

4.1

Decimal Place Value



Objective To extend the base-ten place-value system to decimals.

1 Teaching the Lesson

Key Activities

Students use number lines to visualize the relationship between successive places in decimals. They review the place-value chart for whole numbers and extend it to decimals. They practice identifying places in decimals and the values of the digits in those places.

Key Concepts and Skills

- Identify the values of digits in decimals. [Number and Numeration Goal 1]
- Read and write decimals through thousandths. [Number and Numeration Goal 1]
- Order decimals through thousandths on a number line. [Number and Numeration Goal 6]
- Use extended division facts to expand the place-value chart to decimals. [Operations and Computation Goal 3]
- Describe numeric patterns in number lines. [Patterns, Functions, and Algebra Goal 1]

materials

- Math Journal 1*, p. 78
- Transparencies (*Math Masters*, pp. 106 and 107; optional)
- calculator
- overhead calculator (optional)
- slate

2 Ongoing Learning & Practice

Students play *Polygon Pair-Up* to practice naming properties of polygons.

Students practice and maintain skills through Math Boxes and Study Link activities.

Ongoing Assessment: Recognizing Student Achievement Use journal page 79. [Number and Numeration Goal 1]

materials

- Math Journal 1*, p. 79
- Student Reference Book*, p. 258
- Study Link Master (*Math Masters*, p. 108)
- Polygon Pair-Up* Property Cards and Polygon Cards (*Math Masters*, pp. 496 and 497)

3 Differentiation Options

READINESS

Students use bills and coins to explore decimals to hundredths.

ENRICHMENT

Students make up and solve place-value puzzles.

EXTRA PRACTICE

Students construct and use a Place-Value Flip Book.

materials

- Teaching Master (*Math Masters*, p. 109)
- Teaching Aid Master (*Math Masters*, p. 428)
- Place-Value Flip Book (*Math Masters*, pp. 399–402)
- scissors; dimes and pennies

Technology



Assessment Management System
Math Boxes, Problems 3a–3d
See the iTLG.

Getting Started

Mental Math and Reflexes

Write whole numbers through millions on the board. Ask students to identify the digits in each place and the values of the digits. *Suggestions:*

Write 5,972,681 on the board.

- Which digit is in the thousands place? **2** How much is that digit worth? **2,000**
- Which digit is in the ten-thousands place? **7** How much is that digit worth? **70,000**
- Which digit is in the millions place? **5** How much is that digit worth? **5,000,000**



Math Message

Complete Problem 1 on journal page 78.



1 Teaching the Lesson

Math Message Follow-Up



WHOLE-CLASS ACTIVITY

(Math Journal 1, p. 78; Math Masters, p. 106)

Have students skip count on their calculators to check their answers to Problem 1. Model the keystrokes on an overhead calculator, if available.

Remind the class to reset the calculator (clear all settings and memory) before each problem. For the TI-15 calculator, students press **On/Off** and **Clear** at the same time. For the fx-55 calculator, students press **AC**.

For the TI-15 calculator, they enter the following keystrokes:

Op1 **+** 1 **Op1** 0 **Op1** **Op1** ...

For the Casio fx-55 calculator, they enter the following keystrokes:

1 **+** **+** **=** **=** ...

You may want to use a transparency of *Math Masters*, page 106 to discuss the relationships between and among the number lines. Remind students that a number line goes on infinitely in both directions and that it is not possible to draw the entire number line.

Ask students to imagine that they are looking at the interval from 0 to 1 on the first number line under a magnifying glass—here, they would see the second number line. Or, to put it another way, the second number line shows the segment from 0 to 1 in greater detail than the first number line. Similarly, if students looked at the interval from 0 to 0.1 on the second number line under a magnifying glass, they would see the third number line.

NOTE *Math Masters*, page 106 is identical to *Math Journal 1*, page 78 and may be used to make a transparency.

Student Page

Date _____ Time _____

LESSON 4•1
Place-Value Number Lines

Fill in the missing numbers.

1
2
3
4

Math Journal 1, p. 78

Have students skip count on their calculators to complete the remaining number lines.

For the TI-15:

Problem 2: $\text{Op1} \ (+) \ 0.1 \ \text{Op1} \ 0 \ \text{Op1} \ \text{Op1} \ \dots$

Problem 3: $\text{Op1} \ (+) \ 0.01 \ \text{Op1} \ 0 \ \text{Op1} \ \text{Op1} \ \dots$

Problem 4: $\text{Op1} \ (+) \ 0.001 \ \text{Op1} \ 0 \ \text{Op1} \ \text{Op1} \ \dots$

For the Casio *fx-55*:

Problem 2: $0.1 \ (+) \ (+) \ (=) \ (=) \ \dots$

Problem 3: $0.01 \ (+) \ (+) \ (=) \ (=) \ \dots$

Problem 4: $0.001 \ (+) \ (+) \ (=) \ (=) \ \dots$

From this activity and discussion, some students may realize, or at least grasp intuitively, that 1 is ten times as much as 0.1, that 0.1 is ten times as much as 0.01, and so on. This idea leads naturally to the extension of place value in the remainder of this lesson.

▶ Reviewing the Place-Value Chart for Whole Numbers and Extending It to Decimals



WHOLE-CLASS ACTIVITY

(*Math Masters*, p. 107)

Use the place-value chart on *Math Masters*, page 107 to review the headings for whole-number places. Remind students how to use the chart to determine the value of each digit in the number 5,709:

- ▶ The digit 5 is in the thousands place—its value is 5 thousands, or 5,000.
- ▶ The digit 7 is in the hundreds place—its value is 7 hundreds, or 700; and so on.

Write each digit in the chart as you review its value.

Point out that each place has a value that is 10 times the value of the place to its right: 1,000 is 10 times 100; 100 is 10 times 10; and so on. Stated another way, each place has a value that is one-tenth the value of the place to its left: 1 is one-tenth of 10; 10 is one-tenth of 100; and so on.

	$\div 10$	$\div 10$	$\div 10$			
1,000s	100s	10s	1s			
Thousands	Hundreds	Tens	Ones	.		
5	7	0	9			

Teaching Master

Name _____ Date _____ Time _____

LESSON 4•1 Place-Value Chart

0.001s	0.001s	0.01s	0.1s	1s	10s	100s	1,000s						
Thousandths	Thousandths	Hundredths	Tenths	Ones	Tens	Hundreds	Thousands						

Math Masters, p. 107

Demonstrate how to use a calculator to derive the headings for the place-value chart: Ask students to enter 1000 \div 10 Enter . The display shows the next heading to the right, 100. Enter \div 10 Enter . **10, for the tens place** Then enter \div 10 Enter again. **1, for the ones place STOP!**

- What would the calculator display show if you divided by 10 again? **0.1, for the tenths place** Why? **0.1 is one-tenth of 1.**

Enter the headings 0.1s and Tenths in the next column of your chart.

- What if you divided by 10 again? **0.01, for the hundredths place**
One more time? **0.001, for the thousandths place**

Complete the headings in the chart.

1,000s	100s	10s	1s	0.1s	0.01s	0.001s
Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
5	7	0	9			

Call students' attention to the spellings of the headings: The headings for the decimal places end in *-ths*. Students must be careful not to confuse *tens* with *tenths*, *hundreds* with *hundredths*, and so on.



Adjusting the Activity

Have students speculate about the names of the places to the right of the thousandths place. **Ten-thousandths, hundred-thousandths, millionths, and so on**

A U D I T O R Y ♦ K I N E S T H E T I C ♦ T A C T I L E ♦ V I S U A L

▶ Identifying Digits and the Values of Digits in Decimals



WHOLE-CLASS
ACTIVITY

Write a decimal, such as 7.386, in the place-value chart. Discuss why the decimal point is necessary.

Discuss the value of each digit:

- ▷ The digit 7 is in the ones place—its value is 7.
- ▷ The digit 3 is in the tenths place—its value is 3 tenths; and so on.

Write other decimals in the place-value chart. As a slate activity, have students identify the digits in each place and their values.

Student Page

Date _____ Time _____

LESSON 4•1 Math Boxes

1. Solve mentally.

- a. $9 \times 4 = 36$
 b. $6 \times \frac{3}{2} = 18$
 c. $3 \times \frac{7}{2} = 21$
 d. $16 \div 4 = 4$
 e. $20 \div 4 = 5$
 f. $54 \div 6 = 9$

2. Solve $199 = p - 408$. Choose the best answer.

- p = 209
 p = 309
 p = 607
 p = 507

3. In the numeral 9,358,461.72, the 6 is worth 60.

- a. The 4 is worth 400
 b. The 8 is worth 8,000
 c. The 3 is worth 300,000
 d. The 9 is worth 9,000,000
 e. The 7 is worth 0.7

4. Draw and label ray BY. Draw point A on it.

Sample answer:



5. Insert parentheses to make these number sentences true.

- a. $(5 + 4) - 2 = 18$
 b. $25 + (8 \times 7) = 81$
 c. $1 = (36 \div 6) - 5$
 d. $19 = (15 - 5) + (81 \div 9)$

6. Estimate the sum. Write a number model to show how you estimated.

$458 + 1,999 + 12,307$
 Number model: **Sample answer:**
 $500 + 2,000 + 12,300 = 14,800$

Math Journal 1, p. 79

2 Ongoing Learning & Practice

▶ Playing Polygon Pair-Up



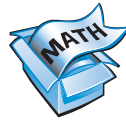
(Student Reference Book, p. 258; Math Masters, pp. 496 and 497)

Students play *Polygon Pair-Up* to practice identifying properties of polygons. See Lesson 1-6 for additional information.

▶ Math Boxes 4•1



(Math Journal 1, p. 79)



Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 4-3. The skill in Problem 6 previews Unit 5 content.



Ongoing Assessment: Recognizing Student Achievement

Math Boxes Problems 3a–3d

Use **Math Boxes, Problems 3a–3d** to assess students' ability to identify the values of digits in whole numbers. Students are making adequate progress if they correctly identify the values of digits through millions. Some students may be able to identify the values of digits in the tenths and hundredths places.

[Number and Numeration Goal 1]

▶ Study Link 4•1



(Math Masters, p. 108)



Home Connection Students solve place-value puzzles.

Study Link Master

Name _____ Date _____ Time _____

STUDY LINK 4•1 Place-Value Puzzles

Use the clues to write the digits in the boxes and find each number.

1. ♦ Write 5 in the tens place.
 ♦ Find $\frac{1}{2}$ of 24. Subtract 4. Write the result in the hundreds place.
 ♦ Add 7 to the digit in the tens place. Divide by 2. Write the result in the thousands place.
 ♦ In the ones place, write an even number greater than 2 that has not been used yet.

1,000s	100s	10s	1s
6	8	5	4

2. ♦ Divide 15 by 3. Write the result in the hundredths place.
 ♦ Multiply 2 by 10. Divide by 10. Write the result in the ones place.
 ♦ Write a digit in the tenths place that is 4 more than the digit in the hundredths place.
 ♦ Add 7 to the digit in the ones place. Write the result in the thousandths place.

100s	10s	1s	0.1s	0.01s	0.001s
		2	9	5	9

3. ♦ Write the result of 6×9 divided by 18 in the ones place.
 ♦ Double 8. Divide by 4. Write the result in the thousandths place.
 ♦ Add 3 to the digit in the thousandths place. Write the result in the tens place.
 ♦ Write the same digit in the tenths and hundredths place so that the sum of all the digits is 14.

10s	1s	0.1s	0.01s	0.001s
7	3	0	0	4

Practice

Write true or false.

4. $6 \times 5 = 15 + 15$ **true** 5. $15 + 7 < 13 - 8$ **false** 6. $72 \div 9 > 9$ **false**

Math Masters, p. 108

3 Differentiation Options

READINESS



PARTNER
ACTIVITY

5–15 Min

Using Money to Explore Decimals

(Math Masters, pp. 109 and 428)

To explore decimals to the hundredths place using a concrete model, have students make bill and coin combinations for given amounts. Upon completion of the table, have students discuss patterns. **Sample answer: The number of pennies is always written in the place farthest to the right (the hundredths place), dimes in the tenths place, and dollars in the ones and tens places.**

ENRICHMENT



PARTNER
ACTIVITY

5–15 Min

Writing and Solving Place-Value Puzzles



To apply students' understanding of place value, have them create place-value puzzles. They write puzzles similar to those on Study Link 4-1 and ask a partner to solve them. Encourage students to use multiplication and division facts in their clues.

EXTRA PRACTICE



SMALL-GROUP
ACTIVITY

15–30 Min

Making and Using a Place-Value Tool

(Math Masters, pp. 399–402)

To practice decimal place value, have students adapt the flip book they made in Lesson 2-4 to use with decimals. On page 12 of the flip book, there are decimal points in each place, so a wide range of mixed numbers can be displayed. *Suggestions:*

- ▷ Dictate a number. Have students display the number with their books. Ask them to display and read the number that is 0.1 more (and less); 0.01 more (and less); and so on.
- ▷ Direct students to display certain digits in the places you specify. Have students read the resulting number.
- ▷ Have students count in unison as they turn over the digits in the books. Count by 1s, starting at 1; by 0.1s, starting at 0.1; by 0.01s, starting at 0.01; and by 0.001s, starting at 0.001.

Teaching Master

Name _____ Date _____ Time _____

LESSON
4•1

Money and Decimals



Use only \$1 bills,  dimes,  , and pennies  .

1. Use as few bills and coins as possible to show each amount below. Record your work.

Amount	\$1 bills	Dimes	Pennies
\$1.26	/	2	6
\$1.11	1	1	1
\$2.35	2	3	5
\$3.40	3	4	0
\$2.06	2	0	6
\$0.96	0	9	6
\$0.70	0	7	0
\$0.03	0	0	3

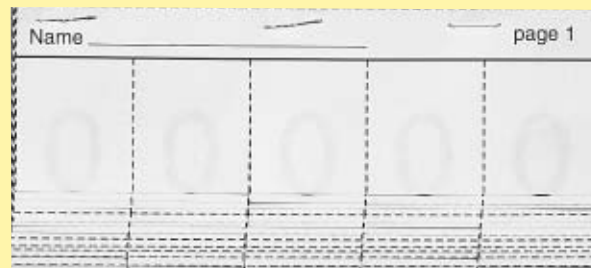
2. Describe any patterns you see in the table.

Sample answer: The ones place shows dollars, the tenths place shows dimes, and the hundredths place shows pennies.

3. You can use \$1 bills, dimes, and pennies to make any amount of money. Why do you think we have nickels, quarters, and half-dollars?

Sample answer: Having nickels, quarters, and half-dollars lets us make change using fewer coins.

Math Masters, p. 109



Students fold back the last page of the Place-Value Flip Book for use with decimals.