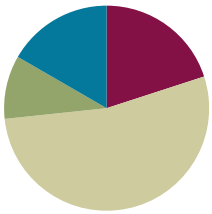
Lesson 5

Objective: Model the equivalence of tenths and hundredths using the area model and place value disks.

Suggested Lesson Structure



Fluency Practice	(12 minutes)
Application Problem	(6 minutes)
Concept Development	(32 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**

Fluency Practice (12 minutes)

- Divide by 10 **4.NF.7** (3 minutes)
- Write the Decimal or Fraction **4.NF.5** (4 minutes)
- Count by Tenths and Hundredths **4.NF.6** (5 minutes)

Divide by 10 (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 4.

T: (Project one 1 hundred disk. Beneath it, write 100 = 10 ___.) 100 is the same as 10 of what unit? Write the number sentence.
S: (Write 100 = 10 tens.)
T: (Write 100 = 10 tens.)

Continue with the following possible sequence: 10 = 10 ones, 1 = 10 tenths, and $\frac{1}{10}$ = 10 hundredths.

Write the Decimal or Fraction (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 4.

T: (Write $\frac{1}{100}$.) Say the fraction.
S: 1 hundredth.

T: (Write $\frac{1}{100}$ = __.__.) Complete the number sentence.

S: (Write $\frac{1}{100}$ = 0.01.)

Continue with the following possible sequence: $\frac{2}{100}$, $\frac{3}{100}$, $\frac{7}{100}$, and $\frac{17}{100}$.

T: (Write $\frac{17}{100} = \frac{10}{100} + \frac{\quad}{100}$ = 0.17.) Complete the number sentence.

S: (Write $\frac{17}{100} = \frac{10}{100} + \frac{7}{100}$ = 0.17.)

Continue with the following possible sequence: $\frac{13}{100}$ and $\frac{19}{100}$.

T: (Write 0.05 = —.) Complete the number sentence.

S: (Write 0.05 = $\frac{5}{100}$.)

Continue with the following possible sequence: 0.15, 0.03, and 0.13.

T: (Write $\frac{100}{100}$.) Say the fraction.

S: 100 hundredths.

T: Complete the number sentence, writing 100 hundredths as a whole number.

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

Count by Tenths and Hundredths (5 minutes)

Note: This fluency activity reviews Lessons 1 and 4.

T: 1 is the same as how many tenths?

S: 10 tenths.

T: Let's count to 10 tenths. When you come to 1, say 1.

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

T: Count by hundredths to 10 hundredths, starting at 0 hundredths.

S: $\frac{0}{100}$, $\frac{1}{100}$, $\frac{2}{100}$, $\frac{3}{100}$, $\frac{4}{100}$, $\frac{5}{100}$, $\frac{6}{100}$, $\frac{7}{100}$, $\frac{8}{100}$, $\frac{9}{100}$, $\frac{10}{100}$.

T: 10 hundredths is the same as 1 of what unit?

S: 1 tenth.

T: Let's count to 10 hundredths again. This time, when you come to 1 tenth, say 1 tenth.

S: $\frac{0}{100}$, $\frac{1}{100}$, $\frac{2}{100}$, $\frac{3}{100}$, $\frac{4}{100}$, $\frac{5}{100}$, $\frac{6}{100}$, $\frac{7}{100}$, $\frac{8}{100}$, $\frac{9}{100}$, $\frac{1}{10}$.

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

S: $\frac{0}{100}$, $\frac{1}{100}$, $\frac{2}{100}$, $\frac{3}{100}$, $\frac{4}{100}$.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Distinguish *tenths* from *tens* for English language learners and others. Some students may not be able to differentiate the *th* sound at the end of the fraction words from the *s* sound at the end of *tens*. If possible, couple Count by Tenths and Hundredths with a visual aid, such as the fraction form, decimal form, or area model.

T: (Raise hand.) Say 4 hundredths using digits.

S: Zero point zero 4.

T: Continue.

S: $\frac{5}{100}, \frac{6}{100}, \frac{7}{100}, \frac{8}{100}$.

T: (Raise hand.) Say 8 hundredths using digits.

S: Zero point zero 8.

T: Continue.

S: $\frac{9}{100}, \frac{1}{10}$.

T: Count backward by hundredths starting at 1 tenth.

Continue interrupting to express the hundredths using digits.

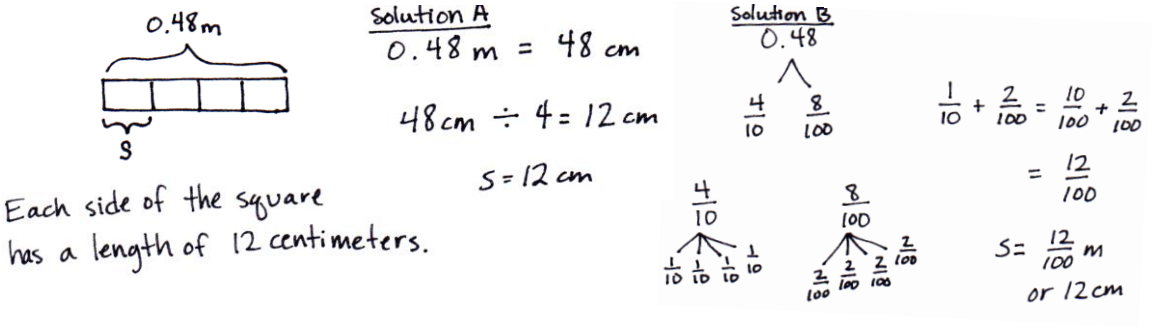
NOTES ON READING DECIMALS:

Students benefit from hearing decimal numbers read in both fraction form and as, for example, "zero point zero eight." Without the latter, it is hard to verify orally that students have written a decimal correctly. Furthermore, this manner of communicating decimals is used at times in the culture.

However, saying "zero point zero eight" is the exception rather than the rule because "8 hundredths" communicates the equality of the fraction and decimal forms. The general rule is that students should read 0.08 and $\frac{8}{100}$ as 8 hundredths.

Application Problem (6 minutes)

The perimeter of a square measures 0.48 m. What is the measure of each side length in centimeters?



Note: The Application Problem reviews solving for an unknown side length (Module 4) and metric conversions (Module 2). Division of decimals is a Grade 5 standard, so instead, students might convert to centimeters (as in Solution A), use their fraction knowledge to decompose 48 hundredths into 4 equal parts (as in Solution B), or simply think in unit form (i.e., 48 hundredths ÷ 4 = 12 hundredths).

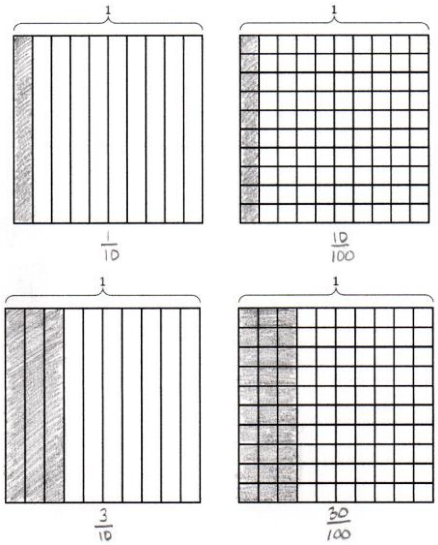
Concept Development (32 minutes)

Materials: (T) Tenths and hundredths area model (Template), tape diagram in tenths (Lesson 4 Template), decimal place value disks (S) Tenths and hundredths area model (Template), personal white board

Problem 1: Simplify hundredths by division.

T: We can show the equivalence of 10 hundredths and 1 tenth in the same way we showed the equivalence of 2 fourths and 1 half by using division.

T: Shade 1 tenth of the first area model. Next, shade 10 hundredths on the second area model. Label each area model. What do you notice?



S: The same amount is shaded for each. → One area is decomposed into tenths and the other into hundredths, but the same amount is selected. That means they are equivalent.

T: (Write $\frac{1}{10} = \frac{10}{100}$.) Write the equivalent statement using decimals.

S: (Write 0.1 = 0.10.)

T: Show in the next area models how many tenths are equal to 30 hundredths. Write two equivalent statements using fractions and decimals.

S: (Shade area models.) $\frac{3}{10} = \frac{30}{100}$. 0.3 = 0.30.

T: Let's show those as equivalent fractions using division. (Write $\frac{10}{100} = \frac{10 \div 10}{100 \div 10} = \frac{1}{10}$.) Why did I divide by 10?

$\frac{10}{100} = \frac{10 \div 10}{100 \div 10} = \frac{1}{10}$

S: It is a common factor of 10 and 100. → Dividing the denominator by 10 gives us tenths, and we are showing equivalent fractions for tenths and hundredths. → We can make a larger unit from 10 hundredths.

$\frac{30}{100} = \frac{30 \div 10}{100 \div 10} = \frac{3}{10}$

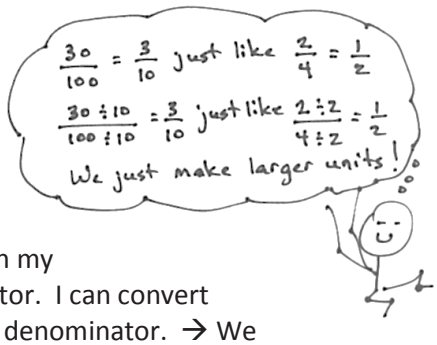
T: With your partner, use division to find how many tenths are equal to 30 hundredths.

S: (Record $\frac{30}{100} = \frac{30 \div 10}{100 \div 10} = \frac{3}{10}$.) 3 tenths.

$\frac{3}{10} = \frac{3 \times 10}{10 \times 10} = \frac{30}{100}$

MP.8 T: With your partner, use multiplication to find how many hundredths are in 3 tenths.

S: (Record $\frac{3}{10} = \frac{3 \times 10}{10 \times 10} = \frac{30}{100}$.) 30 hundredths.



T: Is there a pattern as you find equivalent fractions for tenths and hundredths?

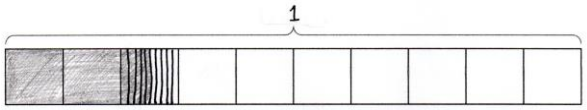
S: I multiply the number of tenths by 10 to get the number of hundredths, and I divide the number of hundredths by 10 to get the number of tenths. → I can convert tenths to hundredths in my head by putting a zero at the end of the numerator and denominator. I can convert hundredths to tenths by removing a zero from the numerator and denominator. → We are just changing the units, making either larger or smaller units. Both have the same value.

Have students convert 7 tenths to 70 hundredths using multiplication and 70 hundredths to 7 tenths using division.

Problem 2: Model hundredths with an area model.

T: (Project a tape diagram, as was used in Lesson 4, with $\frac{25}{100}$ shaded.) Say the fractional part that is shaded.

S: 25 hundredths.



T: Say it as a decimal number.

S: 25 hundredths. We say it the same way.

T: Yes. Both the fraction and decimal number represent the same amount. What is different is the way that they are written. Write 25 hundredths as a fraction and then as a decimal number.

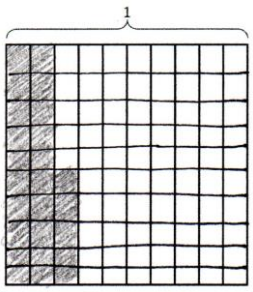
S: (Write $\frac{25}{100}$ and 0.25.)

T: Just as we can express 25 hundredths in different ways when we write it, we can also represent it in different ways pictorially, just like we did with tenths and other fractions from Module 5. (Project the area model.) How can we shade $\frac{25}{100}$?

S: We can draw horizontal lines to make smaller units. → We can decompose each tenth into 10 parts to make hundredths using horizontal lines.

T: Yes. Decimals like this are just fractions. We are doing exactly the same thing, but we are writing the number in a different way. Go ahead and make the hundredths.

S: (Partition the area model.)



T: Shade $\frac{25}{100}$. (Allow students time to shade the area.)

T: What is a shortcut for shading 25 hundredths?

S: There are 10 hundredths in each column. I shaded 10 hundredths at a time. $\frac{10}{100}, \frac{20}{100}$. Then, I shaded 5 hundredths more. → I shaded 2 columns and then 5 more units. → A tenth, and a tenth and 5 hundredths. → I shaded two and a half columns.

T: In total, how many tenths are shaded?

S: 2 tenths and part of another tenth. → $2\frac{1}{2}$ tenths.

T: Both are correct: 2 complete tenths are shaded, and another half of a tenth is shaded. In total, how many hundredths are shaded?

S: 25 hundredths.

Repeat with $\frac{52}{100}$ and $\frac{35}{100}$.

Problem 3: Compose hundredths to tenths using place value disks, and then represent with a number bond.

T: Look at the area model we just drew. 1 tenth equals how many hundredths?

S: 10 hundredths.

T: Write it in decimal form.

S: 0.10. → 0.1.

T: (Project 16 hundredths with place value disks.) What is the value of each disk? How can you tell?

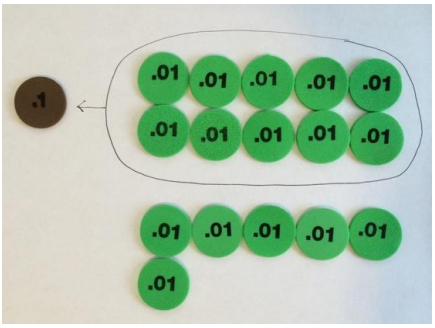
S: 1 hundredth. I see point zero one on each disk.

T: How many hundredths are there?

S: 16 hundredths.

T: Can we make a tenth? Talk to your partner.

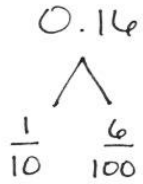
S: 10 hundredths can be traded for 1 tenth. → Yes! We can compose 10 hundredths to 1 tenth since $\frac{1}{10} = \frac{10}{100}$. → It is just like place value: 10 ones make 1 ten, or 10 tens make 1 hundred.



T: Circle 10 hundredths to show 1 tenth. What is represented now?

S: 1 tenth and 6 hundredths.

T: (Draw a number bond to show the parts of 1 tenth and 6 hundredths. Point to the number bond.) 16 hundredths can be represented as 1 tenth and 6 hundredths.



Repeat with 13 hundredths and 22 hundredths.

Problem 4: Use place value disks to represent a decimal fraction. Write the equivalent decimal in unit form.

T: (Write $\frac{5}{100}$.) Draw place value disks to represent this fraction.

S: (Draw 5 hundredths disks.)

T: Say it in unit form.

0.05

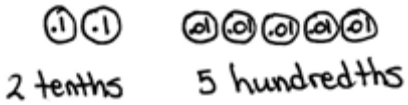
S: 5 hundredths.

T: Write it as a decimal. Be careful that your decimal notation shows hundredths.

S: (Write 0.05.)

T: (Write $\frac{25}{100}$.) Draw place value disks to represent this fraction.

S: That is 25 hundredths! → We can represent $\frac{25}{100}$ with 2 tenth disks and 5 hundredth disks.



T: I hope so, since it takes much too long to draw 25 hundredths. Say the number in unit form, and write it as a decimal.

S: 25 hundredths. → 0.25.

0.25

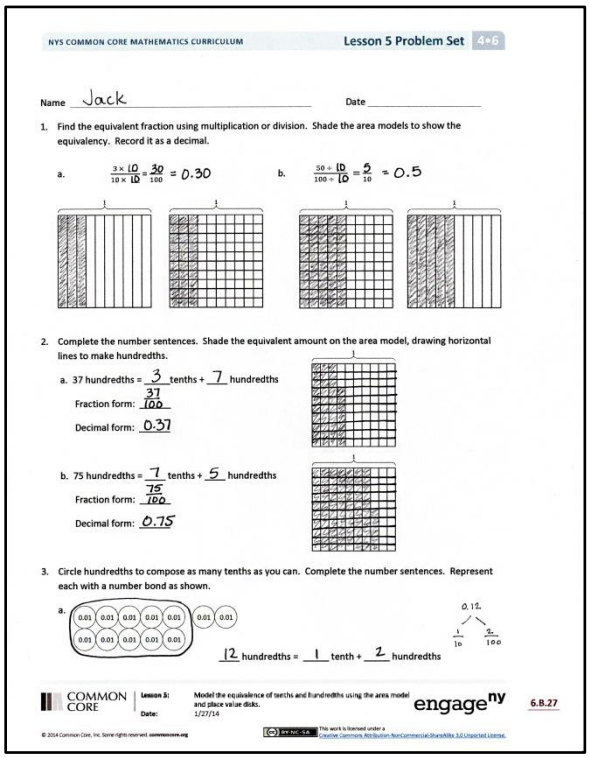
Repeat with 32 hundredths and 64 hundredths.

NOTES ON MULTIPLE MEANS FOR ACTION AND EXPRESSION:

Students working below grade level and English language learners may benefit from additional practice reading and writing decimals. If students are confusing the decimal notation (for example, modeling 0.5 rather than 0.05), couple place value disks with the area model, and have students count and recount their disks.

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.


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 5 Problem Set 4•6

Name Jack Date

1. Find the equivalent fraction using multiplication or division. Shade the area models to show the equivalency. Record it as a decimal.

a. $\frac{3 \times 10}{10 \times 10} = \frac{30}{100} = 0.30$ b. $\frac{50 \div 10}{100 \div 10} = \frac{5}{10} = 0.5$

2. Complete the number sentences. Shade the equivalent amount on the area model, drawing horizontal lines to make hundredths.

a. 37 hundredths = 3 tenths + 7 hundredths
Fraction form: $\frac{37}{100}$
Decimal form: 0.37

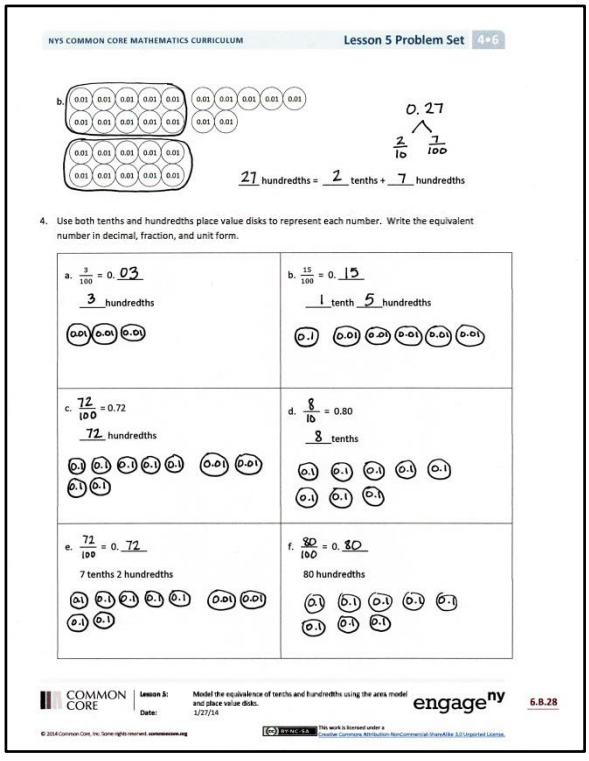
b. 75 hundredths = 7 tenths + 5 hundredths
Fraction form: $\frac{75}{100}$
Decimal form: 0.75

3. Circle hundredths to compose as many tenths as you can. Complete the number sentences. Represent each with a number bond as shown.

a. 12 hundredths = 1 tenth + 2 hundredths

0.12 → $\frac{1}{10}$, $\frac{2}{100}$

COMMON CORE Lesson 5: Date: 1/27/14 Model the equivalence of tenths and hundredths using the area model and place value disks. engage^ny 6.B.27


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 5 Problem Set 4•6

b. 27 hundredths = 2 tenths + 7 hundredths

0.27 → $\frac{2}{10}$, $\frac{7}{100}$

4. Use both tenths and hundredths place value disks to represent each number. Write the equivalent number in decimal, fraction, and unit form.

a. $\frac{3}{100} = 0.03$ — 3 hundredths

b. $\frac{15}{100} = 0.15$ — 1 tenth 5 hundredths

c. $\frac{72}{100} = 0.72$ — 72 hundredths

d. $\frac{8}{10} = 0.80$ — 8 tenths

e. $\frac{72}{100} = 0.72$ — 7 tenths 2 hundredths

f. $\frac{80}{100} = 0.80$ — 80 hundredths

COMMON CORE Lesson 5: Date: 1/27/14 Model the equivalence of tenths and hundredths using the area model and place value disks. engage^ny 6.B.28

Student Debrief (10 minutes)

Lesson Objective: Model the equivalence of tenths and hundredths using the area model and place value disks.

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 does solving Problem 1(a) help you solve Problem 2(a)?
- In Problem 3(a), how does circling groups of 10 hundredths help you find how many tenths are in the number?
- In Problem 4(a), how did you write 3 hundredths in decimal form? A student wrote 0.3 (zero point 3). What number did she write? Use your disks to explain how to properly express 3 hundredths in decimal form.
- With your partner, compare the answers to Problem 4 (d) and (f). Did you write the same equivalent numbers? Why are there several possibilities for answers in these two problems? Where have we seen that before?
- How is using the area model to show tenths and hundredths similar to or different from using place value disks to show tenths and hundredths? Which model do you prefer and why?

- How is exchanging 10 hundredths for 1 tenth like exchanging 10 tens for 1 hundred? How is it different?
- Use an area model to model both renaming 3 sixths as 1 half and renaming 30 hundredths as 3 tenths. What is happening to the units in both renamings?

Exit Ticket (3 minutes)

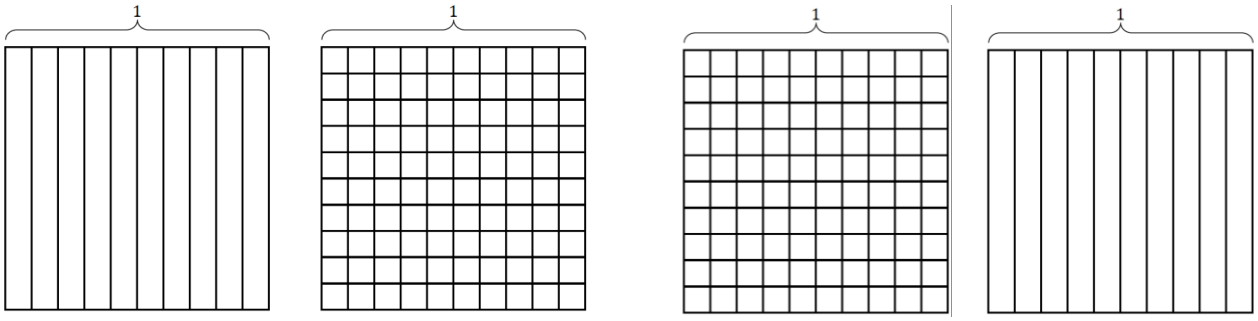
After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Name _____ Date _____

1. Find the equivalent fraction using multiplication or division. Shade the area models to show the equivalency. Record it as a decimal.

a. $\frac{3 \times}{10 \times} = \frac{\quad}{100}$

b. $\frac{50 \div}{100 \div} = \frac{\quad}{10}$

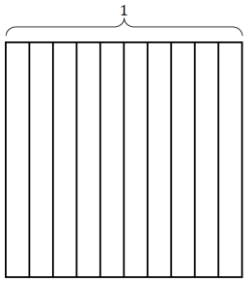


2. Complete the number sentences. Shade the equivalent amount on the area model, drawing horizontal lines to make hundredths.

a. 37 hundredths = _____tenths + ____ hundredths

Fraction form: _____

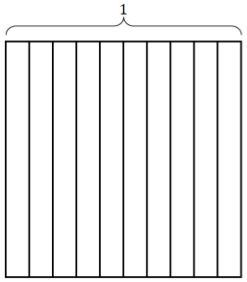
Decimal form: _____



b. 75 hundredths = ____ tenths + ____ hundredths

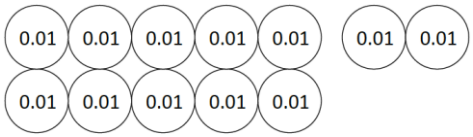
Fraction form: _____

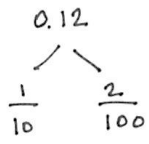
Decimal form: _____



3. Circle hundredths to compose as many tenths as you can. Complete the number sentences. Represent each with a number bond as shown.

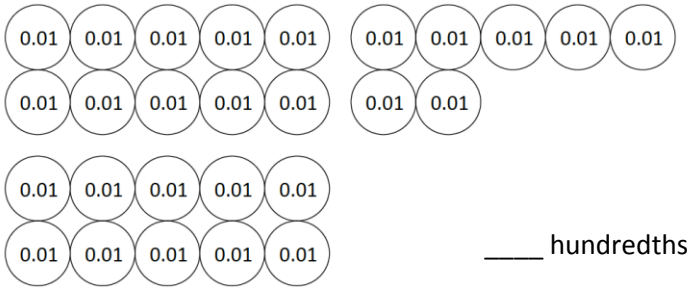
a.





____ hundredths = _____ tenth + _____ hundredths

b.



_____ hundredths = _____ tenths + _____ hundredths

4. Use both tenths and hundredths place value disks to represent each number. Write the equivalent number in decimal, fraction, and unit form.

a. $\frac{3}{100}$ = 0. _____ _____ hundredths	b. $\frac{15}{100}$ = 0. _____ _____ tenth _____ hundredths
c. ___ = 0.72 _____ hundredths	d. ___ = 0.80 _____ tenths
e. ___ = 0. _____ 7 tenths 2 hundredths	f. ___ = 0. _____ 80 hundredths

Name _____ Date _____

Use both tenths and hundredths place value disks to represent each fraction. Write the equivalent decimal, and fill in the blanks to represent each in unit form.

1. $\frac{7}{100}$ = 0.____

___ hundredths

2. $\frac{34}{100}$ = 0. ____

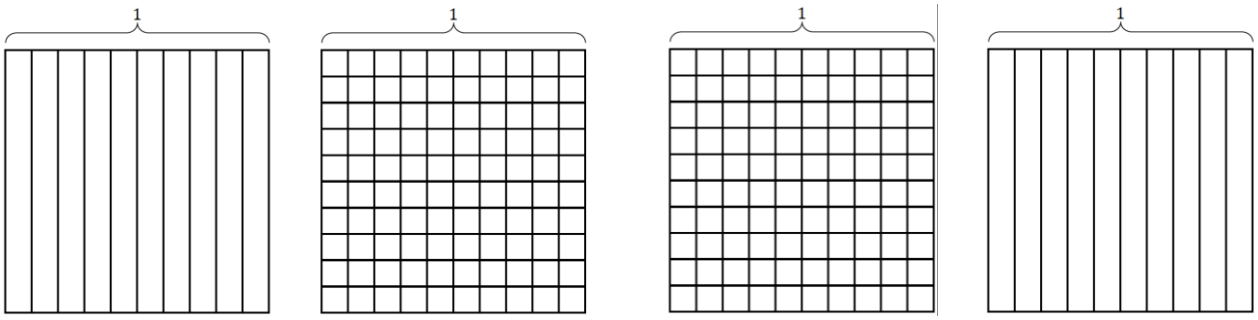
___ tenths ___ hundredths

Name _____ Date _____

1. Find the equivalent fraction using multiplication or division. Shade the area models to show the equivalency. Record it as a decimal.

a. $\frac{4 \times}{10 \times} = \frac{\quad}{100}$

b. $\frac{60 \div}{100 \div} = \frac{\quad}{10}$

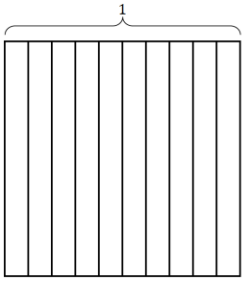


2. Complete the number sentences. Shade the equivalent amount on the area model, drawing horizontal lines to make hundredths.

a. 36 hundredths = _____ tenths + ____ hundredths

Decimal form: _____

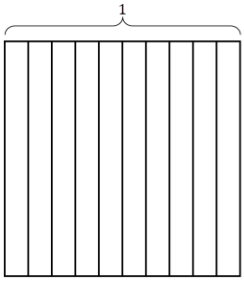
Fraction form: _____



b. 82 hundredths = ____ tenths + ____ hundredths

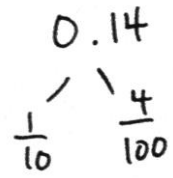
Decimal form: _____

Fraction form: _____



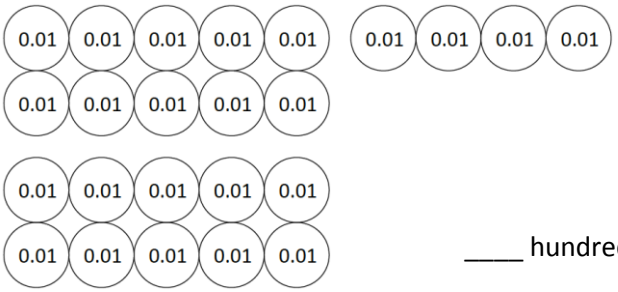
3. Circle hundredths to compose as many tenths as you can. Complete the number sentences. Represent each with a number bond as shown.

a.



____ hundredths = _____ tenth + _____ hundredths

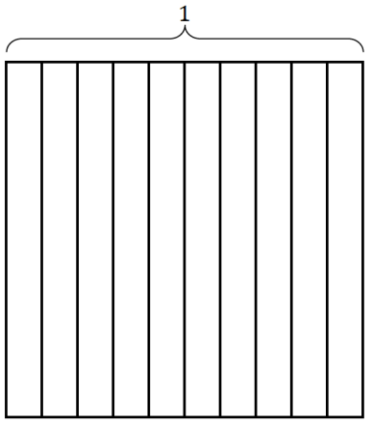
b.

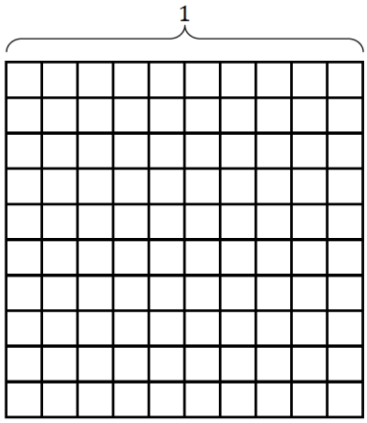


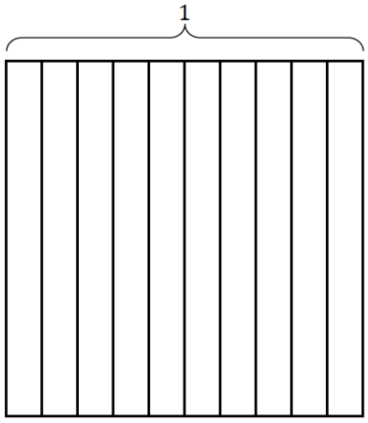
_____ hundredths = _____ tenths + _____ hundredths

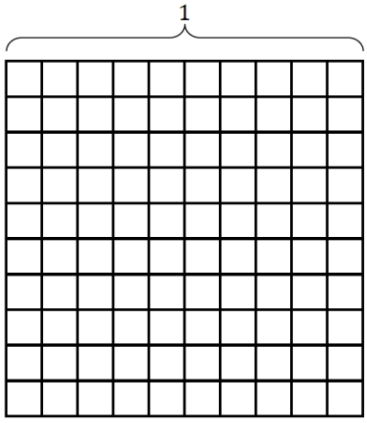
4. Use both tenths and hundredths place value disks to represent each number. Write the equivalent number in decimal, fraction, and unit form.

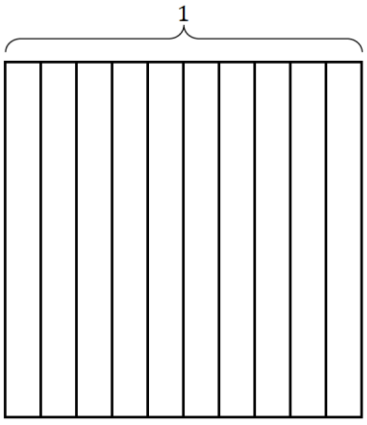
a. $\frac{4}{100}$ = 0. _____ _____ hundredths	b. $\frac{13}{100}$ = 0. _____ _____tenth _____ hundredths
c. ___ = 0.41 _____ hundredths	d. ___ = 0.90 _____ tenths
e. ___ = 0. _____ 6 tenths 3 hundredths	f. ___ = 0. _____ 90 hundredths

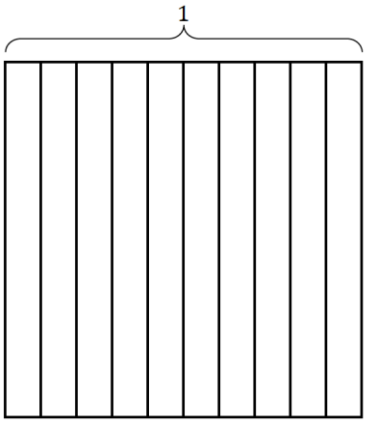


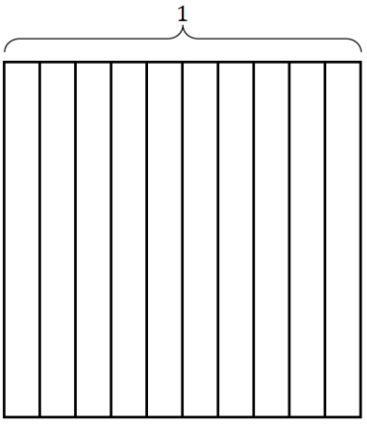












tenths and hundredths area model