Rational Number Project

Fraction Operations and Initial Decimal Ideas **Lesson 9: Overview**	**Materials**
Students create a model for decimals using a 10 x 10 grid to show tenths and hundredths. They record amounts in words, fractions, symbols, and decimals	• Classroom 10 x 10 poster • Orange and yellow overhead pens for teacher • Transparency of Student Page A • Rulers for students • Student Pages A- D • Orange and yellow colored crayons, pencils or markers for each student

Teaching Actions

Warm Up

Order the fractions from smallest to largest. Be ready to explain your reasoning.

$$\frac{3}{10} \quad \frac{87}{100} \quad \frac{49}{100} \quad \frac{15}{100}$$

Large Group Introduction

1. In a large group setting, show the square (Student Page A) at the overhead. Students should have their own copies.

2. Explain: Using the notches at the top and bottom of the square, use your ruler to draw lines down the square.

3. Ask: What did you do to the square? If the square is our whole unit, and I color three of the ten parts orange, what fraction of the whole square is orange? What amount is not shaded? (At this point, emphasize verbal mode; don't record with symbols).

Comments

Teachers should create a larger poster size 10 x 10 grid on card stock, laminated. Cut out from poster board orange strips to represent 10ths and yellow squares to represent 100ths. Have this available for each decimal lesson.

Color is important as students construct mental images for tenths and hundredths. Students will remember not only the size of tenths and hundredths in relation to the 10 x 10 grid but also the color. That is why we recommend that students use orange and yellow crayons, pencils or markers to do the shading activities in the decimal part of the module.

Teaching Actions

4. Return to the grid and draw lines from left to right.
   - Ask: How has the whole changed?
   - How many small squares in all? If I color 3 small squares yellow, what fraction of the whole square is yellow? What fraction is not yellow?
   - How many small squares in 1-tenth of the square? What can you say about 10-hundredths and 1-tenth?

5. Direct students to use their orange and yellow crayons, pencils or markers to show the amounts found in the table below on the 10 x 10 grids on Student Page B.

6. Encourage a variety of ways to describe the amounts on the board. You want students o be flexible in how they interpret the decimal amount. Record what students say on the board.

Show this amount	Describe what you see
3 out of 10 equal parts	3-tenths; $\frac{3}{10}$; 3 orange strips
34 out of 100 equal parts	$\frac{34}{100}$; $\frac{3}{10}$ and $\frac{4}{100}$; 34-hundredths; 34 yellow squares; 3 orange strips and 4 yellow squares more
2 out of 10 equal parts and 6 out of 100 equal parts	$\frac{2}{10}$ and $\frac{6}{100}$; $\frac{26}{100}$; 26-hundredths; 2 orange strips and 6 yellow squares; 26 yellow squares
55 hundredths	$\frac{55}{100}$; 55 yellow squares; 5 orange strips and 5 yellow squares; $\frac{5}{10}$ and $\frac{5}{100}$
8 tenths	$\frac{8}{10}$; 8 orange strips; 80 yellow squares; $\frac{80}{100}$

Comments

Consider how the grids and the colors support these students' understanding of decimal size.

T: Which is bigger .75 or.9? What do you picture when you see the 75-hundredths?
S: I picture 7 oranges and 5 yellow squares.
T: And the tenths?
S: I see 9 oranges.
T: So then which is bigger?
S: 9-tenths.

T: Picture .28 on the 10 x 10 grid. If you added 6-hundredths more. Is the amount shaded more or less than $\frac{1}{2}$ the grid?

S: It would be less than $\frac{1}{2}$. Because you add up the hundredths you line them up. I did it with the fraction grid in my head. If you have 2 oranges and 8 yellows and you add 6 more yellows that would change that 10 to an orange and you have 4 left.

As you can see from the previous examples, students' order and estimation skills with decimals are improved when they have strong mental images for decimals related to this grid model. Consider one more example of student's thinking based on the 10 x 10 grid:

2.3 - .05. I imagine this one with a grid so 2 full grids and then there's 3 tenths so you minus 5 of the hundredths because 3 tenths is the same as 30 hundredths. Cross out 5 hundredths which leaves you with 25. Two and 25-hundredths.

Teaching Actions

Small Group/Partner Work

7. Students work in their groups to complete Student Pages C and D. Students should use orange and yellow crayons, pencils or markers to show the amounts shaded.

Wrap Up

8. Refer students to the first problem on Student Page C. Show this on the large classroom grid using orange strips and yellow squares. Ask: What part of the grid is covered? What are the different ways we can describe that amount:
    - $\frac{3}{10}$ and $\frac{4}{100}$
    - 3-tenths and 4 hundredths more

    If you showed the amount using 34 yellow squares, how can you describe this amount?
    - 34 out of 100
    - $\frac{34}{100}$
    - 34-hundredths

9. Explain: You can also record that amount covered in this way: 0.34

10. Ask: How can you make sense of this way of naming that amount by comparing 0.34 to this way of writing the amount? $\frac{3}{10} + \frac{4}{100}$. (Connect this to showing 3 orange strips and 4 yellow squares).

11. Ask: How can you make sense of this way of naming that amount by comparing .34 to 34 out of 100 or $\frac{34}{100}$? (Connect this to showing the amount as 34 yellow squares).

12. Possible explanations:
    - 3 is in the tenths place so it is $\frac{3}{10}$; 4 is in the 100ths place so it is $\frac{4}{100}$
    - If you consider how many 100ths are covered then it's 34-hundredths.

Comments

You want students to understand .34 as the sum of two parts: $\frac{3}{10}$ and $\frac{4}{100}$.

You want students to see the number as a single entity as well: $\frac{34}{100}$.

$.34 = \frac{3}{10} + \frac{4}{100}$

.34 = 34 out of 100 or $\frac{34}{100}$

Teaching Actions	Comments
13. Repeat for the other examples on Student Page C and D. Students should record the different ways discussed directly on their papers: • Name the amount on the grid • Describe verbally • Record as fractions in two ways • Write as a decimal • Make connections between the two ways of writing the amount as fractions and the decimal symbol. 14. End the lesson by asking students: When do you use decimals in your everyday life? • Money • Metric measurement • Baseball statistics • Track statistics	

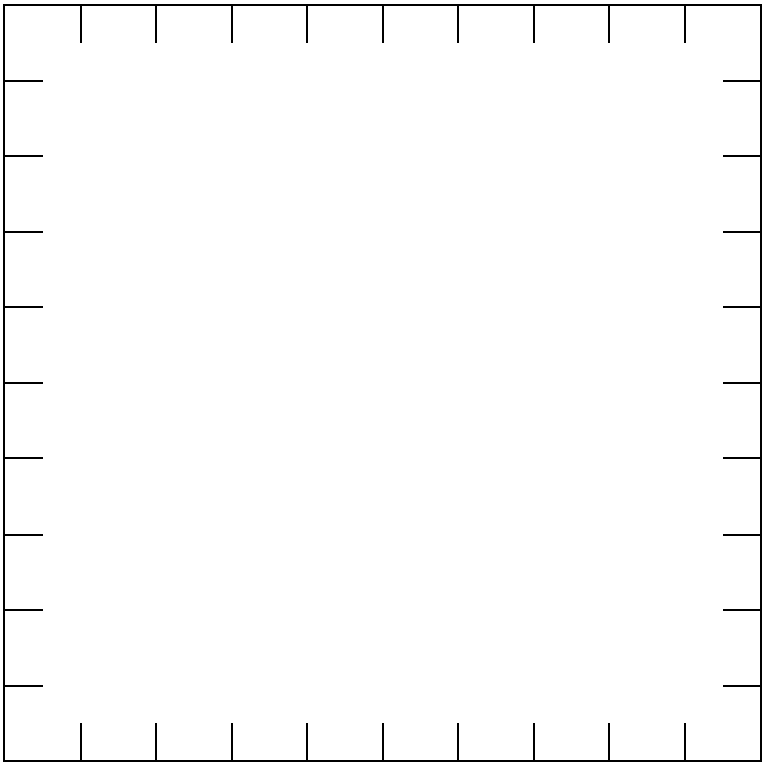
Translations:

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

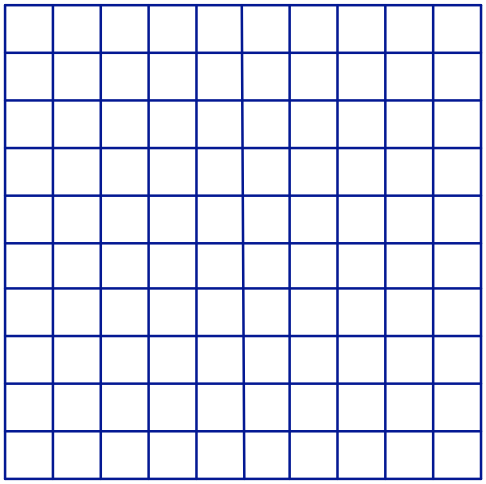
Order the fractions from smallest to largest. Be ready to explain your reasoning.

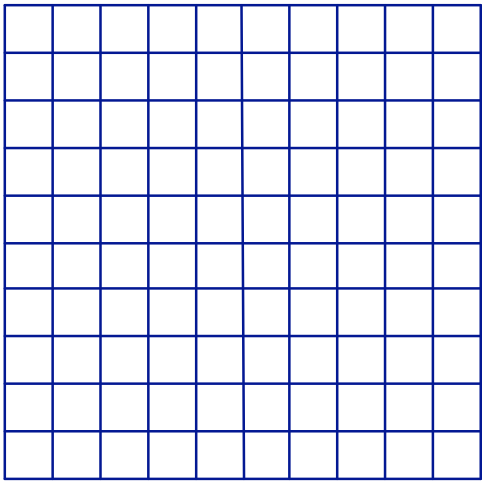
$$\frac{3}{10} \quad \frac{87}{100} \quad \frac{49}{100} \quad \frac{15}{100}$$

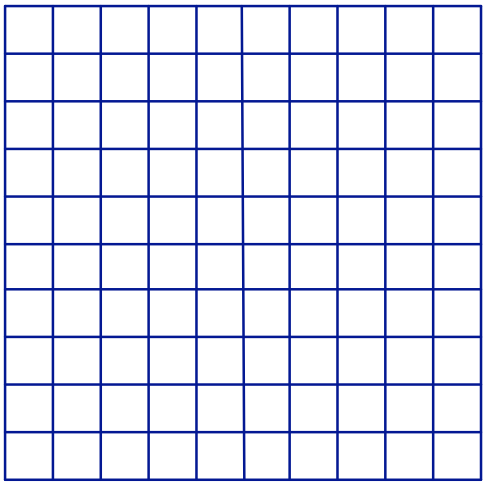
Name_____ Lesson 9/Student Page A

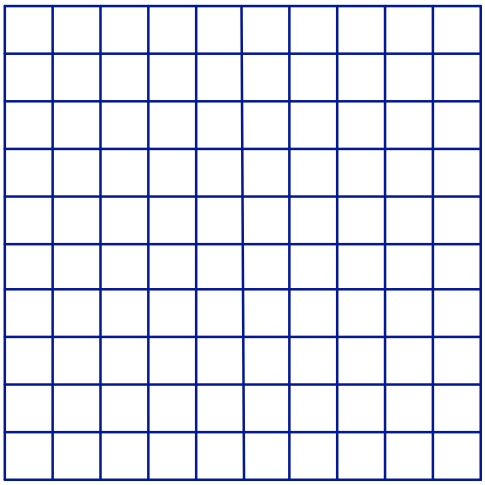


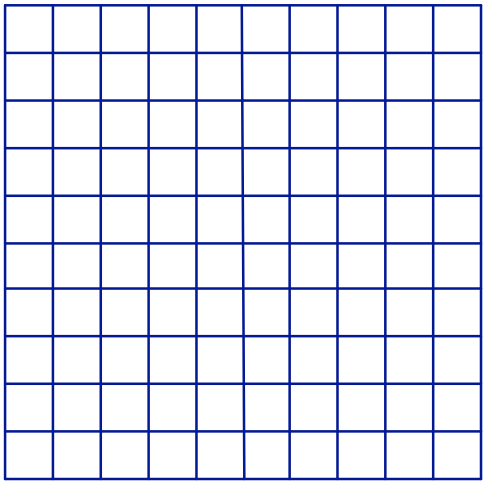
Name_____

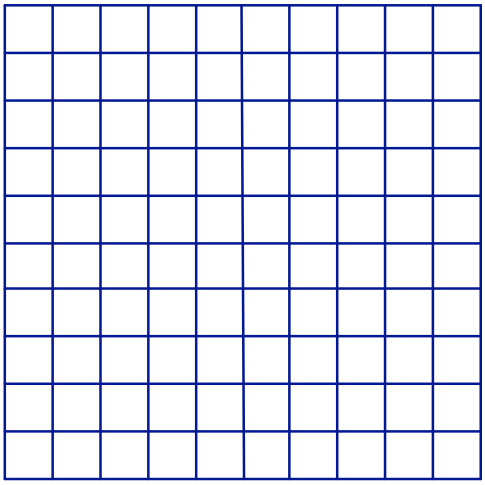








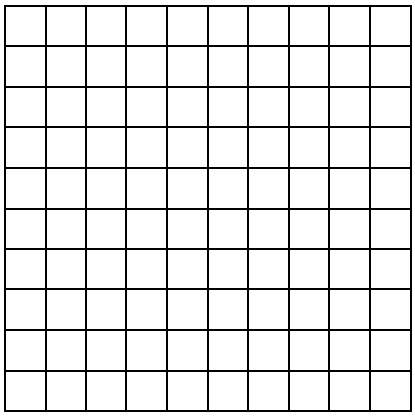




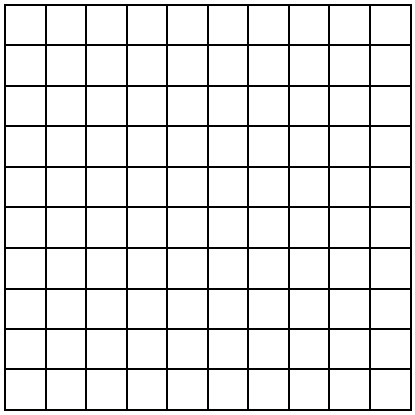
Name_____ Lesson 9 / Student Page C

Naming Tenths and Hundredths on a 10 x 10 Grid

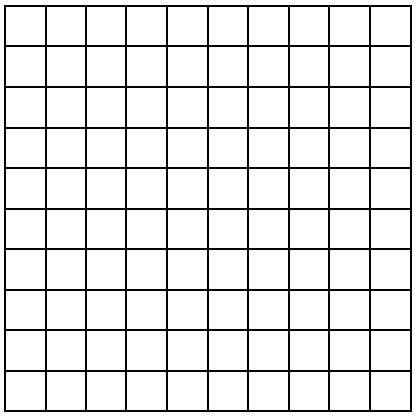
Shade in the amount of the grid noted in each problem.



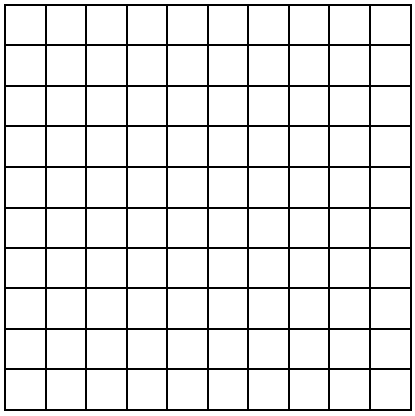
34 – hundredths



$\frac{47}{100}$



9-tenths and 8 hundredths

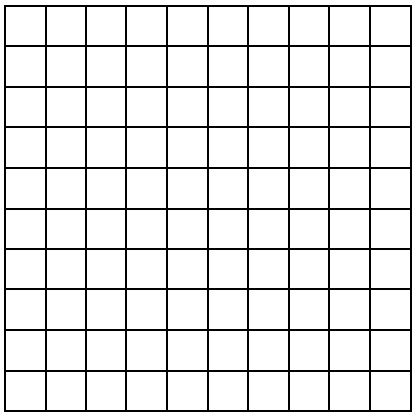


$\frac{5}{10} + \frac{3}{100}$

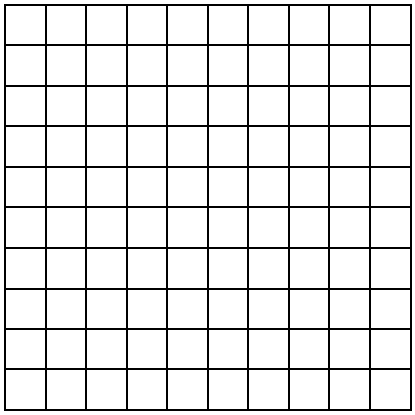
Name_____ Lesson 9 / Student Page D

Naming Tenths and Hundredths on a 10 x 10 Grid

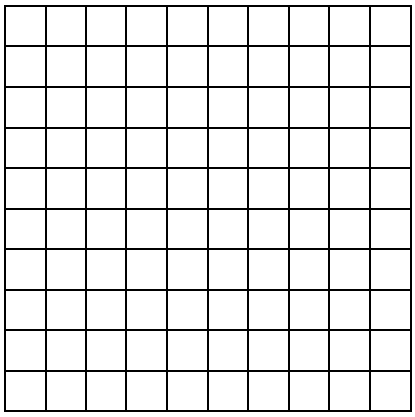
Shade in the amount of the grid noted in each problem.



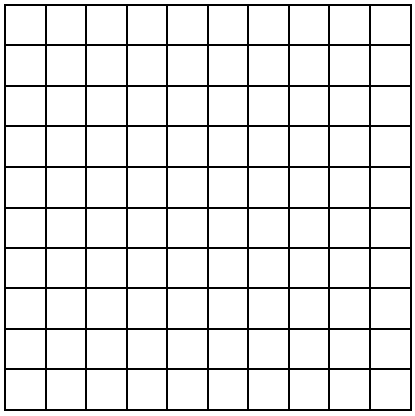
50 – hundredths



$\frac{9}{100}$



1-tenth and 2 hundredths



$\frac{4}{10} + \frac{9}{100}$

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: