Rational Number Project

Fraction Operations and Initial Decimal Ideas **Lesson 10: Overview**	**Materials**
Students develop an understanding of thousandths and begin to look at equivalence among tenths, hundredths, and thousandths. Students develop decimal order strategies by identifying the larger of two decimals, by sorting sets of decimals and by finding a decimal between two decimals.	• Classroom 10 x 10 Grid • Student Pages A – E • Orange and yellow crayons, pencils or markers for students. • Completed Student Page A from Lesson 9

Teaching Actions

Warm Up

Name a decimal close to zero, one close to $\frac{1}{2}$ and one close to 1. Describe the picture in your mind that helps you find the fraction.

Large Group Introduction

1. Explain: You may have encountered decimals in your science class when you measured volume using graduated cylinders, when you measured differences in mass before and after you added another substance, or when you measured the growth of a plant. Often in science you need a great deal of accuracy in your measurements.

2. Notice that these decimals have more digits to the right of the decimal point than the examples we have examined. 0.432; 0.003; 0.106

3. Let's consider what they mean.

4. Ask students to take out their 10 x 10 grid (Student Page A from Lesson 9) from last lesson; the one they partitioned into 100 equal parts. Ask: If the square is our unit, then what is one-tenth? What is 1-hundredth?
   To show hundredths, what did you do to each tenth?

Comments

Language is an important part of understanding decimals. Students struggle keeping track of whether the decimal is read as tenths, hundredths or thousandths. Unfortunately this issue isn't helped when students name a decimal like .23 as "point 23" instead of 23-hundredths.

Teaching Actions	Comments
5. Ask: If I want to shade in 4-thousandths of the grid I need to show thousandths. How can we partition the 10 x 10 grid to show thousandths?	
6. After allowing time for students to determine how to partition the grid into thousandths, summarize the steps: Divide <u>one</u> of the small squares into 10 equal parts. Do this on the class chart. Ask: How many parts would the grid be partitioned into if you did that for each small square? How do you know that?	This might not be obvious to students. In our experience students first suggested to divide each column in half. One student's strategy was to partition one square into 4 equal parts then 8 parts and then realized the square needed to be divided into 10 equal parts if the total was to be 1000.
7. Now show 4-thousandths by dividing one small square into 4 equal parts, shading 4 of them black.	
8. Shade 423-thousandths on the class grid. Explain: Look at the classroom grid and examine the amount I have shaded (0.423). Ask: Describe that amount in terms of the number of tenths, hundredths and thousandths shaded in.	You aren't going to partition all 100 squares into 10 equal parts. To show .423 shade in 4 tenths as orange; 2 hundredths in yellow. Then partition one of the hundredths into 10 equal parts and shade in 3 of those very small parts using a black marker.
9. Record students' descriptions using fractions: $\frac{4}{10} + \frac{2}{100} + \frac{3}{1000}$	
10. Now imagine if <u>each square</u> was divided into 10 equal parts. How many thousandths in the 2 small squares? How many thousandths in the 4 bars?	
11. How many thousandths is that in all? $\frac{400}{1000} + \frac{20}{1000} + \frac{3}{1000}$. Record as a single fraction $\frac{423}{1000}$	
12. Ask: How can we write that as a decimal? (.423) Help students make connections between the decimal and their initial description using the sum of three fractions and to the single fraction using thousandths.	
13. Write these decimals on the board. Direct students to talk to their partner as to what these decimals would look like on the 10 x 10 grid. Have one in each pair shade the amounts using the 10 x 10 grids on Student Page A.	

Teaching Actions

- 0.304
- .034
- 0.004
- .119
- .109
- 0.019

14. Ask: In general, how big is .001?

Small Group/Partner Work

15. Explain the next group activity: Each group will get a set of problems. Use your grids to solve each problem. Be prepared to explain your thinking using the grid to support your decisions.

Comments

In these problems students are using the grids to show decimals and to order decimals. As with fractions order ideas are important part of understanding the relative size of decimals. Students without mental images for decimals will bring whole number thinking to decimal order tasks. When ordering 0.75 and 0.9, a student might say .75 is bigger because as whole numbers 75>9. Below see how two students reasoned through this order task using mental images of 10 x 10 grid:

> 75-hundredths and 9-tenths. Seven rows and 5 hundredths. Nine rows. 9-tenths is bigger.
>
> 9-tenths would be greater than 75-hundredths. I see 9 orange bars and 7 orange bars and 5 yellow squares.

Consider the role of the 10 x 10 grid in these students' explanations.

> Which is bigger .5 or.055?
> I see 5 hundredths and half of a square since there are 10 thousandths in each square and 5 is half of it. And I picture ½ of a whole square, the grid. .5 is bigger.
>
> Which is bigger.9 or .009?
> 9 tenths. I picture that there are 100 boxes and 90 of them are full. With 9 thousandths it would be almost one little box. 9 tenths is

Teaching Actions

Comments

bigger.

In this next example, the teacher helped the student overcome a misunderstanding by asking her to think of the 10 x 10 grid and to describe what she saw in her mind. Initially when ordering .245, .025, .249, .3 the student said .3 was the smallest even though she ordered the other three decimals correctly.

T: I was wondering about 3-tenths. Do you think the 3-tenths is the smallest? How many tenths are in .245?
S: 2 tenths
T: Can you picture that decimal on the grid? How many orange strips would this be?
S: There would be 2 oranges, 4 yellows and ½ of a square.
T: And how many oranges for .3
S: 3. 3 tenths is the biggest.

Modeling many decimals with the 10 x 10 grid enabled these students and others to overcome any whole number thinking most students bring to decimal tasks.

Wrap Up

16. Pick students to present their solutions to the problems. Students should be able to model their answers using the 10 x 10 grid.

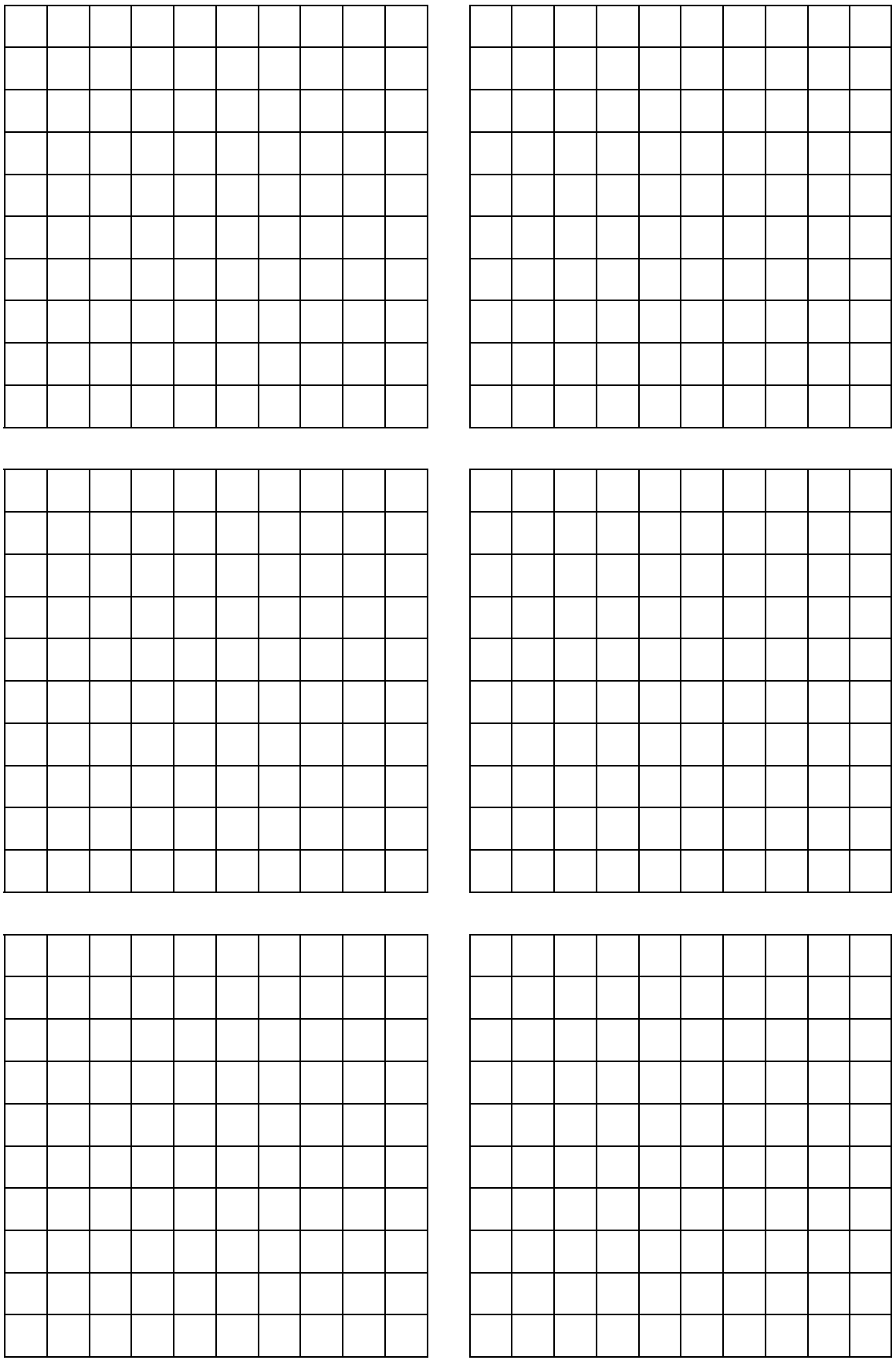
Translations:

- Symbols to pictures to verbal
- Symbols to pictures to symbols

Name a decimal close to zero, one close to ½ and one close to 1.

Describe the picture in your mind that helps you find the fraction.

Name_____ Lesson 10 / Student Page A

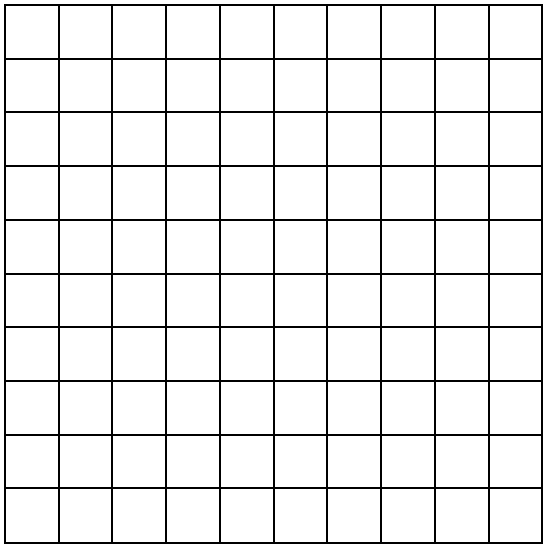


Name_____ Lesson 10 / Student Page B

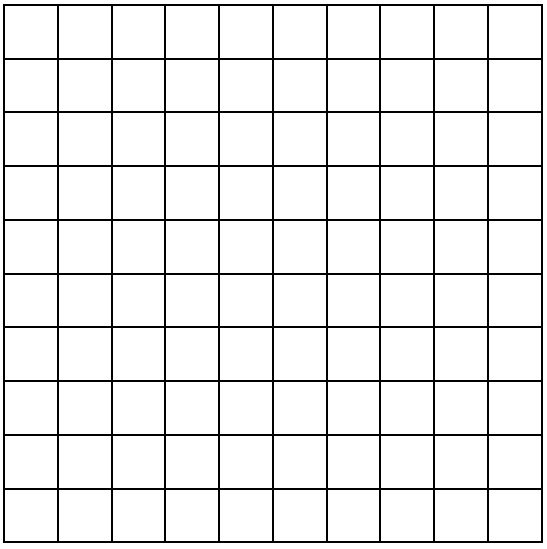
Decimals

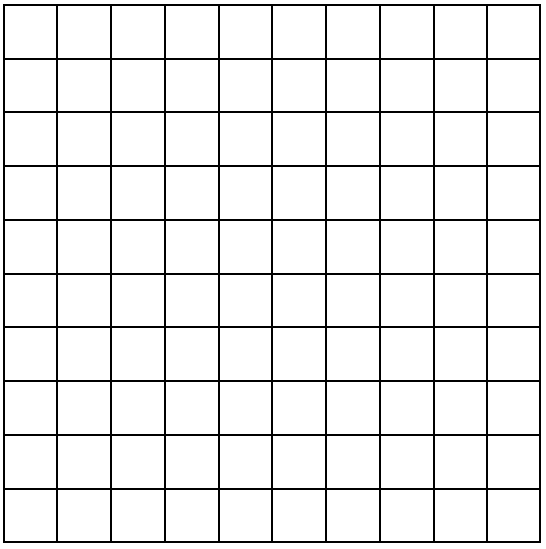
Be ready to explain your work to the class.

1) Use the grid below to find three numbers between 0.07 and 0.08. Explain how you know the numbers are between these two.



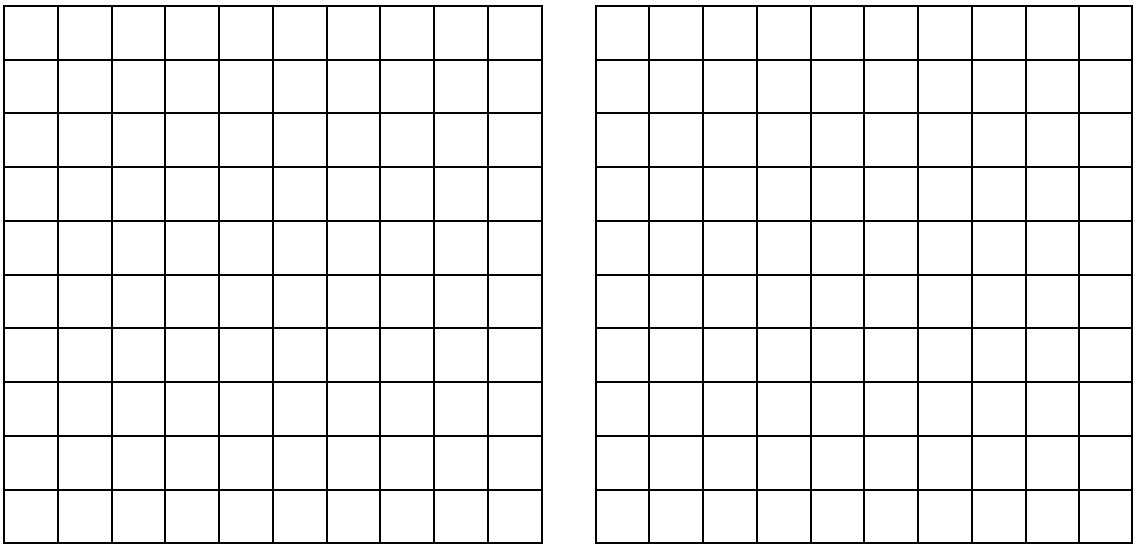
2) Circle the smaller number: .025 0.03. Explain how to use the grids below to support your answer.



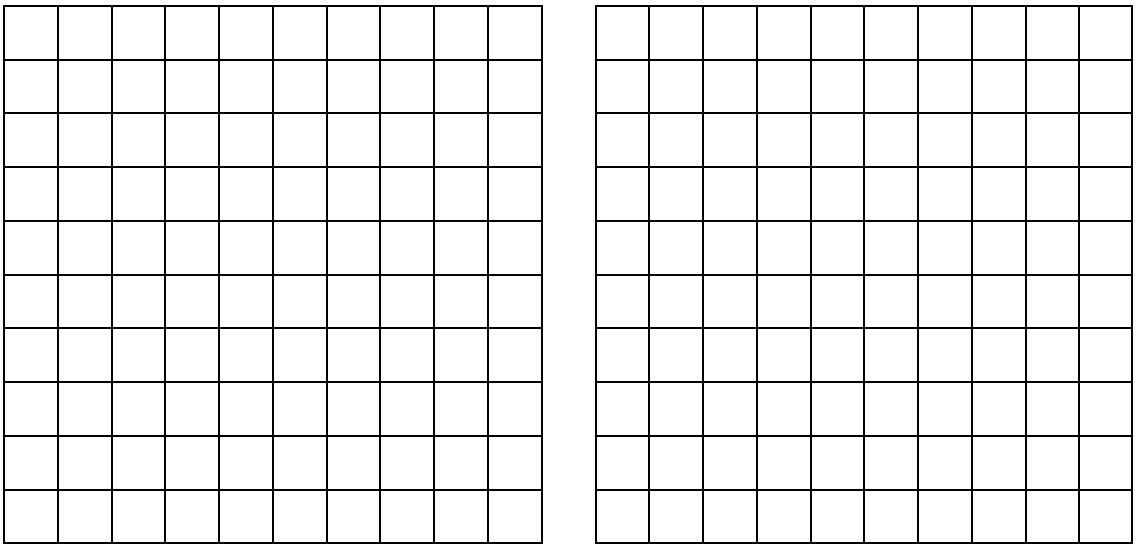


3) Determine if the sentences are true or false. Use the grids to support each answer.

0.40 = 0.4

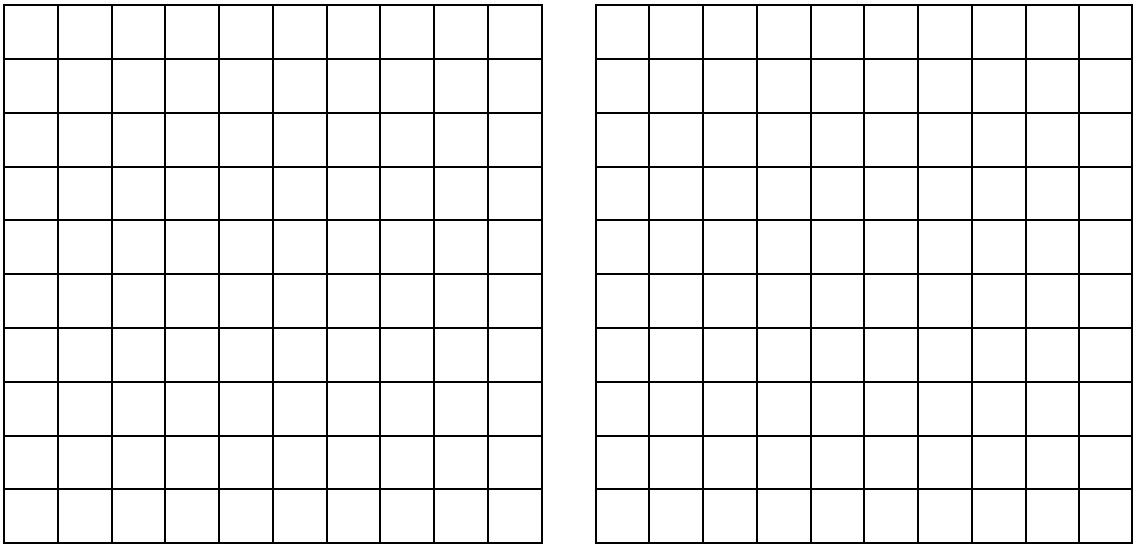


.880 = .8

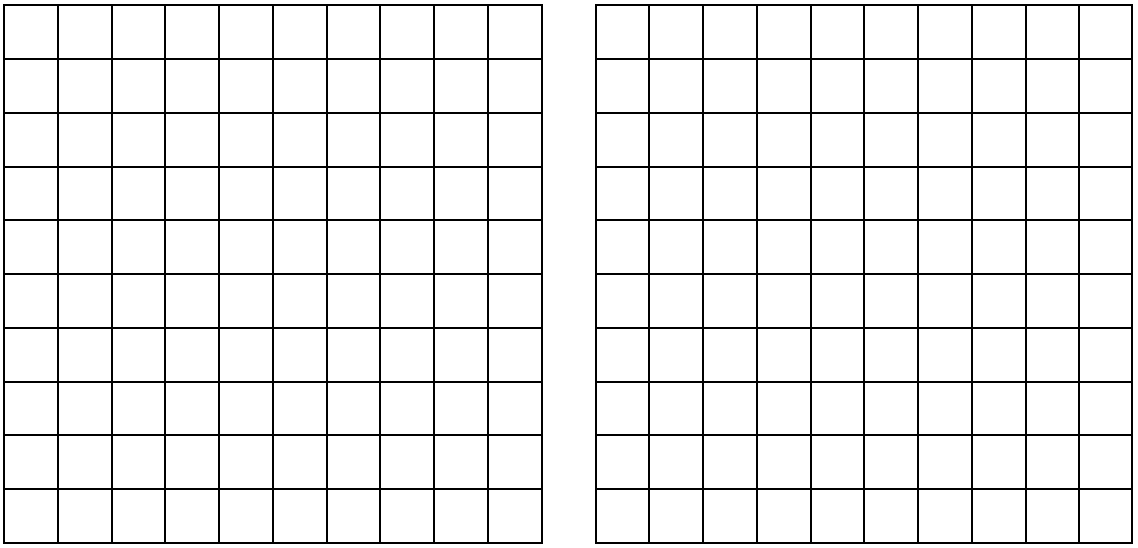


Name_____ Lesson 10 / Student Page D

.098 = .980



.234 = .24



Imagine each decimal on a 10 x 10 grid. Describe each decimal. Then order each set from greatest to least: 2.32 3.082 2.157	Name three decimals less than one but greater than $\frac{1}{2}$. Describe what they would look like on a 10 x 10 grid. How do you know that they are greater than $\frac{1}{2}$?
Imagine each decimal on a 10 x 10 grid. Describe each decimal. Which number is the smallest? How do you know? 0.625 0.25 0.675 0.8	Name three decimals equal to $\frac{1}{2}$. Describe what they would look like on a 10 x 10 grid How do you know that they are equal to $\frac{1}{2}$?

Post Lesson Reflection

Lesson_____

1) Number of class periods allocated to this lesson: _____

2) Student Pages used: _____

3) Adaptations made to lesson: (For example: added extra examples, eliminated certain problems, changed fractions used)

4) Adaptations made on Student Pages:

5) To improve the lesson I suggest: