

Using Pattern Recognition in Dividing Decimals

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Grade Level: 5th Grade

Subject: Math

CT Concept: Pattern Recognition

STANDARDS

CCSS.MATH.CONTENT.5.NBT.B.7

Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

LESSON OBJECTIVES / LEARNING TARGETS

Students will use place value reasoning and pattern recognition to solve decimal division problems.

MATERIALS / CURRICULUM

- Engage New York, Grade 5, Module 4 Lesson 29 (website) or Module 4 Lesson 29 (pdf in Google Drive)
- White boards and markers (one each per student)
- Eureka Math Workbook Modules 3&4 (one per student) -- pages 301-302 (same as pages 10-11 in Lesson 29 pdf)
- Pattern Recognition Worksheet
- Active Inspire Flipchart for Lesson 29

VOCABULARY

- Pattern
- Tenths
- Hundredths
- Thousandths
- Decimal fraction
- Quotient

LESSON DESCRIPTION

Introduction:

- Introduce the Learning Target – We will use pattern recognition to solve decimal equations.

$$5 \div \frac{1}{10} \qquad 5 \div 0.1$$

- Review the equivalence of these two expressions:

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- Math warm-up on **whiteboards**
 - Part One (Parts of a whole) -- Flipchart (FC) Page 3:
 - How many tenths in 1 whole?
 - How many tenths in 2 wholes?
 - How many tenths in 3 wholes?
 - What pattern are you seeing, here?
 - How many tenths in 9 wholes?
 - How did you use the pattern to predict the answer to this?
 - How many tenths in 10 wholes?
 - Part Two (counting by fractions) -- FC Page 4:
 - $10 = 100$ tenths
 - $20 = \underline{\quad}$ tenths
 - $30 = \underline{\quad}$ tenths
 - $50 = \underline{\quad}$ tenths
 - What pattern are you seeing, here?
 - $70 = \underline{\quad}$ tenths
 - How can you use the pattern to predict the answer to this?
 - $90 = \underline{\quad}$ tenths
 - $91 = \underline{\quad}$ tenths
 - $92 = \underline{\quad}$ tenths
 - How has the pattern changed?
 - $82 = \underline{\quad}$ tenths
 - $42 = \underline{\quad}$ tenths
 - $47 = \underline{\quad}$ tenths
 - Part Three (Dividing Fractions) -- FC Page 5:
 - $2 \div \frac{1}{2}$
 - $3 \div \frac{1}{2}$
 - $8 \div \frac{1}{2}$
 - $5 \div \frac{1}{4}$
 - $7 \div \frac{1}{3}$
 - $1 \div \frac{1}{10}$
 - $2 \div \frac{1}{10}$
 - $10 \div \frac{1}{10}$

Concept Development:

- Review the Learning Target -- :We will use pattern recognition to solve decimal equations.
- Flipchart Page 6 -- Have students observe and comment on patterns they see.

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What pattern do you notice?

Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths
				7		
		7	0	0		
	7	0	0	0		
7	0	0	0	0		

$7 \times 1 = 7$
 $7 \times 10 = 70$
 $7 \times 100 = 700$
 $7 \times 1,000 = 7,000$
 $7 \times 10,000 = 70,000$

- Digits move to the left on the place value chart as they grow larger
- All digits are multiplied by whole number
- Same number of zeros in product as in the factor that is the power of 10
- Flipchart Page 7 -- Have students observe and comment on patterns they see.

What pattern do you notice?

Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
		7			
		0	7		
		0	0	7	
		0	0	0	7

$7 \div 1 = 7$
 $7 \div 10 = 0.7$
 $7 \div 100 = 0.07$
 $7 \div 1,000 = 0.007$

- Digits move to the right on the place value chart as they grow smaller
- All digits are divided by a whole number
- Decimals move to the left as many place value column as there are zeroes in the problem
- Flipchart Page 8 -- Have students observe and comment on the differences between dividing and multiplying by powers of 10

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Explain with as much detail as possible the difference between these two sets of equations:

$7 \times 1 = 7$	$7 \div 1 = 7$
$7 \times 10 = 70$	$7 \div 10 = 0.7$
$7 \times 100 = 700$	$7 \div 100 = 0.07$
$7 \times 1,000 = 7,000$	$7 \div 1,000 = 0.007$

When _____, then _____...

- Flipchart Page 9 -- Introduce "Problem 1" (of course, they have been doing plenty of building to get to this "first" problem...
 - Problem 1: $7 \div 0.1$
 - Relate this to $7 \div 1/10$
 - Using what you know about patterns and division of fractions, predict which directions the digits will move on the place value chart.
 - $7 \div 1/10 = 70$, so $7 \div 0.1 = 70$
- Flipchart Page 10 - I DO

Problem 1: $7 \div 0.1$

What pattern do you notice?

Thousands	Hundreds	Tens	Ones	Tenths

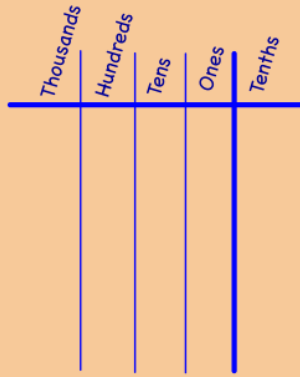
$7 \div 0.1 = 70$
 $7 \div 0.01 = 700$
 $= 7 \div \frac{1}{100} = 700$
 $7 \div 0.001 = 7000$
 $= 7 \div \frac{1}{1000} = 7000$

- Fill out the place value chart, showing the movement of digits to the LEFT as you divide by increasingly smaller decimals (0.1, 0.01, 0.001)
- Flipchart Page 11 - WE DO

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Problem 2: $4 \div 0.1$

Use the pattern you've noticed to solve these decimal equations.



$$4 \div 0.1 = 40$$

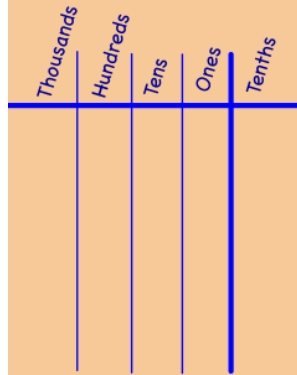
$$4 \div 0.01 = 400$$

$$4 \div 0.001 = 4000$$

- Flipchart Page 12

Problem 3: $7.4 \div 0.1$

Use the pattern you've noticed to solve these decimal equations.



$$7.4 \div 0.1 = 74$$

$$7.4 \div 0.01 = 740$$

$$7.4 \div 0.001 = 7,400$$

- Flipchart Page 13
 - Problem: $7.49 \div 0.01$
 - Rewrite as division of fraction: $7.49 \div \frac{1}{100}$
 - Extend to $7.49 \div 0.001$

Partner Practice:

YOU DO

- Turn to Page 302 in your Modules 3 & 4 Workbook
- Use Additional Worksheet provided
- Do the worksheet first to get comfortable using patterns to solve equations
 - Explain what patterns you saw as you divided by tenths, hundredths and thousandths.
- After using the worksheet to solve decimal division equations, solve all of the problems in the number 2 table on Page 302.

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- Extension: Solve the rest of the problems on Page 302 and do the division sentences on Page 301.
- As students are working, I will drop in to breakout rooms to help, starting with students who traditionally struggle with math. I will partner students with helpful peers, and offer additional support in the form of a small group aid for the one ESL student.

ASSESSMENT PLAN

- Were they able to use patterns to solve division equations?
- Were they able to explain what patterns they saw and describe them on the worksheet?

HOW WAS EQUITY CONSIDERED IN YOUR LESSON?

- I think math is difficult to think about culturally responsive practices except in the format of the lesson. It's a very teacher driven lesson to begin with, but they work in small groups to build understanding.
- Accommodations: Our ESL and IEP students will have additional support in the form of additional aids.