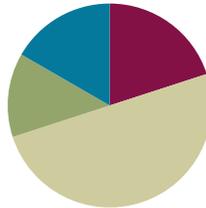# Lesson 5

Objective: Name decimal fractions in expanded, unit, and word forms by applying place value reasoning.

Related Topics: More Lesson Plans for the Common Core Math

Suggested Lesson Structure

■ Fluency Practice   (12 minutes)
■ Application Problems   (8 minutes)
■ Concept Development   (30 minutes)
■ Student Debrief   (10 minutes)
   Total Time   **(60 minutes)**

Fluency Practice (12 minutes)

- Multiply Decimals by 10, 100, and 1000   **5.NBT.2**   (8 minutes)
- Multiply and Divide by Exponents   **5.NBT.2**   (2 minutes)
- Multiply Metric Units   **5.MD.1**   (2 minutes)

Sprint: Multiply Decimals by 10, 100, and 1000 (8 minutes)

Materials: (S) Multiply Decimals by 10, 100, and 1000 Sprint

Note: This Sprint will help students work towards automaticity of multiplying and dividing decimals by 10, 100, and 1000.

Multiply and Divide by Exponents (2 minutes)

Materials: (S) Personal white boards

Note: This fluency will help students work towards mastery on the concept that was introduced in Lesson 4.

Depending on students' depth of knowledge, this fluency may be done with support from a personal place value chart or done simply by responding on the personal white board with the product or quotient.

- T: (Project place value chart from millions to thousandths.) Write 54 tenths as a decimal.
- S: (Students write 5 in the ones column and 4 in the tenths column.)
- T: Say the decimal.
- S: 5.4
- T: Multiply it by 10^2.
- S: (Students indicate change in value by using arrows from each original place value to product or

quotient on personal white board. They may, instead, simply write product.)

T: Say the product.

S: 540.

Repeat the process and sequence for 0.6×10^2, $0.6 \div 10^2$, 2.784×10^3, and $6583 \div 10^3$.

Multiplying Metric Units (2 minutes)

Materials: (S) Personal white boards

Note: This fluency will help students work towards mastery on the concept that was introduced in Lesson 4.

T: (Write 3 m = ____ cm.) Show 3 in your place value chart.

S: (Students write 3 in the ones column.)

T: How many centimeters are in 1 meter?

S: 100 centimeters.

T: Show how many centimeters are in 3 meters on your place value chart.

S: (Students cross out the 3 and shift it 2 place values to the left to show 300.)

T: How many centimeters are in 3 meters?

S: 300 centimeters.

Repeat the process and procedure for 7 kg = _____ g, 7000 ml = _____ l, 7500 m = _____ km _____ m, and 8350 g = _____ kg _____ g.

## Application Problems (8 minutes)

Jordan measures a desk at 200 cm. James measures the same desk in millimeters, and Amy measures the same desk in meters. What is James measurement in millimeters? What is Amy's measurement in meters? Show your thinking using a place value mat or equation using place value mat or an equation with exponents.

Note: Today's application problem offers students a quick review of yesterday's concepts before moving forward to naming decimals.
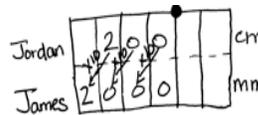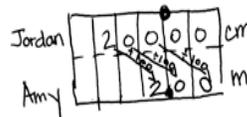
Concept Development (30 minutes)

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

Opener

T: (Write *three thousand forty seven* on the board.) On your personal white board, write this number

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in standard form, expanded form, and unit form.

T: Explain to your partner the purpose of writing this number in these different forms.

S: Standard form shows us the digits that we are using to represent that amount. → Expanded form shows how much each digit is worth and that the number is a total of those values added together. → Unit form helps us see how many of each size unit are in the number.

Problem 1

Represent 1 thousandth and 3 thousandths in standard, expanded, and unit form.

T: Write one thousandth using digits on your place value chart.

T: How many ones, tenths, hundredths, thousandths?

S: Zero, zero, zero, one.

T: This is the standard form of the decimal for 1 thousandth.

T: We write 1 thousandth as a fraction like this. (Write $\frac{1}{1000}$ on the board.)

T: 1 thousandth is a single copy of a thousandth. I can write the expanded form using a fraction like this, $1 \times \left(\frac{1}{1000}\right)$ (saying one copy of one thousandth) or using a decimal like this 1×0.001. (Write on the board.)

T: The unit form of this decimal looks like this *1 thousandth.* (Write on the board.) We use a numeral (point to 1) and the unit (point to thousandth) written as a word.

MP.7

$$\text{One thousandth} = 0.001 = \frac{1}{1000}$$
$$\frac{1}{1000} = 1 \times \left(\frac{1}{1000}\right)$$
$$0.001 = 1 \times 0.001$$
$$1 \text{ thousandth}$$

T: Imagine 3 copies of 1 thousandth. How many thousandths is that?

S: 3 thousandths.

T: (Write in standard form and as a fraction.)

T: 3 thousandths is 3 copies of 1 thousandth, turn and talk to your partner about how this would be written in expanded form using a fraction and using a decimal.

$$\text{Three thousandths} = 0.003 = \frac{3}{1000}$$
$$\frac{3}{1000} = 3 \times \left(\frac{1}{1000}\right)$$
$$0.003 = 3 \times 0.001$$
$$3 \text{ thousandths}$$

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Problem 2

Represent 13 thousandths in standard, expanded, and unit form.

T: Write thirteen thousandths in standard form, and expanded form using fractions and then using decimals. Turn and share with your partner.

S: Zero point zero one three is standard form. Expanded forms are

$1 \times \left(\frac{1}{100}\right) + 3 \times \left(\frac{1}{1000}\right)$ and 1 x 0.01 + 3 x 0.001 .

T: Now write this decimal in unit form.

S: 1 hundredth 3 thousandths → 13 thousandths.

T: (Circulate and write responses on the board.) I notice that there seems to be more than one way to write this decimal in unit form. Why?

S: This is 13 copies of 1 thousandth. → You can write the units separately or write the 1 hundredth as 10 thousandths. You add 10 thousandths and 3 thousandths to get 13 thousandths.

> **NOTES ON MULTIPLE MEANS FOR ENGAGEMENT:**
>
> Students struggling with naming decimals using different unit forms may benefit from a return to concrete materials. Using place value disks to make trades for smaller units combined with place value understandings from Lessons 1 and 2 help make the connection between 1 hundredth 3 thousandths and 13 thousandths.
>
> It may also be fruitful to invite students to extend their Grade 4 experiences with finding equivalent fractions for tenths and hundredths to finding equivalent fraction representations in thousandths.

Thirteen thousandths = 0.013 = $\frac{13}{1000}$

$\frac{13}{1000}$ =

0.013 = 1 × 0.01 + 3 × 0.001

1 hundredth 3 thousandths

13 thousandths

Repeat with 0.273 and 1.608 allowing students to combine units in their unit forms (for example, 2 tenths 73 thousandths; 273 thousandths; 27 hundredths 3 thousandths). Use more or fewer examples as needed reminding students who need it that *and* indicates the decimal in word form.

Problem 3

Represent 25.413 in word, expanded, and unit form.

T: (Write on the board.) Write 25.413 in word form on your board. (Students write.)

S: Twenty-five and four hundred thirteen thousandths.

T: Now, write this decimal in unit form on your board.

S: 2 tens 5 ones 4 tenths 1 hundredth 3 thousandths.

T: What are other unit forms of this number?

Allow students to combine units, e.g., 25 ones 413 thousandths, 254 tenths 13 hundredths, 25,413 thousandths.

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T: Write it as a mixed number, then in expanded form. Compare your work with your partner's.

Twenty-five and four hundred thirteen thousandths = $25\frac{413}{1000}$ = 25.413

$25\frac{413}{1000} = 2 \times 10 + 5 \times 1 + 4 \times \left(\frac{1}{10}\right) + 1 \times \left(\frac{1}{100}\right) + 3 \times \left(\frac{1}{1000}\right)$

25.413 = 2 × 10 + 5 × 1 + 4 × 0.1 + 1 × 0.01 + 3 × 0.001

2 tens 5 ones 4 tenths 1 hundredths 3 thousandths

25 ones 413 thousandths

Repeat the sequence with 12.04 and 9.495. Use more or fewer examples as needed.

Problem 4

Write the standard, expanded, and unit forms of *four hundred four thousandths* and *four hundred and four thousandths.*

T: Work with your partner to write these decimals in standard form. (Circulate looking for misconceptions about the use of the word *and.*)

T: Tell the digits you used to write *four hundred four thousandths*.

T: How did you know where to write the decimal in the standard form?

S: The word *and* tells us where the fraction part of the number starts.

T: Now work with your partner to write the expanded and unit forms for these numbers.

> **NOTES ON MULTIPLE MEANS OF REPRESENTATION:**
>
> Guide students to draw on their past experiences with whole numbers and make parallels to decimals. Whole number units are named by smallest base thousand unit, e.g., 365,000 = 365 thousand and 365 = 365 ones. Likewise, we can name decimals by the smallest unit (e.g., 0.63 = 63 hundredths).

Four hundred four thousandths = $\frac{404}{1000}$ = 0.404

$\frac{404}{1000} = 4 \times \left(\frac{1}{10}\right) + 4 \times \left(\frac{1}{1000}\right)$

0.404 = 4 × 0.1 + 4 × 0.001

4 tenths 4 thousandths

Four hundred and four thousandths = $400\frac{4}{1000}$ =

400.004 $400\frac{4}{1000} = 4 \times 100 + 4 \times \left(\frac{1}{1000}\right)$

Repeat this sequence with *two hundred two thousandths* and *nine hundred and nine tenths.*

T: Work on your problem set now. Read the word forms carefully!

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Problem Set (10 minutes)

Students should do their personal best to complete the problem set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Name decimal fractions in expanded, unit, and word forms by applying place value reasoning.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the problem set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson. You may choose to use any combination of the questions below to lead the discussion.

- Which tasks in Problem 1 are alike? Why?
- What is the purpose of writing a decimal number in expanded form using fractions? What was the objective of our lesson today?
- Compare your answers to Problem 1(c) and 1(d). What is the importance of the word *and* when naming decimals in standard form?
- When might expanded form be useful as a calculation tool? (It helps us see the like units, could help to add and subtract mentally.)
- How is expanded form related to the standard form of a number?

NYS COMMON CORE MATHEMATICS CURRICULUM

Name _Jenny_____ Date _____

1. Express as decimal numerals. The first one is done for you.

a.	four thousandths	0.004
b.	twenty-four thousandths	0.024
c.	One and three hundred twenty-four thousandths	1.324
d.	Six hundred eight thousandths	0.608
e.	Six hundred and eight thousandths	600.008
f.	$\frac{46}{1000}$	0.046
g.	$3\frac{946}{1000}$	3.946
h.	$200\frac{904}{1000}$	200.904

2. Express in words.

a. 0.005 five thousandths

b. 11.037 eleven and thirty-seven thousandths

c. 403.608 four hundred three and six hundred eight thousandths

3. Write the number on a place value chart then write it in expanded form using fractions or decimals to express the decimal place value units. The first one is done for you.

a. 35.827

tens	ones		tenths	hundredths	thousandths
3	5	●	8	2	7

$35.827 = 3 \times 10 + 5 \times 1 + 8 \times \left(\frac{1}{10}\right) + 2 \times \left(\frac{1}{100}\right) + 7 \times \left(\frac{1}{1000}\right)$ or

$= 3 \times 10 + 5 \times 1 + 8 \times 0.1 + 2 \times 0.01 + 7 \times 0.001$

NYS COMMON CORE MATHEMATICS CURRICULUM

b. 0.249

1's	10's	100's	1000's
0	2	4	9

$0.249 = 2 \times \frac{1}{10} + 4 \times \frac{1}{100} + 9 \times \frac{1}{1000}$

$0.249 = 2 \times 0.1 + 4 \times 0.01 + 9 \times 0.001$

c. 57.281

10's	1's	$\frac{1}{10}$'s	$\frac{1}{100}$'s	$\frac{1}{1000}$'s
5	7	2	8	1

$57.281 = 5 \times 10 + 7 \times 1 + 2 \times \frac{1}{10} + 8 \times \frac{1}{100} + 1 \times \frac{1}{1000}$

$= 5 \times 10 + 7 \times 1 + 2 \times 0.1 + 8 \times 0.01 + 1 \times 0.001$

4. Write a decimal for each of the following. Use a place value chart to help if necessary.

a. $7 \times 10 + 4 \times 1 + 6 \times \left(\frac{1}{10}\right) + 9 \times \left(\frac{1}{100}\right) + 2 \times \left(\frac{1}{1000}\right)$ 74.692

b. $5 \times 100 + 3 \times 10 + 8 \times 0.1 + 9 \times 0.001$ 530.809

c. $4 \times 1000 + 2 \times 100 + 7 \times 1 + 3 \times \left(\frac{1}{100}\right) + 4 \times \left(\frac{1}{1000}\right)$ 4207.034

5. Mr. Pham wrote 2.619 on the board. Christy says its two and six hundred nineteen thousandths. Amy says its 2 ones 6 tenths 1 hundredth 9 thousandths. Who is right? Use words and numbers to explain your answer.

Both girls are right. Christy used word form and Amy used unit form. Both are equal to 2.619

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

A

Correct _____

Multiply.

1	62.3 x 10 =		23	4.1 x 1000 =	
2	62.3 x 100 =		24	7.6 x 1000 =	
3	62.3 x 1000 =		25	0.01 x 1000 =	
4	73.6 x 10 =		26	0.07 x 1000 =	
5	73.6 x 100 =		27	0.072 x 100 =	
6	73.6 x 1000 =		28	0.802 x 10 =	
7	0.6 x 10 =		29	0.019 x 1000 =	
8	0.06 x 10 =		30	7.412 x 1000 =	
9	0.006 x 10 =		31	6.8 x 100 =	
10	0.3 x 10 =		32	4.901 x 10 =	
11	0.3 x 100 =		33	16.07 x 100 =	
12	0.3 x 1000 =		34	9.19 x 10 =	
13	0.02 x 10 =		35	18.2 x 100 =	
14	0.02 x 100 =		36	14.7 x 1000 =	
15	0.02 x 1000 =		37	2.021 x 100 =	
16	0.008 x 10 =		38	172.1 x 10 =	
17	0.008 x 100 =		39	3.2 x 20 =	
18	0.008 x 1000 =		40	4.1 x 20 =	
19	0.32 x 10 =		41	3.2 x 30 =	
20	0.67 x 10 =		42	1.3 x 30 =	
21	0.91 x 100 =		43	3.12 x 40 =	
22	0.74 x 100 =		44	14.12 x 40 =	

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B   Improvement _____   # Correct _____

Multiply.

1	46.1 x 10 =		23	5.2 x 1000 =	
2	46.1 x 100 =		24	8.7 x 1000 =	
3	46.1 x 1000 =		25	0.01 x 1000 =	
4	89.2 x 10 =		26	0.08 x 1000 =	
5	89.2 x 100 =		27	0.083 x 10 =	
6	89.2 x 1000 =		28	0.903 x 10 =	
7	0.3 x 10 =		29	0.017 x 1000 =	
8	0.03 x 10 =		30	8.523 x 1000 =	
9	0.003 x 10 =		31	7.9 x 100 =	
10	0.9 x 10 =		32	5.802 x 10 =	
11	0.9 x 100 =		33	27.08 x 100 =	
12	0.9 x 1000 =		34	8.18 x 10 =	
13	0.04 x 10 =		35	29.3 x 100 =	
14	0.04 x 100 =		36	25.8 x 1000 =	
15	0.04 x 1000 =		37	3.032 x 100 =	
16	0.007 x 10 =		38	283.1 x 10 =	
17	0.007 x 100 =		39	2.1 x 20 =	
18	0.007 x 1000 =		40	3.3 x 20 =	
19	0.45 x 10 =		41	3.1 x 30 =	
20	0.78 x 10 =		42	1.2 x 30 =	
21	0.28 x 100 =		43	2.11 x 40 =	
22	0.19 x 100 =		44	13.11 x 40 =	

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Lesson 5: Name decimal fractions in expanded, unit, and word forms by applying place value reasoning.
Date: 4/1/14

engage^ny 1.B.10

Name _____   Date _____

1. Express as decimal numerals. The first one is done for you.

a. four thousandths	0.004
b. twenty-four thousandths	
c. one and three hundred twenty-four thousandths	
d. six hundred eight thousandths	
e. six hundred and eight thousandths	
f. $\frac{46}{1000}$	
g. $3\frac{946}{1000}$	
h. $200\frac{904}{1000}$	

2. Express in words.

   a. 0.005

   b. 11.037

   c. 403.608

3. Write the number on a place value chart then write it in expanded form using fractions or decimals to express the decimal place value units. The first one is done for you.
   a. 35.827

tens	ones		tenths	hundredths	thousandths
3	5	●	8	2	7

$35.827 = 3 \times 10 + 5 \times 1 + 8 \times \left(\frac{1}{10}\right) + 2 \times \left(\frac{1}{100}\right) + 7 \times \left(\frac{1}{1000}\right)$ *or*

$\quad\quad\quad = 3 \times 10 + 5 \times 1 + 8 \times 0.1 + 2 \times 0.01 + 7 \times 0.001$

Lesson 5: Name decimal fractions in expanded, unit, and word forms by applying place value reasoning.
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engage^{ny} 1.B.11

b. 0.249

c. 57.281

4. Write a decimal for each of the following. Use a place value chart to help if necessary.

a. $7 \times 10 + 4 \times 1 + 6 \times \left(\frac{1}{10}\right) + 9 \times \left(\frac{1}{100}\right) + 2 \times \left(\frac{1}{1000}\right)$

b. $5 \times 100 + 3 \times 10 + 8 \times 0.1 + 9 \times 0.001$

c. $4 \times 1000 + 2 \times 100 + 7 \times 1 + 3 \times \left(\frac{1}{100}\right) + 4 \times \left(\frac{1}{1000}\right)$

5. Mr. Pham wrote 2.619 on the board. Christy says its two and six hundred nineteen thousandths. Amy says its 2 ones 6 tenths 1 hundredth 9 thousandths. Who is right? Use words and numbers to explain your answer.

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Name _____   Date _____

1. Express nine thousandths as a decimal.

2. Express twenty-nine thousandths as a fraction.

3. Express 24.357 in words.

    a. Write the expanded form using fractions or decimals.

    b. Express in unit form.

Lesson 5:   Name decimal fractions in expanded, unit, and word forms by applying place value reasoning.

Date: 4/1/14

engage^ny   **1.B.13**

Name _____   Date _____

1. Express as decimal numerals. The first one is done for you.

a.	Five thousandths	0.005
b.	Thirty-five thousandths	
c.	Nine and two hundred thirty-five thousandths	
d.	Eight hundred and five thousandths	
e.	$\frac{8}{1000}$	
f.	$\frac{28}{1000}$	
g.	$7\frac{528}{1000}$	
h.	$300\frac{502}{1000}$	

2. Express in words.

   a. 0.008

   b. 15.062

   c. 607.409

3. Write the number on a place value chart then write it in expanded form using fractions or decimals to express the decimal place value units. The first one is done for you.

   a. 27.346

tens	ones	●	tenths	hundredths	thousandths
2	7		3	4	6

$27.346 = 2 \times 10 + 7 \times 1 + 3 \times \left(\frac{1}{10}\right) + 4 \times \left(\frac{1}{100}\right) + 6 \times \left(\frac{1}{1000}\right)$

OR

$27.346 = 2 \times 10 + 7 \times 1 + 3 \times 0.1 + 4 \times 0.01 + 6 \times 0.001$

Lesson 5:   Name decimal fractions in expanded, unit, and word forms by applying place value reasoning.
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b. 0.362

c. 49.564

4. Write a decimal for each of the following. Use a place value chart to help if necessary.

a. $3 \times 10 + 5 \times 1 + 2 \times \left(\frac{1}{10}\right) + 7 \times \left(\frac{1}{100}\right) + 6 \times \left(\frac{1}{1000}\right)$

b. $9 \times 100 + 2 \times 10 + 3 \times 0.1 + 7 \times 0.001$

c. $5 \times 1000 + 4 \times 100 + 8 \times 1 + 6 \times \left(\frac{1}{100}\right) + 5 \times \left(\frac{1}{1000}\right)$

5. At the beginning of a lesson, a piece of chalk is 2.967 of an inch. At the end of lesson, it's 2.308 of an inch. Write the two amounts in expanded form using fractions.

a. At the beginning of the lesson:

b. At the end of the lesson:

6. Mrs. Herman asked the class to write an expanded form for 412.638. Nancy wrote the expanded form using fractions and Charles wrote the expanded form using decimals. Write their responses.

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engage^{ny} **1.B.15**