Decimals Are Fractions Too

NAME:

Math PATHWAYS & PITFALLS

Purpose

To find equivalent decimals for fraction amounts

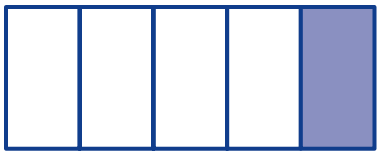
Math Words

decimal amounts	Decimal amounts may be in ten**ths**, hundred**ths**, thousand**ths**, ten thousand**ths**, and so on.
decimal point	Whole numbers are to the left of a decimal point and parts of a whole are to the right.

Starter Problem

$\frac{1}{5}$ of this rectangle is shaded.

What decimal amount is shaded?

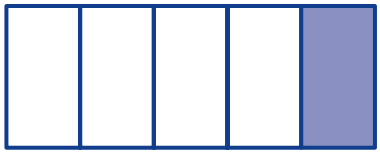


NAME:

Starter Problem

$\frac{1}{5}$ of this rectangle is shaded.

What decimal amount is shaded?

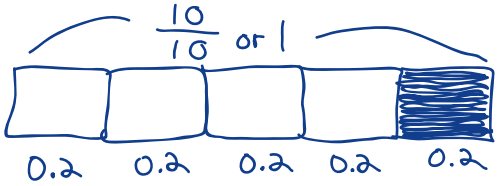


Student Thinking

Lee

I needed a decimal, so I called the whole rectangle 10 tenths. There are 10 tenths in all, so each of the 5 parts has 2 tenths. I could have called the rectangle 100 hundredths or 1,000 thousandths, too.

OK



$\frac{1}{5} = 0.2$

Maria

How easy. $\frac{1}{5}$ is the same as point 15. You just put a decimal point in front!

Pitfall

$\frac{1}{5} = .15$

Things to Remember

* .....

.....

* .....

.....

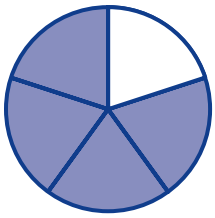
STOP

NAME:

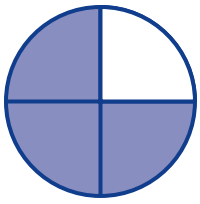
Our Turn

Write a decimal name for the shaded amount.

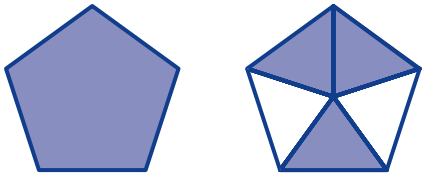
1. $\frac{4}{5}$ = _____ (Write the answer in tenths.)



2. $\frac{3}{4}$ = _____ (Write the answer in hundredths.)



3. $1\frac{3}{5}$ = _____ (Write the answer in tenths.)

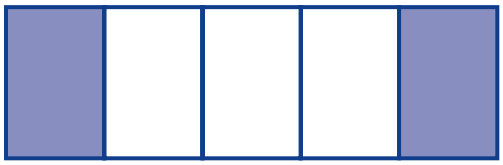


NAME:

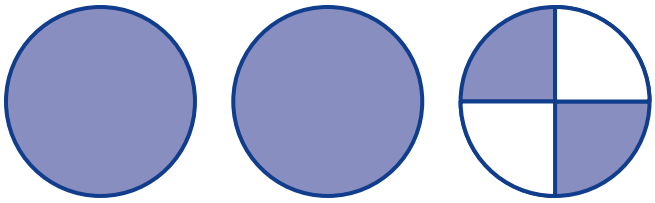
My Turn

Write a decimal name for the shaded amount.

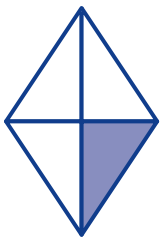
1. $\frac{2}{5}$ = _____ (Write the answer in tenths.)



2. $2\frac{1}{2}$ = _____ (Write the answer in hundredths.)



3. $\frac{1}{4}$ = _____ (Write the answer in hundredths.)



Decimals Are Fractions Too

NAME:

Multiple Choice Mini Lesson

Fill in the circle next to the decimal that names the shaded part of each picture.

1. 

○ 0.4 ○ 4.1 ○ .41 ○ 0.8

2. 

○ 0.14 ○ 0.25 ○ 0.2 ○ 2.5

STUDENT PAGE 5

Decimals Are Fractions Too

NAME:

Multiple Choice Mini Lesson

Fill in the circle next to the decimal that names the shaded part of each picture.

1. 

○ 0.4 ○ 4.1 ○ .41 ○ 0.8

2. 

○ 0.14 ○ 0.25 ○ 0.2 ○ 2.5

NAME:

Writing Task Mini Lesson

$\frac{2}{5}$ of the circle is shaded. Write two decimals for the shaded amount. Explain how you know both ways are correct.

_____ and _____

Decimals Are Fractions Too STUDENT PAGE 6

NAME:

Writing Task Mini Lesson

$\frac{2}{5}$ of the circle is shaded. Write two decimals for the shaded amount. Explain how you know both ways are correct.

_____ and _____

Decimals Are Fractions Too

Lesson at a Glance

Prior Learning Needed

- Understand the concept of unit or whole related to fractions
- Find equivalencies among fractions, whole numbers, and mixed numbers

Lesson Preparation

- Study Lesson Foundation
- Review Teaching Guide and Student Pages
- Prepare stapled packet of Student Pages 1–4 for each student
- Copy and cut in half Student Pages 5 and 6
- Post *Discussion Builders* poster

Mathematical goals

- Find an equivalent decimal for fractions and mixed numbers
- Understand the decimal forms of 1

Mathematical language and reasoning goals

- Learn how to determine decimal amounts using area and set models
- Make sense of decimal amounts

LESSON ROADMAP			MATERIALS
CORE LESSON: DAY 1	GROUPING	TIME	❍ *Discussion Builders* poster ❍ Projector (optional) ❍ Student Page 1 ❍ Student Page 2 ❍ Teaching Guide ❍ Fraction pieces (suggested)
Opener *Discussion Builders* Purpose Math Words			
Starter Problem			
Discussion Student Thinking			
Things to Remember Reflection			
CORE LESSON: DAY 2			❍ Clipboard Prompts, page 37 ❍ Student Page 2 (completed day 1) ❍ Student Pages 3 and 4 ❍ Teaching Guide ❍ Fraction pieces (suggested)
Review and Practice Review Day 1 Lesson			
Our Turn			
My Turn			
MINI LESSONS: 2–3 DAYS LATER			❍ Student Pages 5 and 6 ❍ Teaching Guide ❍ Fraction pieces for fourths or fifths, paper rectangles (suggested)
Assess and Reinforce Multiple Choice Mini Lesson			
Writing Task Mini Lesson			

Lesson Foundation

LESSON SNAPSHOT

Starter Problem

$\frac{1}{5}$ of this rectangle is shaded.

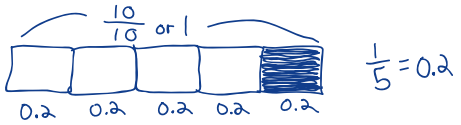
What decimal amount is shaded?

Student Thinking

Lee

I needed a decimal, so I called the whole rectangle 10 tenths. There are 10 tenths in all, so each of the 5 parts has 2 tenths. I could have called the rectangle 100 hundredths or 1,000 thousandths, too.

OK



Maria

How easy. $\frac{1}{5}$ is the same as point 15. You just put a decimal point in front!

Pitfall

$\frac{1}{5} = .15$

MATHEMATICAL INSIGHTS & TEACHING TIPS

Using Reasoning to Convert Fractions to Decimals

Lee realized that decimal numbers can be written as tenths, hundredths, thousandths, and other denominators that are powers of ten. He used reasoning to find an equivalent decimal in tenths for 1/5. First, he thought about the whole, or 1, as 10 tenths. He then thought about how many tenths would fit in each of the 5 fifths the rectangle was divided into. He discovered that 1/5 is equal to 2 tenths and wrote 0.2. If he renamed the whole as 100 hundredths and it was divided into 5 parts, then each part would be 20 hundredths, or 0.20. Likewise, if the whole was 1,000 thousandths, 1/5 would be 200 thousandths, or 0.200.

Pitfall Maria conveniently (and incorrectly) used the digits in the fraction to make 1/5 into .15 instead of the correct equivalent of 0.2.

Reasoning could also be used to prove that if 1/5 is 2 tenths (0.2), then 2/5 would be twice as much, or 4 tenths (0.4). Students could also divide each fifth of the rectangle into 2 equal parts to make 10 tenths.

Lesson Foundation (continued)

MATHEMATICAL INSIGHTS & TEACHING TIPS (CONTINUED)

Lee's picture shows that he divided 1 whole (1.0, or 10 tenths) into 5 parts and shaded 1 part to get 2 tenths. A common procedure for converting a fraction to a decimal number is to divide 1 (or 1.0 or 10 tenths) by 5 to get 0.2. Yet this method makes little sense to most students unless they have had earlier experiences making sense of such problems. When you divide 1 by 5, it is equivalent to dividing 10 tenths or 100 hundredths by 5.

Many Ways to Write Decimal Amounts

Decimal ideas and symbols are deceptively complicated. For example, the whole unit can be thought of as 10 tenths, 100 hundredths, 1,000 thousandths, and so on. There are also infinite names for a decimal amount. For example, 1/5 is equivalent to 0.2 as well as 0.20, 0.200, 0.2000, and so on. Students need to know that 1 can be written as 1.0 and read as 1 and 0 tenths as well as 10 tenths, and 1.00 can be read as 1 and 0 hundredths as well as 100 hundredths. These different forms are useful at different times when calculating.

Relating a Decimal Amount to a Fraction

Maria tried to convert the fraction to a decimal by simply writing the digits and a decimal point. So, 1/5 became .15. If she had a clear understanding of how to rename the whole in different ways using fifths, tenths, or hundredths, she could use number sense to check if her answer was reasonable. If her answer was correct and each of the 5 parts were 15 hundredths, then all 5 parts should add up to 1; instead, they add up to 75 hundredths. In beginning lessons, the part/whole model is often used to build number sense. 1 is often referred to as 1 whole or 1 unit instead of just 1.

MATHEMATICAL DISCUSSION SUPPORT

Ask students questions that prompt them to explain why they can use different symbols or words for the same numbers. Write the following examples on the board: one tenth, 1/10, 1 tenth, 0.1, and .1. Ask students to read each example aloud. Ask why these examples are read in the same way.

English Learner Access

Model and discuss the use of phrases such as "out of," "divided into," "divided by," and "shared by." This will help develop students' use of mathematical language while they are developing an understanding of fractions and decimals.

Core Lesson Day 1

Opener

Review *Discussion Builders*

Read the poster. **Suggest** a section to focus on today:
Presenting Alternative Ideas, Expanding on Others' Ideas, or *Posing Additional Questions.*

Purpose

Distribute stapled packets of Student Pages 1–4. **Project** an image of page 1 (optional).

Call on a student to read the purpose.

Math Words

Point to and say the first math words. **Ask** students to repeat them aloud or silently.

Read the sentence containing the words.

Give an example using objects or drawings.

Repeat for the other math words.

STUDENT PAGE 1

Purpose
To find equivalent decimals for fraction amounts

Math Words

decimal amounts	Decimal amounts may be in ten**ths**, hundred**ths**, thousand**ths**, ten thousand**ths**, and so on.
decimal point	Whole numbers are to the left of a decimal point and parts of a whole are to the right.

Starter Problem

$\frac{1}{5}$ of this rectangle is shaded.
What decimal amount is shaded?

Starter Problem

Read the Starter Problem. **Call on** a student to restate it in his/her own words.

Think about what the Starter Problem means. WAIT
Try to use what you understand to solve the problem on your own.

I'll walk around and write notes about things we need to discuss. Look out for pitfalls! WAIT

Look at your work. It's easy to have a pitfall in this type of problem. You might also have made a pitfall if your answer has the digits 1 and 5.

Don't worry. Next we'll discuss how two imaginary students solved this problem. One has a pitfall! You may keep your solution private, but bring up your ideas in the discussion.

Core Lesson
Day 1
(continued)

Discussion

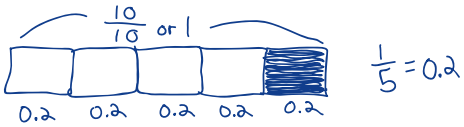
Student Thinking

STUDENT PAGE 2

Lee

I needed a decimal, so I called the whole rectangle 10 tenths. There are 10 tenths in all, so each of the 5 parts has 2 tenths. I could have called the rectangle 100 hundredths or 1,000 thousandths, too.

OK



Ask students to refer to page 2. **Read** the statement marked OK.

Explain that this statement is about the same problem students worked on earlier.

We can learn a lot about the math by studying what this student did.

Read each sentence silently and look at the drawing. Think about what they mean. WAIT

Now talk with a partner about what each sentence and each part of the drawing means.

Listen in, ask questions, and observe. **Note** potential contributions for the discussion.

Who can come up to explain why Lee wrote "10/10 or 1" above his drawing?

What did he mean when he said each of the 5 parts has 2 tenths in it? Who can show why he wrote 0.2 beneath each part?

How does his drawing show that 1/5 = 0.2? How would you write 0.2 as a fraction? What decimal would be equal to 2/5? How can you prove it?

Talk to your neighbor about what Lee meant when he said, "I could have called the rectangle 100 hundredths or 1,000 thousandths." WAIT

How many hundredths are in 1 whole? How many thousandths?

If he used 100 hundredths to name the whole, how many hundredths would be equal to 1/5? How would we find a decimal in thousandths for 1/5?

Call on students to state things to remember about solving problems like this.

Start a Things to Remember list on the board.

MORE DAY 1

Core Lesson
Day 1
(continued)

Discussion

Student Thinking, continued

STUDENT PAGE 2


Maria

How easy. $\frac{1}{5}$ is the same as point 15. You just put a decimal point in front!

$\frac{1}{5} = .15$

Pitfall

Read the statement marked Pitfall. **Remind** students that this is a common pitfall.

Maria made a pitfall when she wrote down the same digits that were in the fraction and put a decimal point in front. Talk with your neighbor about why her answer doesn't make sense. WAIT **Who would like to read Maria's answer using decimal terms? Explain why her answer doesn't make sense.**

Draw a circle on the board. **Divide** it into fourths and shade 1/4. **Write** on the board: 1/4, 0.14, 2/5, and 0.25. **Ask** students to talk with a neighbor about which fraction and which decimal tell how much of the circle is shaded. **Ask** students to look out for pitfalls. **Call on** students to show why their answer makes sense.

Things to Remember

Call on students to **add** to the Things to Remember list on the board. **Read** the list.

Help students summarize and record two important Things to Remember.

Things to Remember List (sample)

1. Think about a whole as 10 tenths (1.0), 100 hundredths (1.00), or 1,000 thousandths (1.000).
2. Think about how many tenths, hundredths, or thousandths are in each fractional part.

Reflection

Ask students to reflect on the discussion process using one of the sample prompts.

Reflection Prompts (sample)

- Name a *Discussion Builder* that we used today. How did it help the discussion?
- What *Discussion Builder* could we use next time to make the discussion even better?
- What did someone do or say today that helped you understand the math?

Core Lesson Day 2

Review and Practice

Review

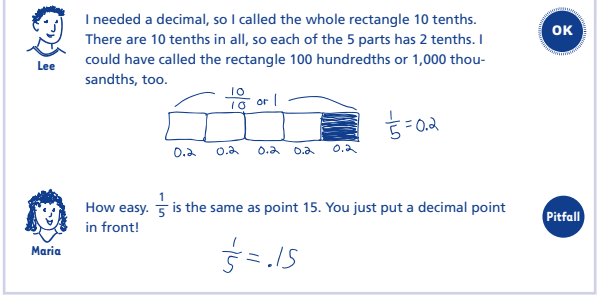
Ask students to review page 2 to jog their memory.

Read the statement marked OK. **Call on** a student to explain how the problem was solved.

Read the statement marked Pitfall. **Call on** a student to explain why it is incorrect.

Call on two or three students to read an item on their Things to Remember list.

STUDENT PAGE 2



Our Turn

Ask students to refer to page 3.

Use the procedure below and the Clipboard Prompts to discuss students' solutions. **Discuss** the problems one at a time.

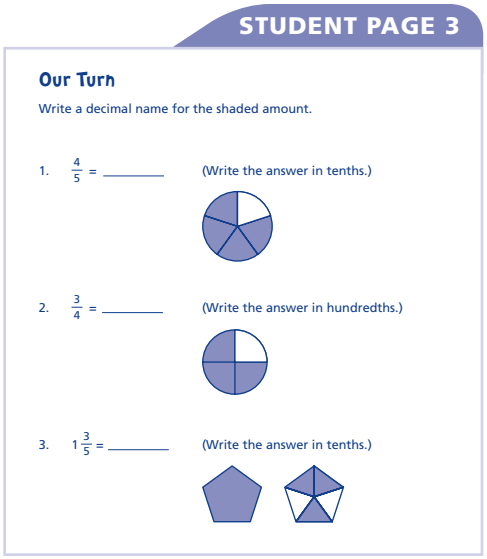
Read the problem.

Ask students to work with a neighbor to solve it.

Discuss one or two students' solutions.

Answer Key
1. 0.8
2. 0.75
3. 1.6

STUDENT PAGE 3



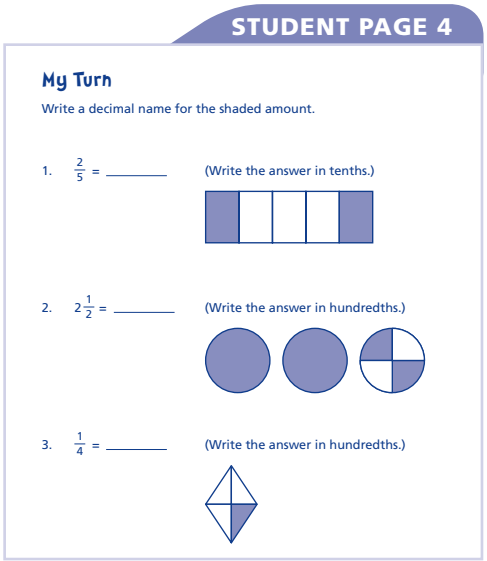
My Turn

Ask students to solve the problems on page 4. **Remind** them to watch out for pitfalls!

After allowing time to work, **read** the answers. **Have** students use pens to mark and revise their papers.

Answer Key
1. 0.4
2. 2.50
3. 0.25

STUDENT PAGE 4



Mini Lessons
(2–3 Days Later)

Assess and Reinforce

Multiple Choice Mini Lesson

Distribute Student Page 5.

Problem 1

Please read problem 1.
Talk with your neighbor about which choices don't make sense. WAIT
How could you use reasoning to know that 0.8 is the correct choice?

Some students may not realize they can easily create tenths by cutting each fifth into 2 parts (1 tenth each) in their imagination or on paper.

STUDENT PAGE 5

Multiple Choice Mini Lesson

Fill in the circle next to the decimal that names the shaded part of each picture.

1. 

○ 0.4 ○ 4.1 ○ .41 ● 0.8

2. 

○ 0.14 ● 0.25 ○ 0.2 ○ 2.5

Problem 2

Read the problem and find the correct choice. WAIT
Which response is correct? Explain why.
Who can draw a picture or diagram to show why the correct answer is 0.25? Explain.

Writing Task Mini Lesson

Distribute Student Page 6.

Ask a student to read the task. **Call on** students to respond with their ideas.

Jot the ideas on the board.

Write an explanation together using their ideas. **Read** it aloud.

Ask students to write an explanation on their page.

STUDENT PAGE 6

Writing Task Mini Lesson

$\frac{2}{5}$ of the circle is shaded. Write two decimals for the shaded amount. Explain how you know both ways are correct.

 _____ and _____

Sample Explanation: The whole circle could be called 10 tenths. Each section of 1 fifth would equal 2 tenths, so 2 fifths would be twice as much, or 4 tenths. That's 0.4. But, if the whole is called 100 hundredths, 1,000 thousandths, and so on, each part would have lots of tiny parts. For hundredths, each fifth would be 20 hundredths, so 2/5 is 0.40.

English Learner Access

Mathematical Discussion Support

Invite students to use drawings or materials such as folded paper rectangles or fraction pieces for fifths and tenths to help them describe their ideas.

Ask students to explain what "2 fifths" means. Then ask them to explain how fifths are related to tenths.