Scaffolding Task: Base Ten Decimals

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NF.6 Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

When exploring whole-number place value relationships, the pieces represented by each of the values become increasingly larger as you move to the left. Similarly, it is important that students understand as you move to the right past the decimal point the pieces become smaller and smaller. One critical question becomes, "Will there ever be a smallest piece?" There is no largest piece or smallest piece when it comes to our place value system, and as the students begin to explore decimals, it is important to reinforce the 10-to-1 relationship that occurs between the places in our place value system.

Using the base-ten model system, decimals to many places can be represented, though when working with base-ten models to the hundredths, the square is most often referred to as the whole or one unit, the rods become the tenths, and the unit cubes become hundredths.

ESSENTIAL QUESTIONS

- What role does the decimal point play in our base-ten system?
- How can I model decimal fractions using the base-ten and place value system?
- How are decimal fractions written using decimal notation?

MATERIALS

- Base-ten blocks (or copies of 10 x 10 grids cut into base ten pieces)
- Place-value chart
- Copies of "Base-Ten Decimal Cards"

GROUPING

Individual or partner grouping

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments

The purpose of this scaffolding task is to help link decimal fraction understandings to our base-ten place value system. In this task students will learn how the base-ten model can be used to model decimal fractions to the hundredths place. They will also learn how decimal fractions are written using decimal notation.

As you extend the base-ten system into decimals, it is important to review concepts of whole-number place value. Review with students the 10-to-1 relationship between the values of any two place value positions that are next to each other. For example, 260 can be represented as 26 tens. In reference to the base-ten model, 10 of any one piece will make 1 of the next larger, and vice versa.

If base-ten manipulative blocks are not available, use copies of a large *10 x 10 Grid*. Copy additional grids on one color of paper to cut into rods and copy additional grids on another color to cut into units. Large 10 x 10 grids and smaller 10 x 10 grids are provided.

Task:

Part 1

- Show students examples of base-ten blocks and lead a review discussion of what they have already seen these blocks referred to as (hundreds, tens, and ones).
- Review the concept of each larger piece representing a group of 10 of the smaller piece to its right (1 flat = 10 rods, 1 rod = 10 cubes, etc.).
- Ask student to imagine what the next smallest unit would look like if the pattern continued. What would the next unit look like? What should it be called?
- Guide students to develop a "new" way to look at these base-ten blocks; they are now representations of parts of a whole.
- The flat becomes the ones, the rods become the tenths, and the units become the hundredths.
- Have students complete the Part 1 task using this new meaning for the base-ten blocks.

Student Directions:

1. Represent the following decimal fractions using base-ten models.

3/10, 4/10, 54/100, 75/100, 60/100

2. Choose three decimal fractions with a denominator of 10 or 100. Draw a base-ten representation of these three decimal fractions and explain how you know your base-ten model matches your decimal fraction.

- Have students present their work to each other. Use their work and the questions below to prompt discussion during their share time.

PART 2

- Review our place-value system and the 10-to-1 relationship between each place (100 = 10 tens, 1 = 10 ones, etc.).
- Show a place-value chart such as the one below with the decimal point and the places to the right of the decimal point covered and guide students to discuss what would be true of the place to the right of the ones place.
- Introduce the placement of the decimal point as a way to show we're moving from wholes to parts of wholes in our base-ten notation. Have students discuss what the next places should be called.
    - What would one of the ten pieces that a "one" would be broken up into be called?
    - What would one of the ten pieces that a "tenth" would be broken up into be called?

Thousands	*Hundreds*	*Tens*	*Ones*	.	*Tenths*	*Hundredths*

- Revisit the base-ten representations the students made during Part 1 and have them discuss how they might write each model using base-ten decimal notation on the place value chart.
- After having students practice several examples of writing base ten fractions and base-ten models using decimal notation, have students match the base-ten models, decimal fractions, and decimals on the Base-Ten Decimals Cards.

Student Directions:

- *Use what you know about base-ten models, decimal fractions, and decimals to find the matching cards. Create a poster that shows the cards grouped together correctly. Be ready to explain your thinking about how you matched your cards.*

FORMATIVE ASSESSMENT QUESTIONS

- How do you know your base-ten model matches the decimal fraction?
- What strategies did you use when building your model for the decimal fraction?
- What patterns did you see as you created your models?
- How did you know your models matched the fraction and decimals cards?
- What strategies did you use for counting the squares in the models? How did these strategies related to the decimals?
- Did students use correct thinking as they wrote the decimal notations and matched models with decimal notation?
- What misconceptions in students thinking did I observe? How will I address these?
- How did I assess for student understanding?
- Did students see the pattern that occurs with decimal fractions?
- How did my students engage in the 8 mathematical practices today?

- How effective was I in creating an environment where meaningful learning could take place?
- How effective was my questioning today? Did I question too little or say too much?
- Were manipulatives made accessible for students to work through the task?
- Name at least one positive thing about today's lesson and one thing you will change.
- How will today's learning impact tomorrow's instruction?

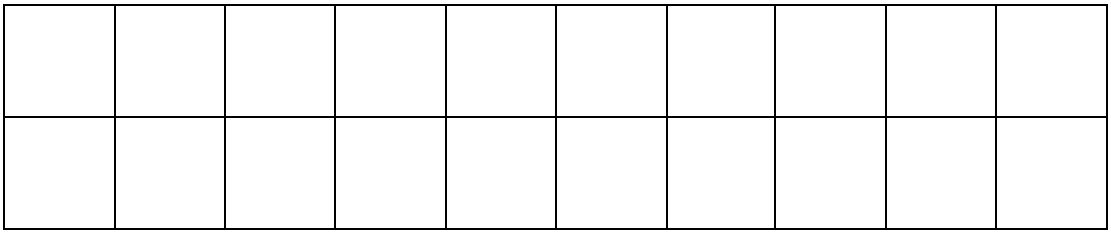
DIFFERENTIATION

Extension

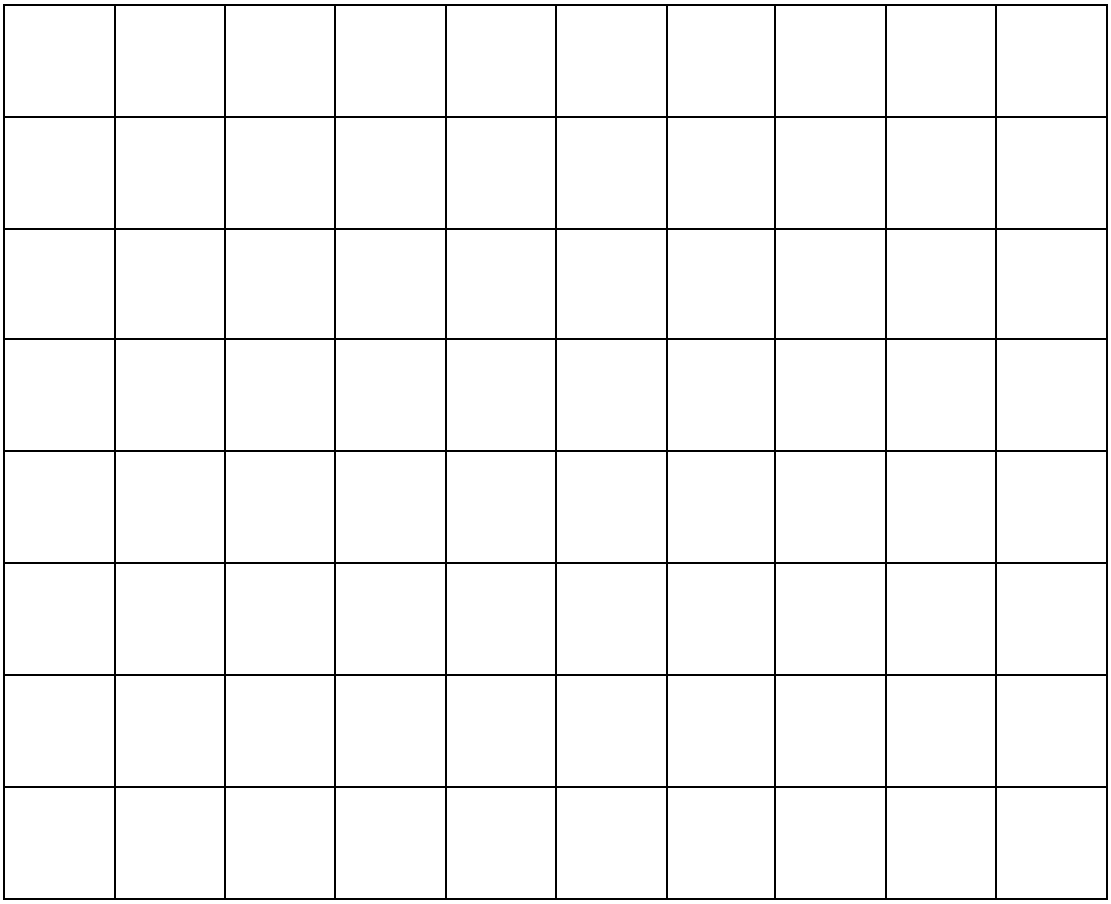
- Have students create their own new model/representation for wholes, tenths, and hundredths and use these models to draw decimal fractions. Students should label their models with decimal notation.

Intervention

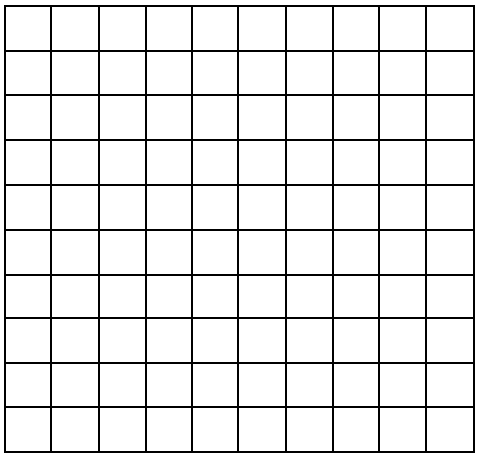
- Have students create base-ten models on a place value mat and put the decimal notation directly underneath the model using the place-value chart.

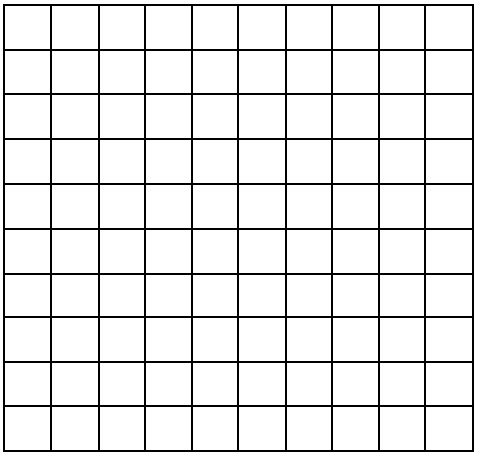


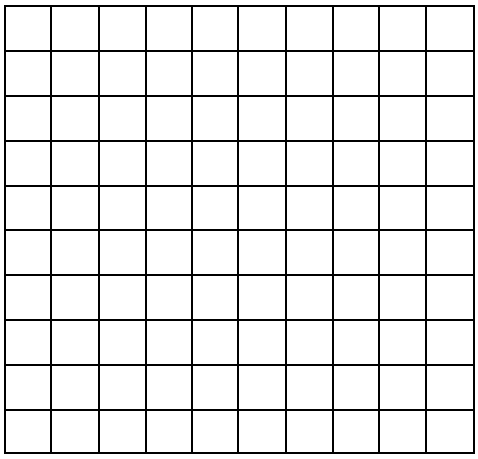
Large 10 X 10 Grid

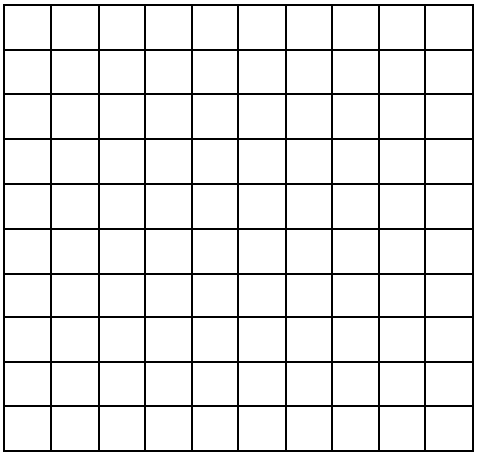


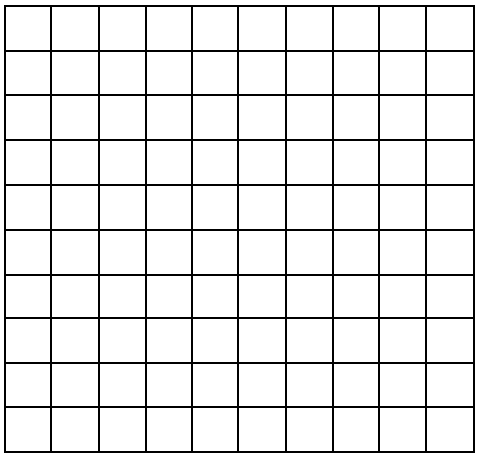
Small 10 x 10 Grids

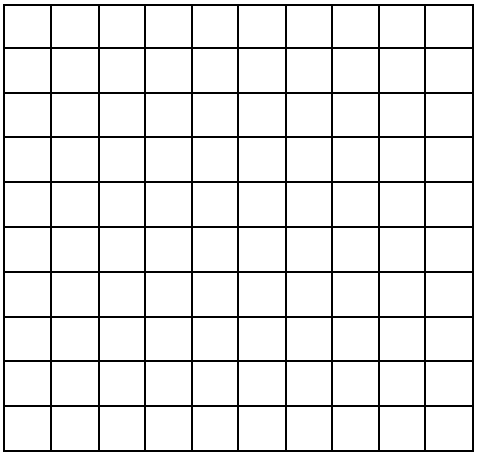




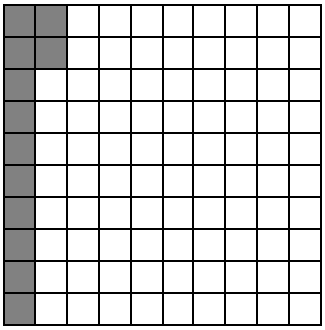
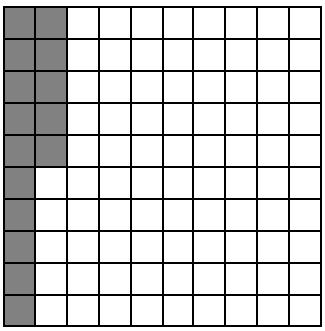
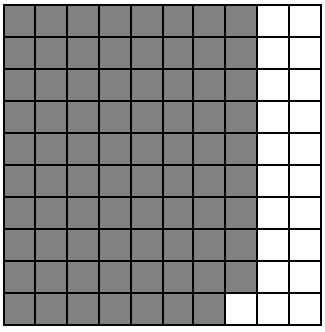


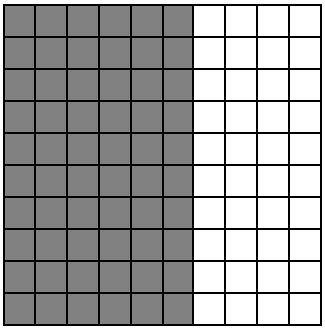
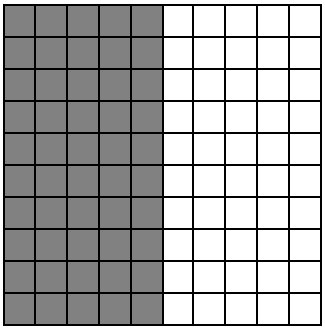
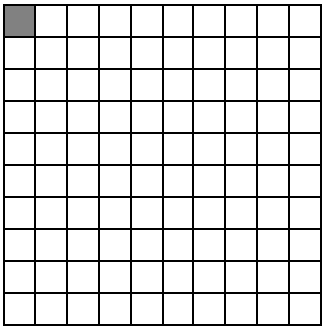
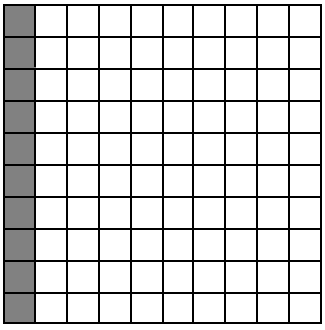






Base-Ten Decimal Cards

	$\frac{12}{100}$	0.12
	$\frac{15}{100}$	0.15
	$\frac{79}{100}$	0.79

	$\frac{60}{100}$	0.60
	$\frac{50}{100}$	0.50
	$\frac{1}{100}$	0.01
	$\frac{10}{100}$	0.10