Lesson 8
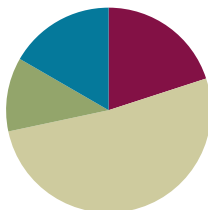
Objective: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

Suggested Lesson Structure

■ Fluency Practice   (12 minutes)
■ Application Problem   (7 minutes)
■ Concept Development   (31 minutes)
■ Student Debrief   (10 minutes)
  Total Time   **(60 minutes)**

Fluency Practice (12 minutes)

- Sprint: Write Fractions and Decimals **4.NF.5**   (9 minutes)
- Expanded Form **4.NF.5**   (3 minutes)

Sprint: Write Fractions and Decimals (9 minutes)

Materials: (S) Write Fractions and Decimals Sprint

Note: This Sprint reviews Lessons 4–7.

Expanded Form (3 minutes)

Materials: (T/S) Personal white board

Note: This fluency activity reviews Lesson 7.

T: (Write $4\frac{17}{100}$.) Write 4 and 17 hundredths in expanded fraction form without multiplication.

S: (Write $4\frac{17}{100} = 4 + \frac{1}{10} + \frac{7}{100}$.)

T: Write 4 and 17 hundredths in expanded decimal form.

S: (Write 4.17 = 4 + 0.1 + 0.07.)

Repeat the process for $25\frac{64}{100}$.

T: (Write 5.93.) Write 5 and 93 hundredths in expanded decimal form.

S: (Write 5.93 = 5 + 0.9 + 0.03.)

EUREKA MATH™

Lesson 8:   Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^ny

114

T: Write 5 and 93 hundredths in expanded fraction form.

S: (Write $5\frac{93}{100} = 5 + \frac{9}{10} + \frac{3}{100}$.)

Application Problem (7 minutes)

Jashawn had 5 hundred dollar bills and 6 ten dollar bills in his wallet. Alva had 58 ten dollar bills under her mattress. James had 556 one dollar bills in his piggy bank. They decide to combine their money to buy a computer. Express the total amount of money they have using the following bills:

a. Hundreds, tens, and ones   b. Tens and ones   c. Ones

Jashawn   500 + 60   560   ⓐ 16 hundreds 9 tens 6 ones
Alva   58 × 10   580   ⓑ 169 tens   6 ones
James   + 556   © 1696 ones
                      _____
                      $1,696

Note: This Application Problem reviews expanded form and patterns of ten in the place value chart, as taught in Module 1. Reviewing patterns of ten and decomposition of familiar, larger place value units prepares students for today's exploration of decomposition and composition of smaller place value units.

Concept Development (31 minutes)

Materials: (T/S) Area model and place value chart (Template), personal white board

Problem 1: Represent numbers in unit form in terms of different units using the area model.

T: (Place the area model and place value chart template into personal white boards.) Show 2 ones 4 tenths shaded on the area model.

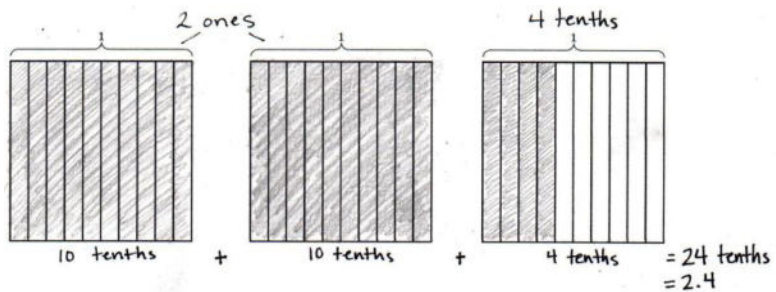T: (Point to the first rectangle.) How many tenths are in 1?

S: 10 tenths.

T: Record 10 tenths below the first two rectangles. (Point to the third rectangle.) How many tenths are represented?

S: 4 tenths.

T: Record 4 tenths below this rectangle. (Write the addition symbol between the units.) What is 10 tenths plus 10 tenths plus 4 tenths?

S: 24 tenths.

Lesson 8:   Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

115

T: (Write 2.4.) So, 2 and 4 tenths is equal to 24 tenths, true?

S: True.

T: Shade 2 ones 40 hundredths on the next set of area models.

T: Record an addition sentence in unit form that tells how many hundredths are shaded.

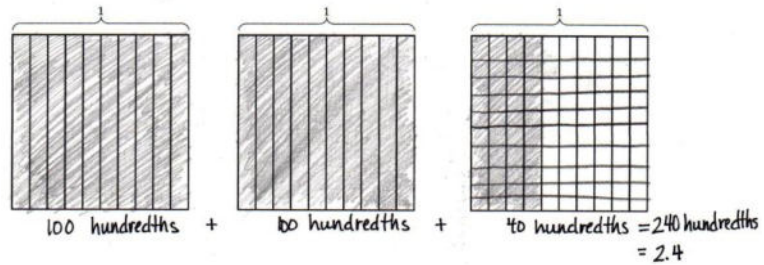100 hundredths + 100 hundredths + 40 hundredths = 240 hundredths = 2.4

S: (Write 100 hundredths + 100 hundredths + 40 hundredths = 240 hundredths.)

T: What decimal number is 240 hundredths equal to?

S: 2.40. → 2.4.

T: How can it be equivalent to both?

S: 4 tenths is equal to 40 hundredths, so 0.4 equals 0.40.

Problem 2: Represent numbers in unit form in terms of different units using place value disks.

T: Represent 2 as tenths. How many tenths are in 2 ones?

S: $1 = \frac{10}{10}$, $2 = \frac{10}{10} + \frac{10}{10} = \frac{20}{10}$.

T: Say the equivalence.

S: 2 ones equals 20 tenths.

T: Show 2 ones 4 tenths on your place value chart using place value disks. Express the number in unit form as it is shown on the chart.

S: 2 ones 4 tenths.

T: Decompose the 2 ones, and express them as tenths.

S: 2 ones = $\frac{20}{10}$. There are 20 tenths + 4 tenths = 24 tenths.

T: How can I express 24 tenths as hundredths?

MP.6

S: You can decompose the tenths to hundredths and count the total number of hundredths. That's too many place value disks to draw!

T: You are right! Let's solve without drawing place value disks. 1 tenth equals how many hundredths?
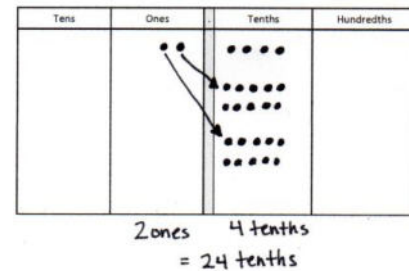
S: 1 tenth equals 10 hundredths.

T: 2 tenths is equivalent to how many hundredths?
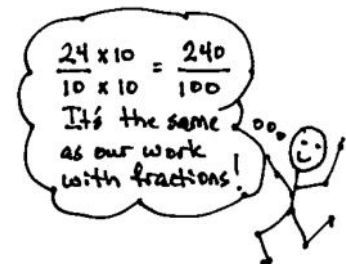
S: 2 tenths equals 20 hundredths.

T: So, 24 tenths equals…? Discuss it with your partner.

S: 240 hundredths. There are 10 times as many hundredths as there are tenths. We showed that using area models. → We can multiply the numerator and denominator by the same number, just like with fractions.

Tens	Ones	Tenths	Hundredths

2 ones   4 tenths
= 24 tenths

$2\frac{4}{10} = \frac{24}{10} = 2.4$

$2\frac{40}{100} = \frac{240}{100} = 2.40$

$\frac{24 \times 10}{10 \times 10} = \frac{240}{100}$ It's the same as our work with fractions!

EUREKA MATH

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^ny

116

MP.6

T: (Write $\frac{240}{100}$.) Write the equivalent decimal.

S: 2.40 or 2.4.

Repeat with 4.3.

Problem 3: Decompose mixed numbers to express as smaller units.

- T: (Write 3.6.) Say this decimal.
- S: 3 and 6 tenths.
- T: How many tenths are in 3 ones?
- S: 30 tenths.
- T: How many tenths are in 3.6?
- S: 36 tenths.
- T: In fraction form and unit form, write how many tenths are equal to 3.6.
- S: 3.6 = 36 tenths = $\frac{36}{10}$.
- T: How many hundredths are in 3 ones?
- S: 300 hundredths.
- T: How many hundredths are in 6 tenths?
- S: 60 hundredths.
- T: How many hundredths are in 3.6?
- S: 360 hundredths.
- T: In fraction form and unit form, write how many hundredths are equal to 3.6.
- S: 3.6 = 360 hundredths = $\frac{360}{100}$.

Repeat this process with 5.2 and 12.5.

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.

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

To scaffold the conversion of 24 tenths to 240 hundredths for students working below grade level, offer a few more steps. After verifying that 2 tenths equals 20 hundredths, ask, "5 tenths is equivalent to how many hundredths? (50.) 10 tenths is equivalent to how many hundredths? (100.) 20 tenths is equivalent to how many hundredths? (200.) So, 24 tenths equals…?"

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

117

Student Debrief (10 minutes)

Lesson Objective: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

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.

- ▪ Explain why the area model in Problem 1 is a good tool for representing the decimal fraction. How does it help to determine the equivalent decimal number?
- ▪ How did drawing the place value disks in Problem 2 help you to understand decomposing from one unit to another?
- ▪ How did solving Problem 3 help you to solve Problem 4?
- ▪ What strategies did you use when completing the chart in Problem 5? Did you complete one column at a time or one row at a time? Which columns were especially helpful in completing other columns?
- ▪ How is decomposing hundreds to tens or tens to ones similar to decomposing ones to tenths or tenths to hundredths?
- ▪ When decomposing numbers on the place value chart, each column to the right of another shows 10 times as many parts. Explain why this is so. Even though we have 10 times as many parts, we are really dividing. Explain.
- ▪ How did the Application Problem connect to today's lesson?

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.

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

118

A

Number Correct: _____

Write Fractions and Decimals

1.	$\frac{3}{10} =$	.	23.	$2 + \frac{1}{10} + \frac{6}{100} =$	.
2.	$\frac{3}{100} =$	.	24.	$2 + 0.1 + 0.06 =$	.
3.	$\frac{23}{100} =$	.	25.	$3 + 0.1 + 0.06 =$	.
4.	$1\frac{23}{100} =$	.	26.	$3 + 0.1 + 0.04 =$	.
5.	$4\frac{23}{100} =$	.	27.	$3 + 0.5 + 0.04 =$	.
6.	$0.07 =$	—	28.	$2 + 0.3 + 0.08 =$	.
7.	$1.07 =$	—	29.	$2 + 0.08 =$	.
8.	$0.7 =$	—	30.	$1 + 0.3 =$	.
9.	$1.7 =$	—	31.	$10 + 0.3 =$	.
10.	$1.74 =$	—	32.	$1 + 0.4 + 0.06 =$	.
11.	$\frac{4}{100} =$	.	33.	$10 + 0.4 + 0.06 =$	.
12.	$0.6 =$	—	34.	$30 + 0.7 + 0.02 =$	.
13.	$\frac{7}{100} =$	.	35.	$2 + \frac{3}{10} + 0.05 =$	.
14.	$0.02 =$	—	36.	$4 + 0.5 + \frac{3}{100} =$	.
15.	$\frac{9}{100} =$	.	37.	$4 + \frac{3}{100} + 0.5 =$	.
16.	$\frac{10}{100} =$	.	38.	$0.5 + \frac{3}{100} + 4 =$	.
17.	$\frac{10}{100} + \frac{2}{100} =$	.	39.	$20 + 0.8 + 0.01 =$	.
18.	$\frac{1}{10} + \frac{2}{100} =$	.	40.	$4 + \frac{9}{100} + \frac{2}{10} =$	.
19.	$\frac{1}{10} + \frac{3}{100} =$	.	41.	$0.04 + 2 + 0.7 =$	—
20.	$\frac{1}{10} + \frac{4}{100} =$	.	42.	$\frac{6}{10} + 8 + \frac{2}{100} =$	.
21.	$\frac{1}{10} + \frac{9}{100} =$	.	43.	$\frac{5}{100} + 8 + 0.9 =$	—
22.	$3 + \frac{1}{10} + \frac{9}{100} =$	.	44.	$0.9 + 10 + \frac{4}{100} =$	.

EUREKA MATH™

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^ny

119

B

Write Fractions and Decimals

#	Problem	Answer	#	Problem	Answer
1.	$\frac{1}{10} =$	.	23.	$2 + \frac{1}{10} + \frac{4}{100} =$	.
2.	$\frac{2}{10} =$	.	24.	$2 + 0.1 + 0.04 =$	.
3.	$\frac{3}{10} =$	.	25.	$3 + 0.1 + 0.04 =$	.
4.	$\frac{7}{10} =$	.	26.	$3 + 0.1 + 0.06 =$	.
5.	$\frac{5}{10} =$	.	27.	$3 + 0.5 + 0.06 =$	.
6.	$0.2 =$	—	28.	$2 + 0.4 + 0.09 =$	.
7.	$0.3 =$	—	29.	$2 + 0.06 =$	.
8.	$0.4 =$	—	30.	$1 + 0.5 =$	.
9.	$0.8 =$	—	31.	$10 + 0.5 =$	.
10.	$0.6 =$	—	32.	$1 + 0.2 + 0.04 =$	.
11.	$\frac{4}{10} =$	.	33.	$10 + 0.2 + 0.04 =$	.
12.	$0.9 =$	—	34.	$30 + 0.9 + 0.06 =$	.
13.	$\frac{6}{10} =$	.	35.	$2 + \frac{5}{10} + 0.07 =$	.
14.	$0.5 =$	—	36.	$4 + 0.7 + \frac{5}{100} =$	.
15.	$\frac{9}{10} =$	.	37.	$4 + \frac{5}{100} + 0.7 =$	.
16.	$\frac{10}{10} =$	.	38.	$0.7 + \frac{5}{100} + 4 =$	.
17.	$\frac{11}{10} =$	.	39.	$20 + 0.6 + 0.01 =$	.
18.	$\frac{12}{10} =$	.	40.	$6 + \frac{7}{100} + \frac{4}{10} =$	.
19.	$\frac{17}{10} =$	.	41.	$0.06 + 2 + 0.9 =$	—
20.	$\frac{27}{10} =$	.	42.	$\frac{8}{10} + 6 + \frac{4}{100} =$	.
21.	$\frac{47}{10} =$	.	43.	$\frac{3}{100} + 8 + 0.7 =$	—
22.	$\frac{34}{10} =$	.	44.	$0.7 + 10 + \frac{6}{100} =$	.

EUREKA MATH™

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^{ny}

120

Name _____ Date _____

1. Use the area model to represent $\frac{250}{100}$. Complete the number sentence.

   a. $\frac{250}{100}$ = _____ tenths = _____ ones _____ tenths = __.____
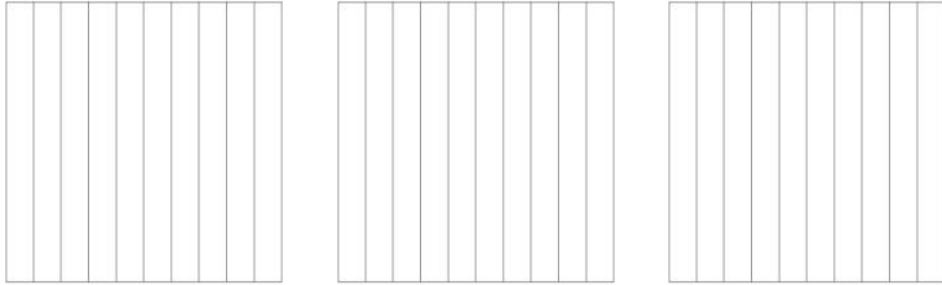
   b. In the space below, explain how you determined your answer to part (a).

2. Draw place value disks to represent the following decompositions:

   2 ones = _____ tenths

ones	.	tenths	hundredths

   2 tenths = _____ hundredths

ones	.	tenths	hundredths

   1 one 3 tenths   = ____ tenths

ones	.	tenths	hundredths

   2 tenths 3 hundredths = ____ hundredths

ones	.	tenths	hundredths

EUREKA MATH™

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^{ny}

121

3. Decompose the units to represent each number as tenths.

   a. 1 = _____ tenths

   b. 2 = _____ tenths

   c. 1.7 = _____ tenths

   d. 2.9 = _____ tenths

   e. 10.7 = _____ tenths

   f. 20.9 = _____ tenths

4. Decompose the units to represent each number as hundredths.

   a. 1 = _____ hundredths

   b. 2 = _____ hundredths

   c. 1.7 = _____ hundredths

   d. 2.9 = _____ hundredths

   e. 10.7 = _____ hundredths

   f. 20.9 = _____ hundredths

5. Complete the chart. The first one has been done for you.

Decimal	Mixed Number	Tenths	Hundredths
2.1	$2\frac{1}{10}$	21 tenths $\frac{21}{10}$	210 hundredths $\frac{210}{100}$
4.2			
8.4			
10.2			
75.5			

Name _____   Date _____

1. a. Draw place value disks to represent the following decomposition:

    3 ones 2 tenths = _____ tenths

ones	.	tenths	hundredths

    b. 3 ones 2 tenths = _____ hundredths

2. Decompose the units.

    a. 2.6 = _____ tenths

    b. 6.1 = _____ hundredths

EUREKA MATH™

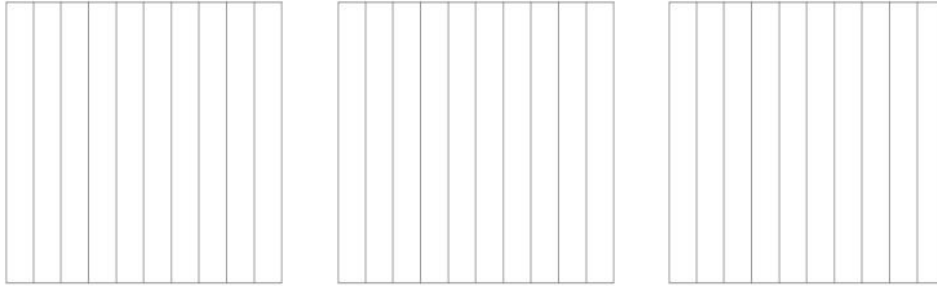Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^ny   123

Name _____   Date _____

1. Use the area model to represent $\frac{220}{100}$. Complete the number sentence.

   a. $\frac{220}{100}$ = _____ tenths = _____ ones _____ tenths = __.____

   b. In the space below, explain how you determined your answer to part (a).

2. Draw place value disks to represent the following decompositions:

   3 ones = _____ tenths

ones	.	tenths	hundredths

   3 tenths = _____ hundredths

ones	.	tenths	hundredths

   2 ones 3 tenths = ____ tenths

ones	.	tenths	hundredths

   3 tenths 3 hundredths = ____ hundredths

ones	.	tenths	hundredths

EUREKA MATH™

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^{ny}

124

3. Decompose the units to represent each number as tenths.

   a.   1 = _____ tenths

   b.   2 = _____ tenths

   c.   1.3 = _____ tenths

   d.   2.6 = _____ tenths

   e.   10.3 = _____ tenths

   f.   20.6 = _____ tenths

4. Decompose the units to represent each number as hundredths.

   a.   1 = _____ hundredths

   b.   2 = _____ hundredths

   c.   1.3 = _____ hundredths

   d.   2.6 = _____ hundredths

   e.   10.3 = _____ hundredths

   f.   20.6 = _____ hundredths

5. Complete the chart. The first one has been done for you.

Decimal	Mixed Number	Tenths	Hundredths
4.1	$4\frac{1}{10}$	41 tenths $\frac{41}{10}$	410 hundredths $\frac{410}{100}$
5.3			
9.7			
10.9			
68.5			

EUREKA MATH™

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

engage^ny

125
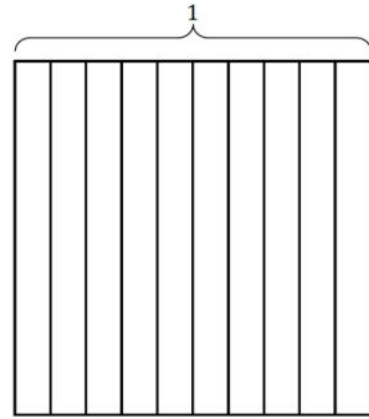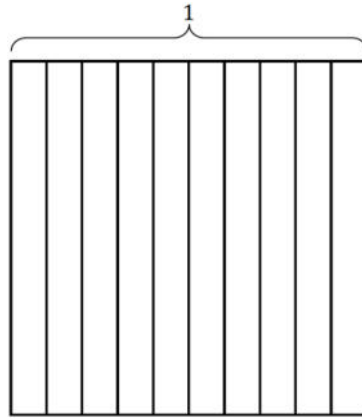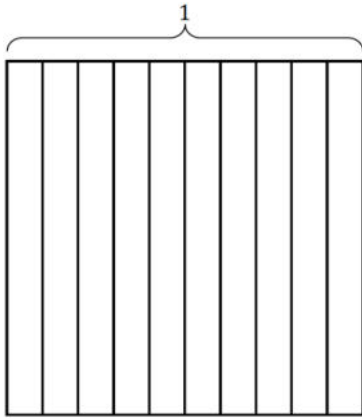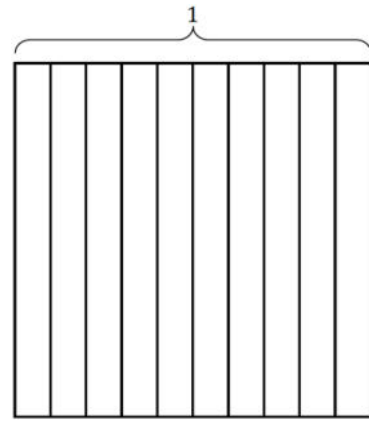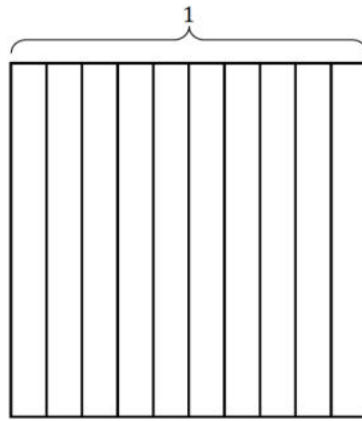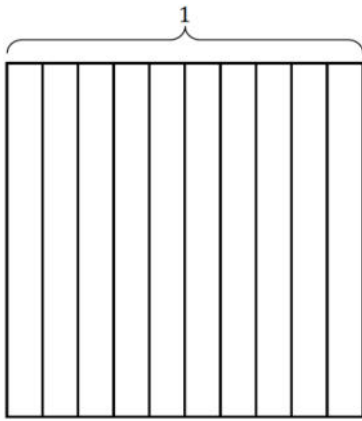
Tens	Ones	.	Tenths	Hundredths

area model and place value chart

Lesson 8: Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units.

126