: Continue.

S: $\frac{2}{10}, \frac{15}{100}, \frac{1}{10}$.

T: (Raise hand.) Say 1 tenth in digits.

S: Zero point one.

T: Continue.

S: $\frac{5}{100}, \frac{0}{100}$.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Students working below grade level and others may find it challenging to integrate equivalent fractions (such as $\frac{1}{10}$) into the Count by Hundredths fluency activity. Ease the task by chunking. Count a little at a time, and repeat the count so that students are comfortable, confident, and excited. For example, lead students to count from $\frac{1}{100}$ to $\frac{1}{10}$, repeat a few times, and then add onto the count $\frac{15}{100}$, and so on.

Write the Decimal or Fraction (4 minutes)

Materials: (T) Hundredths area model (Fluency Template), personal white board (S) Personal white board

Note: This fluency activity reviews Lessons 4–5.

T: (Project the hundredths area model. Shade 3 units.) 1 whole is decomposed into 100 equal units. Write the fraction of the grid that is shaded.

S: (Write $\frac{3}{100}$.)

T: (Write $\frac{3}{100}$ = __.__.) Complete the number sentence.

S: (Write $\frac{3}{100}$ = 0.03.)

Continue the process for $\frac{5}{100}, \frac{8}{100}, \frac{4}{100}$, and $\frac{14}{100}$.

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T: (Write $\frac{14}{100} = \frac{10}{100} + \frac{\quad}{100} = 0.14$.) Complete the number sentence.

S: (Write $\frac{14}{100} = \frac{10}{100} + \frac{4}{100} = 0.14$.)

Continue with the following possible sequence: $\frac{17}{100}$ and $\frac{53}{100}$.

T: (Shade 4 units.) Write the amount of the grid that is shaded as a decimal.

S: (Write 0.04.)

T: (Write $0.04 = \frac{\quad}{100}$.) Complete the number sentence.

S: (Write $0.04 = \frac{4}{100}$.)

Continue with the following possible sequence: 0.14, 0.06, and 0.16.

T: (Shade in the entire grid.) Write the amount of the grid that is shaded as a fraction and as a digit.

S: (Write $\frac{100}{100} = 1$.)

Break Apart Hundredths (3 minutes)

Materials: (T/S) Personal white board

Note: This fluency activity reviews Lesson 5.

T: (Project 13 hundredths disks.) Say the value.

S: 13 hundredths.

T: Write the value of the disks as a decimal.

S: (Write 0.13.)

T: (Write 0.13 = —.) Write 13 hundredths as a fraction.

S: (Write $0.13 = \frac{13}{100}$.)

T: How many hundredths are in 1 tenth?

S: 10 hundredths.

T: Draw place value disks to represent the 13 hundredths after composing 1 tenth.

S: (Draw 1 tenth disk and 3 hundredth disks.)

T: (Write $0.13 = \frac{13}{100} = \frac{\quad}{10} + \frac{\quad}{100}$.) Complete the number sentence.

S: (Write $0.13 = \frac{13}{100} = \frac{1}{10} + \frac{3}{100}$.)

Continue with the following possible sequence: 0.21 and 0.14.

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Application Problem (5 minutes)

The table shows the perimeter of four rectangles.

a. Which rectangle has the smallest perimeter?
b. The perimeter of Rectangle C is how many meters less than a kilometer?
c. Compare the perimeters of Rectangles B and D. Which rectangle has the greater perimeter? How much greater?

Rectangle	Perimeter
A	54 cm
B	$\frac{69}{100}$ m
C	54 m
D	0.8 m

a) Rectangle A has the smallest perimeter.
A: 54 cm = $\frac{54}{100}$ m
B: $\frac{69}{100}$ m
C: 54 m
D: 0.8 m = $\frac{8}{10}$ m = $\frac{80}{100}$ m

b) The perimeter of Rectangle C is 946 meters less than a kilometer.
1 km = 1,000 m

$$\begin{array}{r} {}^{9}{}^{9}{}^{10} \\ 1\,\cancel{0}\,\cancel{0}\,\cancel{0} \\ -\quad 54 \\ \hline 946 \end{array}$$

c) Rectangle D's perimeter is $\frac{11}{100}$ m greater than Rectangle B's perimeter.

$\frac{80}{100} - \frac{69}{100} = \frac{11}{100}$

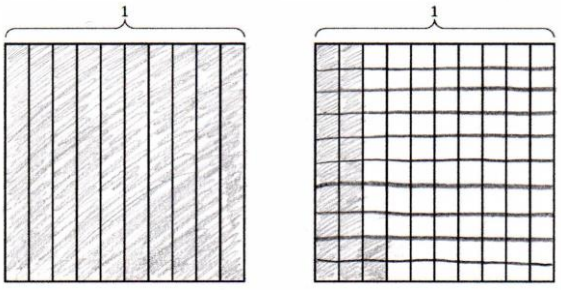
Note: This Application Problem reviews related metric units (Module 2) and comparing measurements expressed as fractions and decimals in preparation for work with mixed numbers, metric units, and place value in today's Concept Development.

Concept Development (33 minutes)

Materials: (T/S) Area model (Template 1), number line (Template 2), pencil, personal white board

Problem 1: Represent mixed numbers with units of ones, tenths, and hundredths using area models.

T: (Write $1\frac{22}{100}$.) How many ones?
S: 1 one.
T: How many hundredths more than 1?
S: 22 hundredths.
T: (Distribute Template 1, area model.) Use the area models to shade $1\frac{22}{100}$.
S: (Shade the area models.)
T: How many ones are shaded?
S: 1 one.



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T: What fraction of another one is shaded?

S: 22 hundredths.

T: Write $1\frac{22}{100}$ as a decimal number.

S: (Write 1.22.)

Continue with $1\frac{38}{100}$, $1\frac{60}{100}$, and $1\frac{81}{100}$.

Problem 2: Represent mixed numbers with units of ones, tenths, and hundredths on a number line.

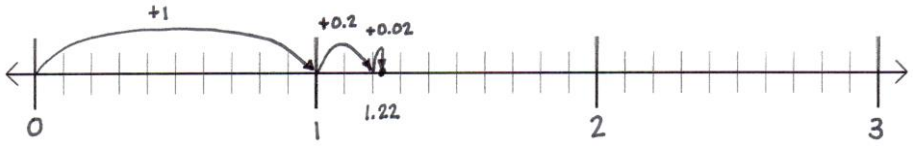
T: (Refer to the area models representing 1.22.) We have used tape diagrams, area models, and place value disks to represent decimal numbers. We can also use a number line. (Distribute Template 2, number line, and label the intervals of 0, 1, 2, and 3.) To find 1.22 on a number line, we can start with the largest unit. What is the largest unit?

S: Ones.

T: Start at zero, and slide 1 one. What is remaining?

S: 22 hundredths.

T: What is the next largest unit?



S: Tenths.

T: How many tenths?

S: 2 tenths.

T: From 1 one, slide 2 tenths. What remains?

S: 2 hundredths.

T: Can we show hundredths? How do we partition tenths into hundredths?

S: Each tenth would be split into 10 parts, just like on a tape diagram or an area model. It's hard to do that here because the tenths are so small.

T: Let's estimate where the hundredths would be. We need to show 2 hundredths. If I imagine each tenth partitioned into ten parts, where would 2 hundredths be? I will move very slowly. Say, "Stop!" when I get to 1 and 22 hundredths. (Slide very slowly from 1.2.)

S: Stop! (This should be at a place just beyond 1 and 2 tenths.)

T: Draw an arrow to show this very small slide. Discuss with a partner. How did we move from zero to 1.22?

S: We began with moving 1 one. Then, we moved 2 tenths, and then we moved 2 hundredths. → We started at zero and went up, beginning with the largest unit, the ones, the tenths, and then the hundredths. → We slid units from left to right, largest to smallest, but we estimated the 2 hundredths.

T: Draw a point to show where 1.22 is located. Write the number in decimal form.

T: Let's locate $3\frac{46}{100}$ on the next number line. Can we label the intervals the same?

S: No, because this point will come after 3.

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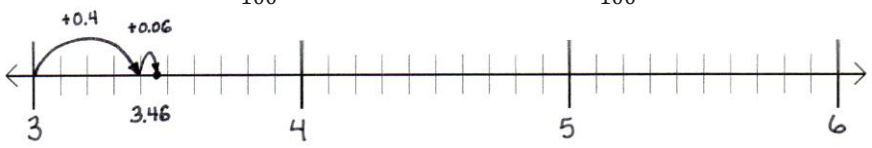
T: Start the number line at 3 ones. We will locate $\frac{46}{100}$ more than 3. Decompose $\frac{46}{100}$ into tenths and hundredths.

S: $\frac{46}{100} = \frac{4}{10} + \frac{6}{100}$.



T: Which unit is larger: tenths or hundredths?

S: Tenths.

T: Let's count up 4 tenths. Draw an arrow, or keep track of the movement with your pencil. Now, what unit is left?

S: Hundredths. We have 6 hundredths. 6 hundredths is one hundredth more than 5 hundredths, so 4 tenths 6 hundredths would be just past the midpoint of 4 tenths and 5 tenths.

T: Draw a point to show where $3\frac{46}{100}$ is located. Write the number in decimal form.

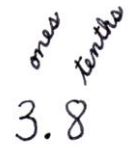
S: (Draw and write 3.46.)

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Students working above grade level or others may present alternative ways of locating $3\frac{46}{100}$ on the number line, such as reasoning that half of 100 is 50 and then counting back to 46. Efficiency and variety in strategies are always welcome.

Repeat with 2.34 and 3.70.

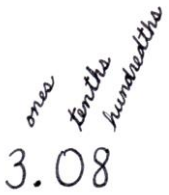
Problem 3: Match the unit form of a mixed number to its decimal and fraction forms.



T: When we write decimal numbers, the decimal point separates the whole number part on the left from the decimal fraction part on the right.

T: Write 3 ones 8 tenths as a decimal.

S: (Write 3.8.)

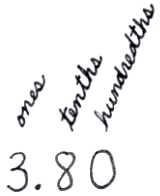


T: The ones and the tenths each have a special place. (Label each place value.)

MP.6

T: Write 3 ones 8 hundredths in decimal form. Show your partner what you have written. Are your answers the same?

S: The answer is 3.8. → I disagree. That would be 3 ones 8 tenths. We want hundredths. It's 3.08. There are no tenths. We need to put a zero to show that. It's just like when we write whole numbers. The zero holds a place value.



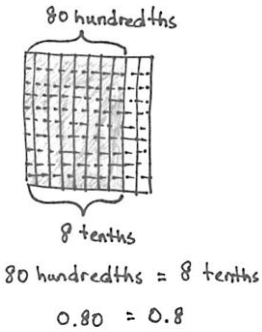
T: Look again at 3 ones 8 tenths.

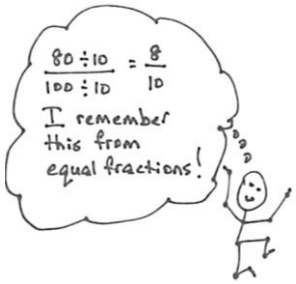
T: Place a zero to the right of the digit eight. Say that number in unit form.

S: 3 ones 80 hundredths.

T: Express 80 hundredths as tenths.

S: 8 tenths.





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T: Yes. 0.80 and 0.8 are equivalent. We have shown this using an area model and using division, too, when the number was in fraction form.

T: Let's practice writing fractions and decimals. Be mindful of each digit's place in the number.

T: Write 2 ones 8 hundredths as a mixed number and then as a decimal number.

S: $2\frac{8}{100}$, 2.08.

T: Write 8 ones 2 hundredths as a mixed number and a decimal number.

S: $8\frac{2}{100}$, 8.2. Wait! That decimal is not right. That would be 8 and 2 tenths. It is 8.02. There are 8 ones, 0 tenths, and 2 hundredths.

Repeat, as needed, with 9 ones 80 hundredths, 2 ones 2 tenths, and 4 ones 7 hundredths.

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)

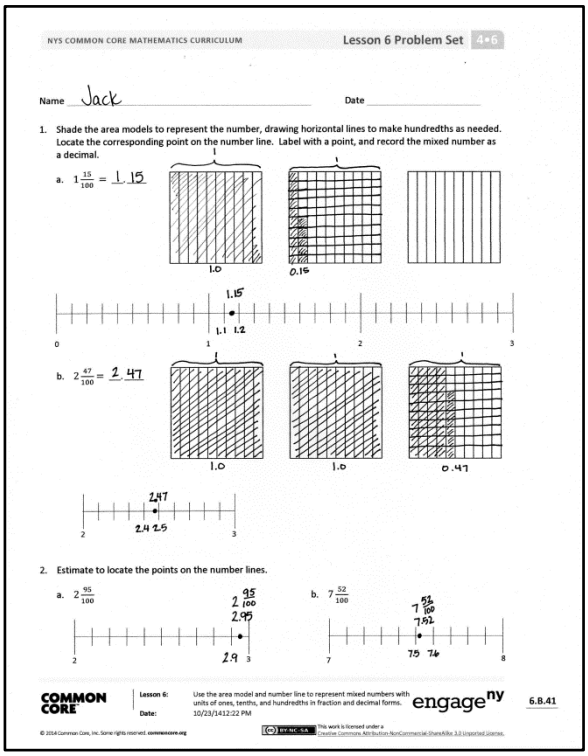
Lesson Objective: Use the area model and number line to represent mixed numbers with units of ones, tenths, and hundredths in fraction and decimal forms.

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 could you count backward to locate 2.47 on the number line in Problem 1(b)?
- In Problem 2(a), how did you estimate the location of your point?
- In Problem 3(a), the units are ones and hundredths. If I had 1.02 liters of water and you had 1.02 kilograms of rice, how do the measurement units change the meaning of that number?


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

Name Jack Date

1. Shade the area models to represent the number, drawing horizontal lines to make hundredths as needed. Locate the corresponding point on the number line. Label with a point, and record the mixed number as a decimal.

a. $1\frac{15}{100} = 1.15$

b. $2\frac{47}{100} = 2.47$

2. Estimate to locate the points on the number lines.

a. $2\frac{95}{100}$

b. $7\frac{52}{100}$

COMMON CORE Lesson 6: Date: Use the area model and number line to represent mixed numbers with units of ones, tenths, and hundredths in fraction and decimal forms. engage^ny 6.B.41

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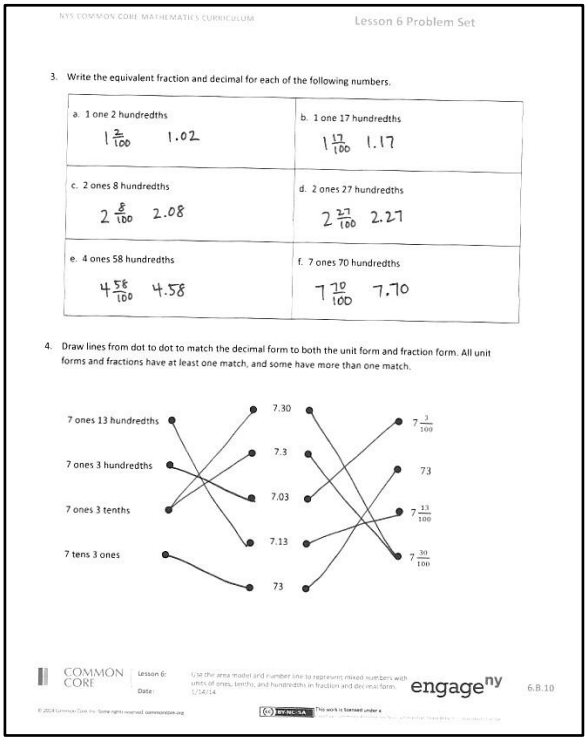
- In Problem 3(f), express this number in ones and tenths. Use a model to show that this new representation is equivalent to 7 ones 70 hundredths.
- Simplify $7\frac{70}{100}$ using division to show it is equal to $7\frac{7}{10}$. Explain to your partner how that relates to 7.70 = 7.7.
- Explain to your partner why there is one less item in the left and right columns of Problem 4 than in the center column.
- Compare. (Write 1.4 meters _____ 1.7 grams.) Does it make sense to compare meters with grams? Why not?
- Talk with your partner about the importance of the number zero. Use the number 100 and the number 0.01 in your discussion. (Provide Hide Zero cards to strengthen the conversation.)



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 6 Problem Set

3. Write the equivalent fraction and decimal for each of the following numbers.

a. 1 one 2 hundredths $1\frac{2}{100}$ 1.02	b. 1 one 17 hundredths $1\frac{17}{100}$ 1.17
c. 2 ones 8 hundredths $2\frac{8}{100}$ 2.08	d. 2 ones 27 hundredths $2\frac{27}{100}$ 2.27
e. 4 ones 58 hundredths $4\frac{58}{100}$ 4.58	f. 7 ones 70 hundredths $7\frac{70}{100}$ 7.70

4. Draw lines from dot to dot to match the decimal form to both the unit form and fraction form. All unit forms and fractions have at least one match, and some have more than one match.

7 ones 13 hundredths
7 ones 3 hundredths
7 ones 3 tenths
7 tens 3 ones

7.30
7.3
7.03
7.13
73

$7\frac{3}{100}$
73
$7\frac{13}{100}$
$7\frac{30}{100}$

COMMON CORE Lesson 6: Date: Use the area model and number line to represent mixed numbers with units of ones, tenths, and hundredths in fraction and decimal form. 7/14/14 engage^ny 6.B.10

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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.

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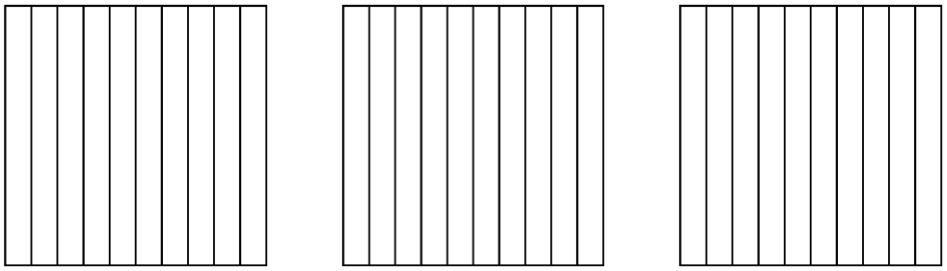
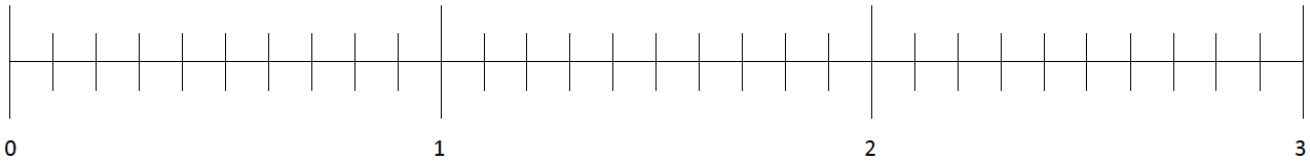
Name _____ Date _____

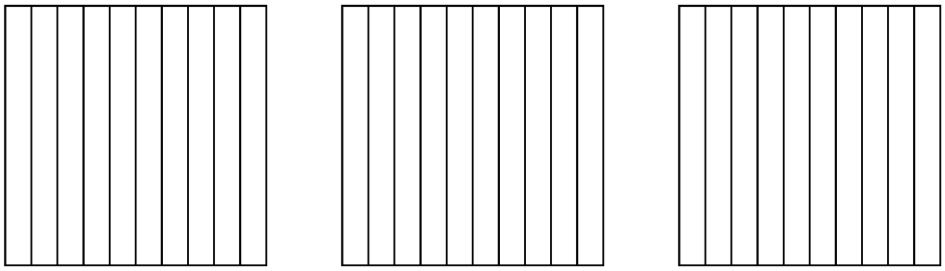
1. Shade the area models to represent the number, drawing horizontal lines to make hundredths as needed. Locate the corresponding point on the number line. Label with a point, and record the mixed number as a decimal.

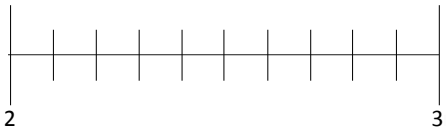
a. $1\frac{15}{100}$ = ____._____





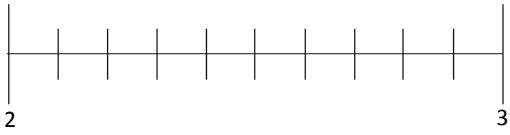
b. $2\frac{47}{100}$ = ____._____



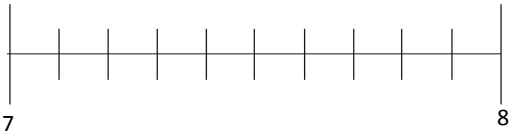


2. Estimate to locate the points on the number lines.

a. $2\frac{95}{100}$



b. $7\frac{52}{100}$



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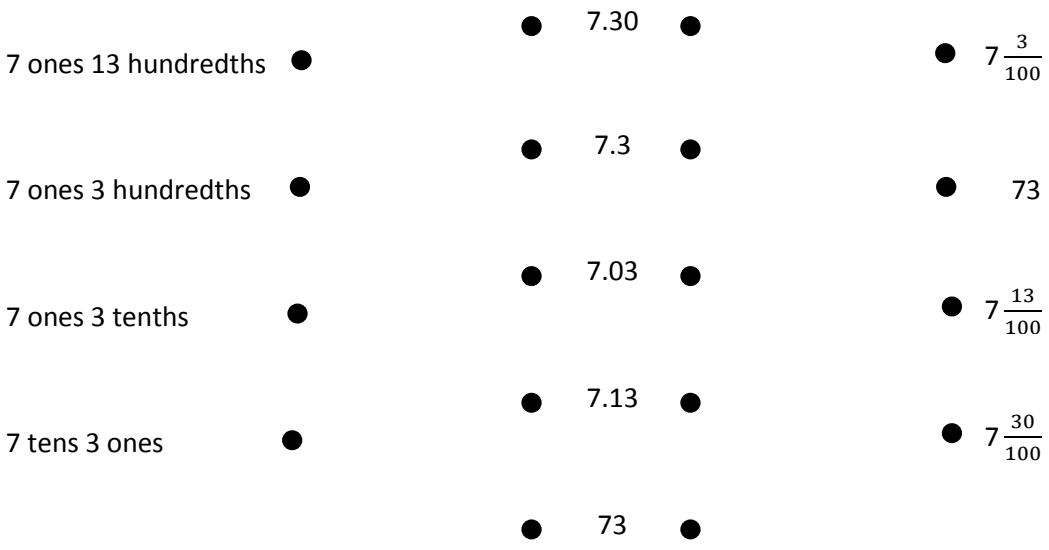
3. Write the equivalent fraction and decimal for each of the following numbers.

a. 1 one 2 hundredths	b. 1 one 17 hundredths
c. 2 ones 8 hundredths	d. 2 ones 27 hundredths
e. 4 ones 58 hundredths	f. 7 ones 70 hundredths

4. Draw lines from dot to dot to match the decimal form to both the unit form and fraction form. All unit forms and fractions have at least one match, and some have more than one match.



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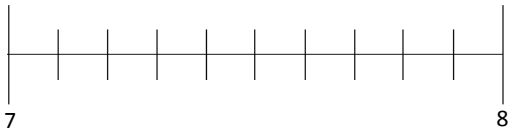
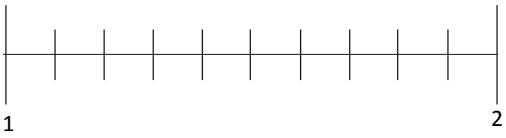
Name _____ Date _____

1. Estimate to locate the points on the number lines. Mark the point, and label it as a decimal.

a. $7\frac{20}{100}$



b. $1\frac{75}{100}$



2. Write the equivalent fraction and decimal for each number.

a. 8 ones 24 hundredths

b. 2 ones 6 hundredths

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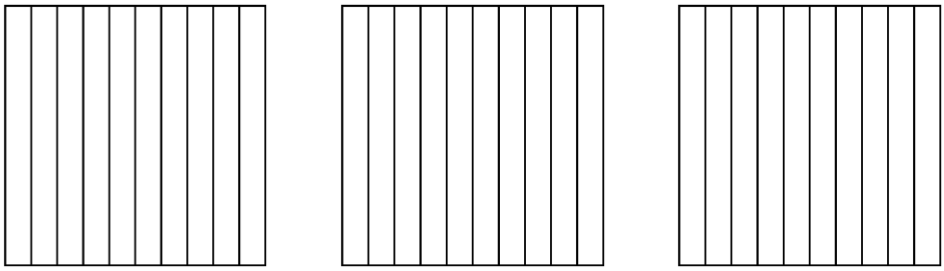
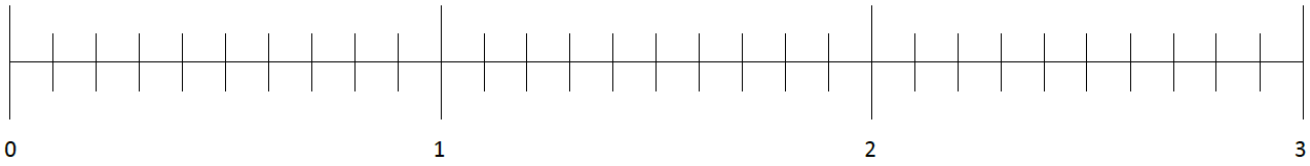
Name _____ Date _____

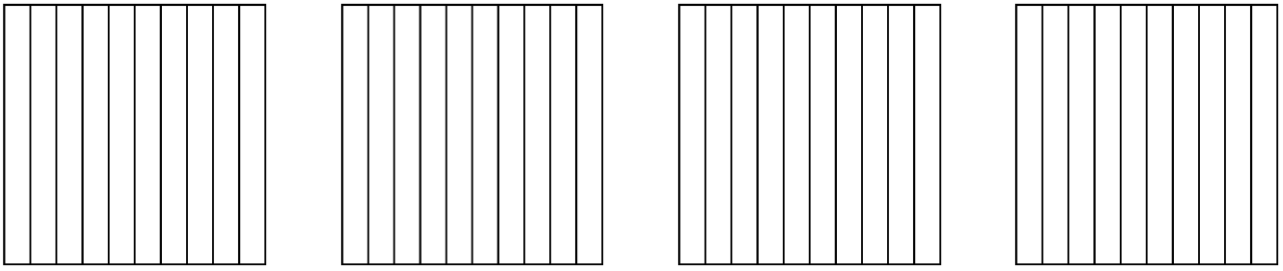
1. Shade the area models to represent the number, drawing horizontal lines to make hundredths as needed. Locate the corresponding point on the number line. Label with a point, and record the mixed number as a decimal.

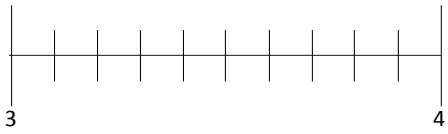
a. $2\frac{35}{100}$ = ____._____





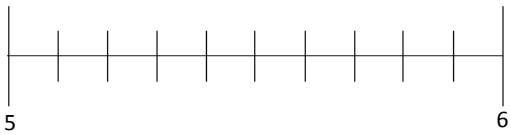
b. $3\frac{17}{100}$ = ____._____



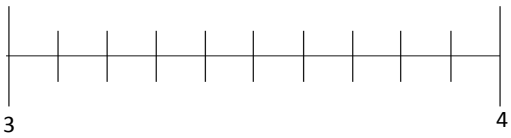


2. Estimate to locate the points on the number lines.

a. $5\frac{90}{100}$



b. $3\frac{25}{100}$



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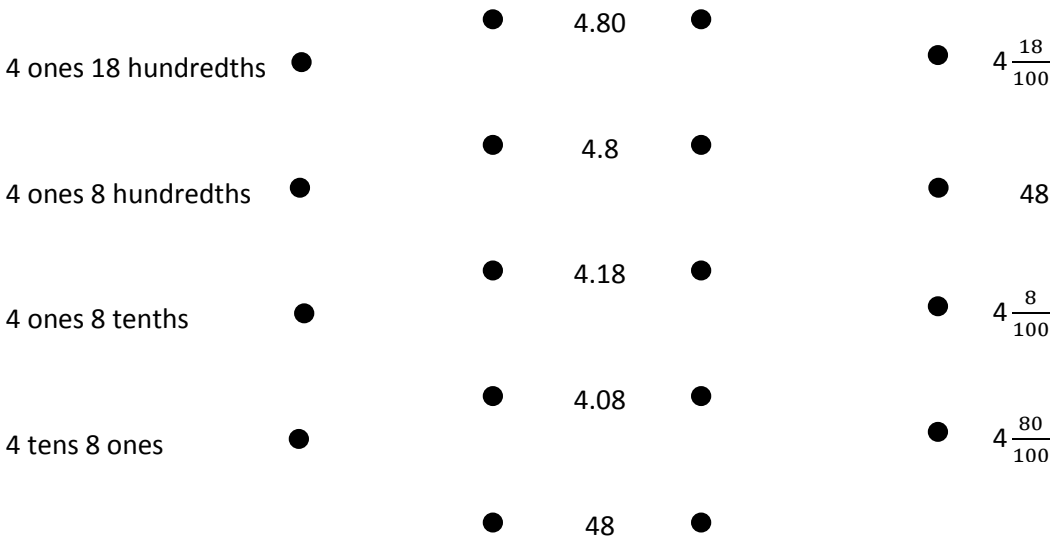
3. Write the equivalent fraction and decimal for each of the following numbers.

a. 2 ones 2 hundredths	b. 2 ones 16 hundredths
c. 3 ones 7 hundredths	d. 1 one 18 hundredths
e. 9 ones 62 hundredths	f. 6 ones 20 hundredths

4. Draw lines from dot to dot to match the decimal form to both the unit form and fraction form. All unit forms and fractions have at least one match, and some have more than one match.



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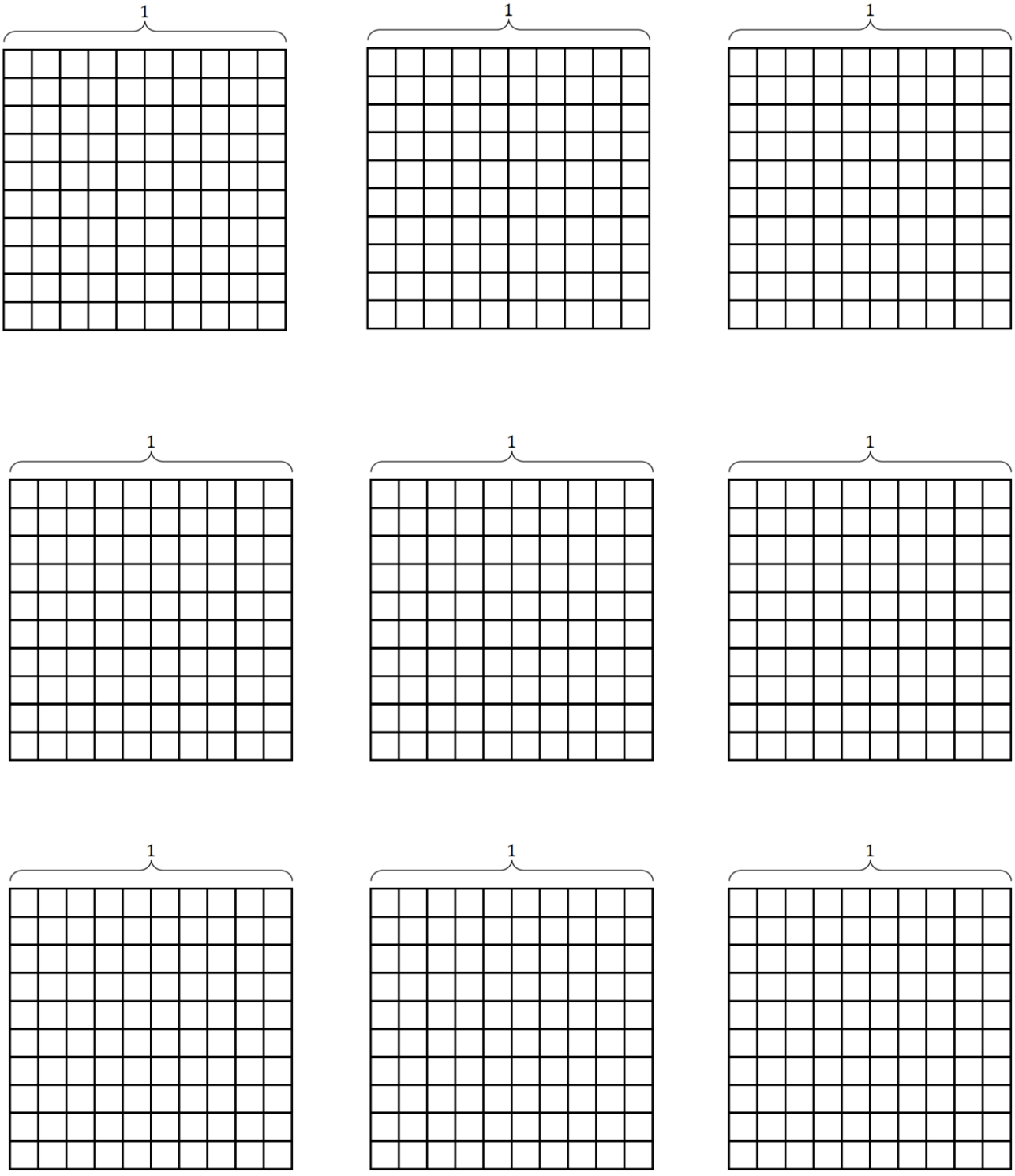

hundredths area model

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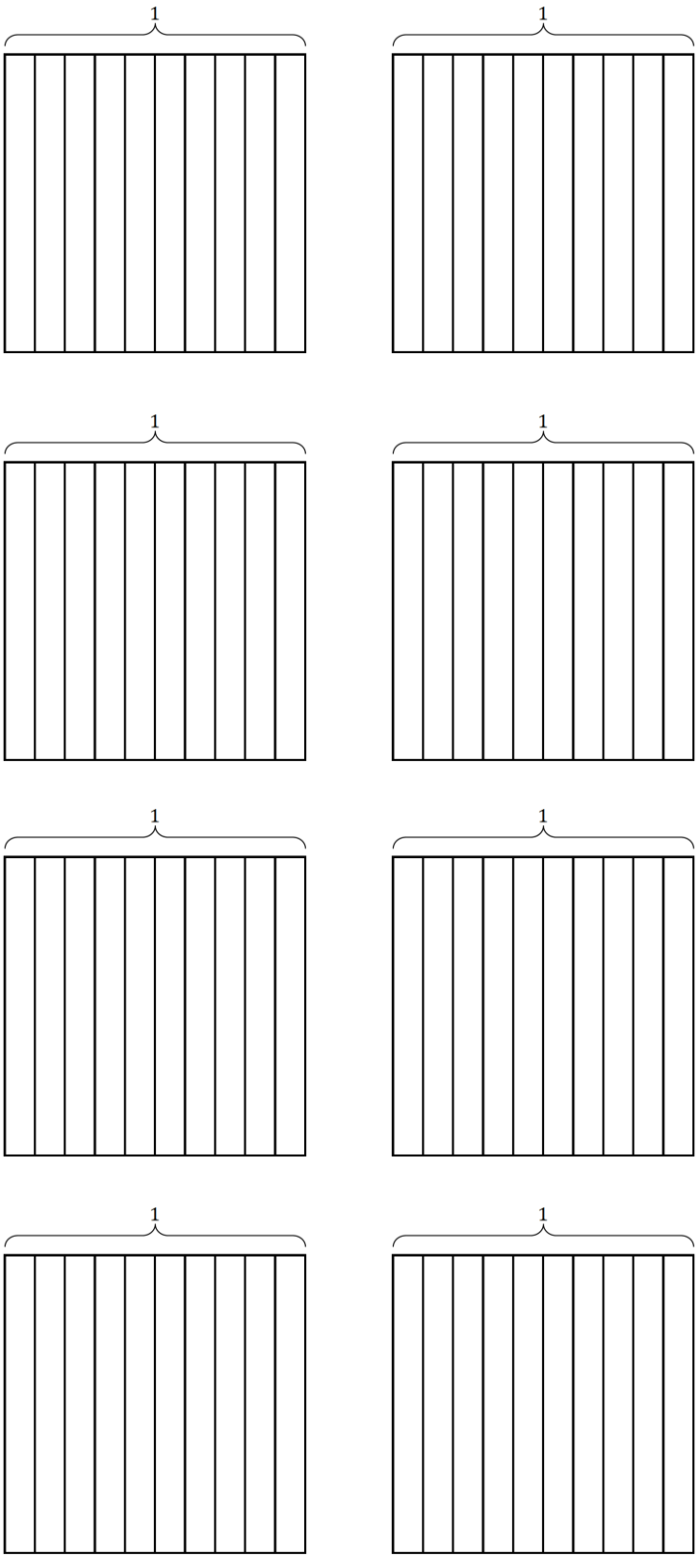

area model

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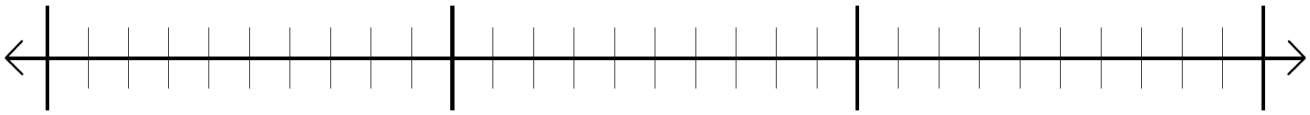

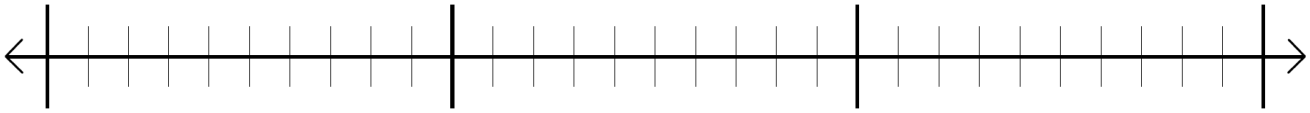

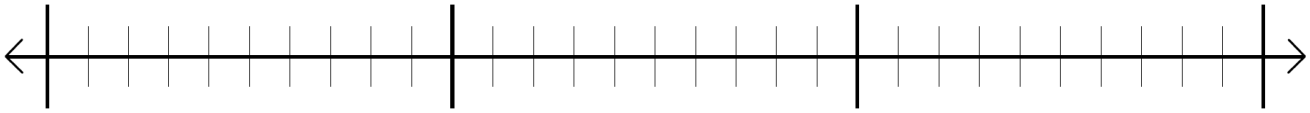

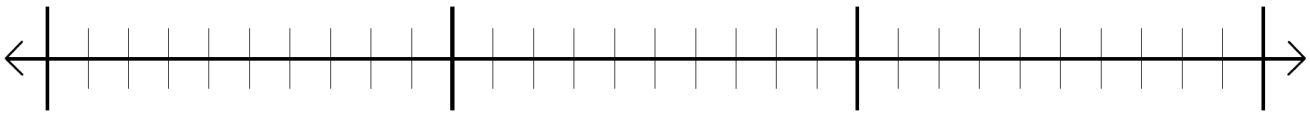

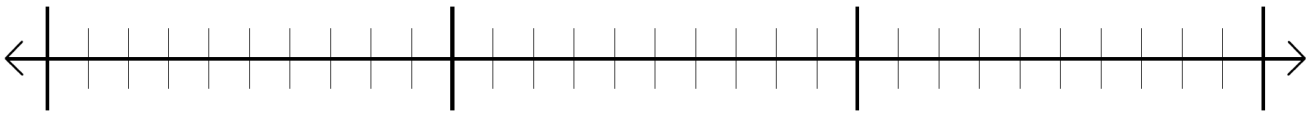

number line

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