# Rational Number Project

| Fraction Operations and Initial Decimal Ideas<br>**Lesson 14: Overview** | **Materials** |
|---|---|
| Students model decimal addition and subtraction problems using a number line, 10 x 10 grid and symbols. | • Several copies of Student Pages A and B for students<br>• Student Pages C-E<br>• Transparency 1 (optional) |

## Teaching Actions

### Warm Up

Mental Math: Find the sum or difference without using fraction circles or paper and pencil

| | |
|---|---|
| 0.35 + 2.05 = | 0.90 + 0.15 = |
| 0.90 - 0.14 = | 2.85 - 1.05 = |

### Large Group Introduction

1. Explain: In a previous lesson you showed how to model addition and subtraction problems involving decimals with a 10 x 10 grid and with symbols. Today you will learn how to model similar problems using a number line.

2. By the end of today's lesson you should be able to show how to add and subtract decimals in three ways: number line, grid and with symbols. You should also be able to explain similarities among the different ways.

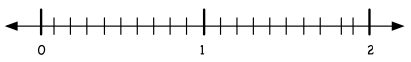
3. Say: Let's take a moment to examine the page of number lines. How many units on the number lines? How is each unit divided?

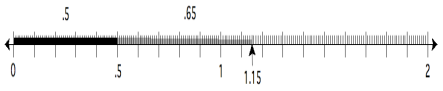
4. Using the first number line, let's find these decimals: 0.97; 0.07; 1.35.

## Comments

**Note: This lesson may take 2 days.**

You should draw a large number line on the board from 0 to 2 with tenths shown. Put in the hundredths as needed during the lesson.



| Teaching Actions | Comments |
|---|---|
| 5. Which is larger: .07 or .68? How can you use your number line to support your answer? Repeat for 1.45 and 1.405 | Encourage students to verbalize what each decimal means. For example: .97 is 9-tenths and 7 hundredths or 97-hundredths. Stating the decimal as tenths and hundredths will help students see how to find that amount on the number line. |
| 6. Consider this problem: A plant grew .5 of a unit in one week; the next week the plant grew .65 of a unit. How much did the plant grow in two weeks? Do you think the plant is more or less than one unit? | |
| 7. Since our estimate is over 1 unit, we will need a Decimal +/- board with an extra grid at the bottom. (Hand out Student Page 14B). | |
| 8. Explain: A number line is a model that can include many units. So I will use a number line to model this addition problem. But you will use the Decimal +/- board. Let's see how the two models are alike for adding decimals. | |
| 9. Show a number line at the board. Students use the Decimal +/- board. Ask students to show .5 on their grid. You show .5 on the number line by shading from 0 to .5. Say: We both have shown the growth for week one on our models. To show the growth of week two, we need to add to .65 to this .5 amount. Show .65 on the other grid at the top of your board. Combine the two amounts on the grids at the bottom of the boards. Based on the grids what is the answer? | We want students to see how adding .5 + .65 on the 10 x 10 grid is similar to adding .5 + .65 on the number line. We want students to verbalize that they need to add tenths to tenths and hundredths to hundredths. |
| 10. State: Let's show that on the number line. Starting at .5, I will extend the line 6-tenths more and then add on .05 to that. What is the value of the point on the number line at the end of my line? Is it the same as with the grid? How are the two models alike? Different? | You are modeling a picture-to-picture translation.   |
| 11. Ask a student to model the problem using symbols. Guide the student to explain how the symbols match the actions with the number line and decimal board. Without using a rule (line up the decimal points) point out that she is matching tenths to tenths and hundredths to hundredths. | |
| 12. We need to show subtraction using the number line too. Consider this problem: Ada's tomato plant | |

## Teaching Actions

was 1.4 units tall, while Diego's tomato plant was 1.65 units tall. Which plant was the tallest? How much taller?

13. Let's make a quick sketch to show the two plants. How can we solve the problem?

14. Because the numbers are greater than one we can't use the Decimal +/- boards. But we can model this problem with the number lines. Show 1.65 on the large class number line by shading a line up to 1.65. Whose plant does this amount refer to? Where is Ada's plant height on the number line? (Shade a line up to 1.4) What is the difference between these two amounts? How can we figure that out? (Count up from 1.4 to 1.65).

15. Record with symbols.

16. Explain: You have several pages of number lines at your tables as well as Decimal +/- boards. Student Page C contains a table of data related to plant growth. All data is measured in decimals as parts of the one unit of length. Student Pages D and E contain problems to be solved based on the data table on Student Page C.

### Small Group/Partner Work

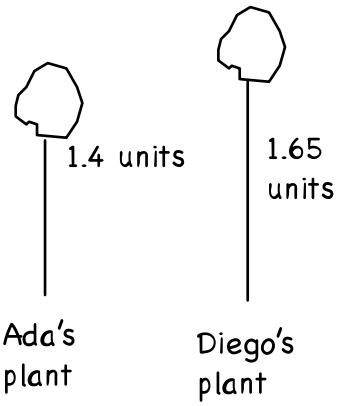
16. Work together in your groups to find out how to use number line, and grids to add or subtract decimals. You can draw on any number line. Be prepared to share your strategies in large group discussion.

17. Provide students in groups with several pages of the number lines, Decimal +/- boards, and Student Pages B – D.

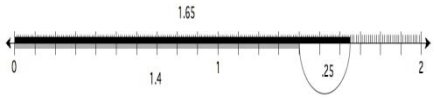
### Wrap Up

18. Ask select students to share their solutions to problem 5. This is a "take-away" subtraction problem. Discuss how they used the number line differently for this subtraction problem than for problem 1 (compare problem). Conclude that both are subtraction. For both problems, record using

## Comments




Students seem to have difficulty identifying a compare problem as subtraction. We found having students do a sketch first helped them see the need to subtract.




Encourage students to clearly label the number lines. See examples of students' work on Notes for the Teacher Lesson 14.

| Teaching Actions | Comments |
| --- | --- |
| symbols in vertical form.<br><br>19. Ask student to go back to each problem and record with symbols (vertical format). They should verify that their answers are the same whether solving using number line, grids or symbols. | |

**Translations:**

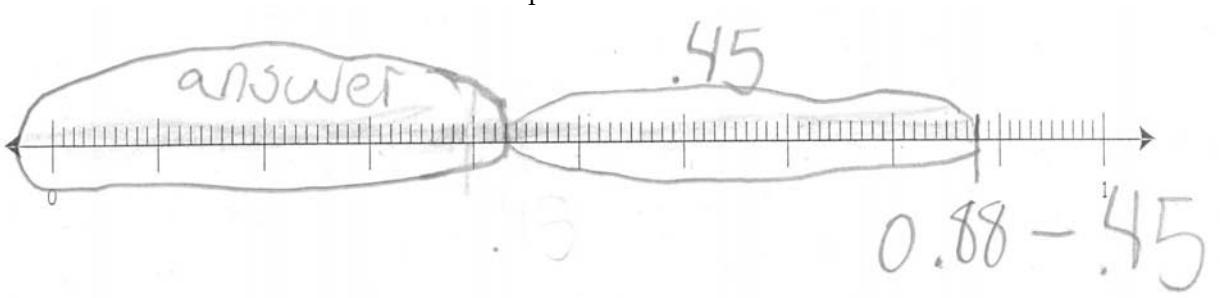
- Picture to Picture to verbal
- Real-life to pictures to symbols to verbal

**Additional Notes for the Teacher**
**Lesson 14**

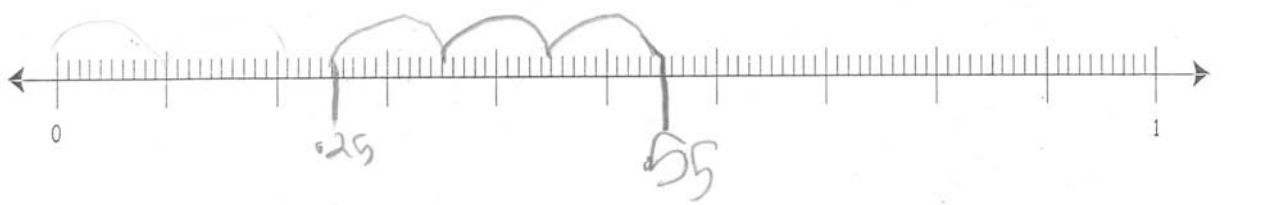
Look for examples among students' work where students have been careful in recording their work on the number lines. Ask these students to share their ways of labeling the number lines with others.

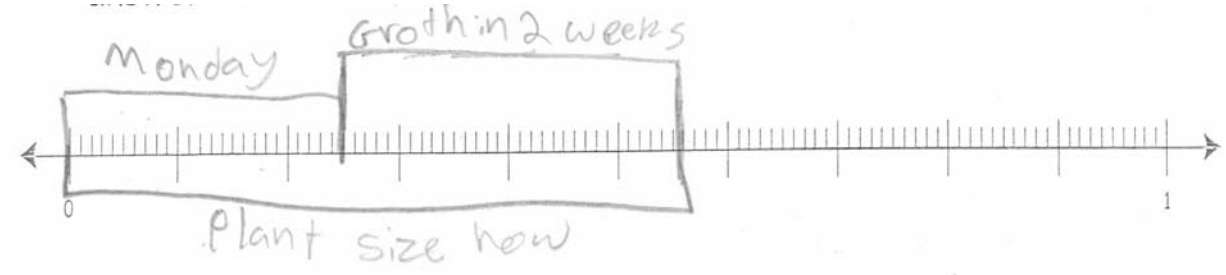
Below find examples of students' work that clearly informs the teacher how the student used the number line to solve a decimal addition or subtraction problem using a number line. These items came from a decimal test students in our teaching experiments took at the end of the decimal lessons.

Beth's plan was 0.88 units tall. She cut off the flower part that was .45 units tall. How tall was her plant now? Use the number line below to solve the problem.

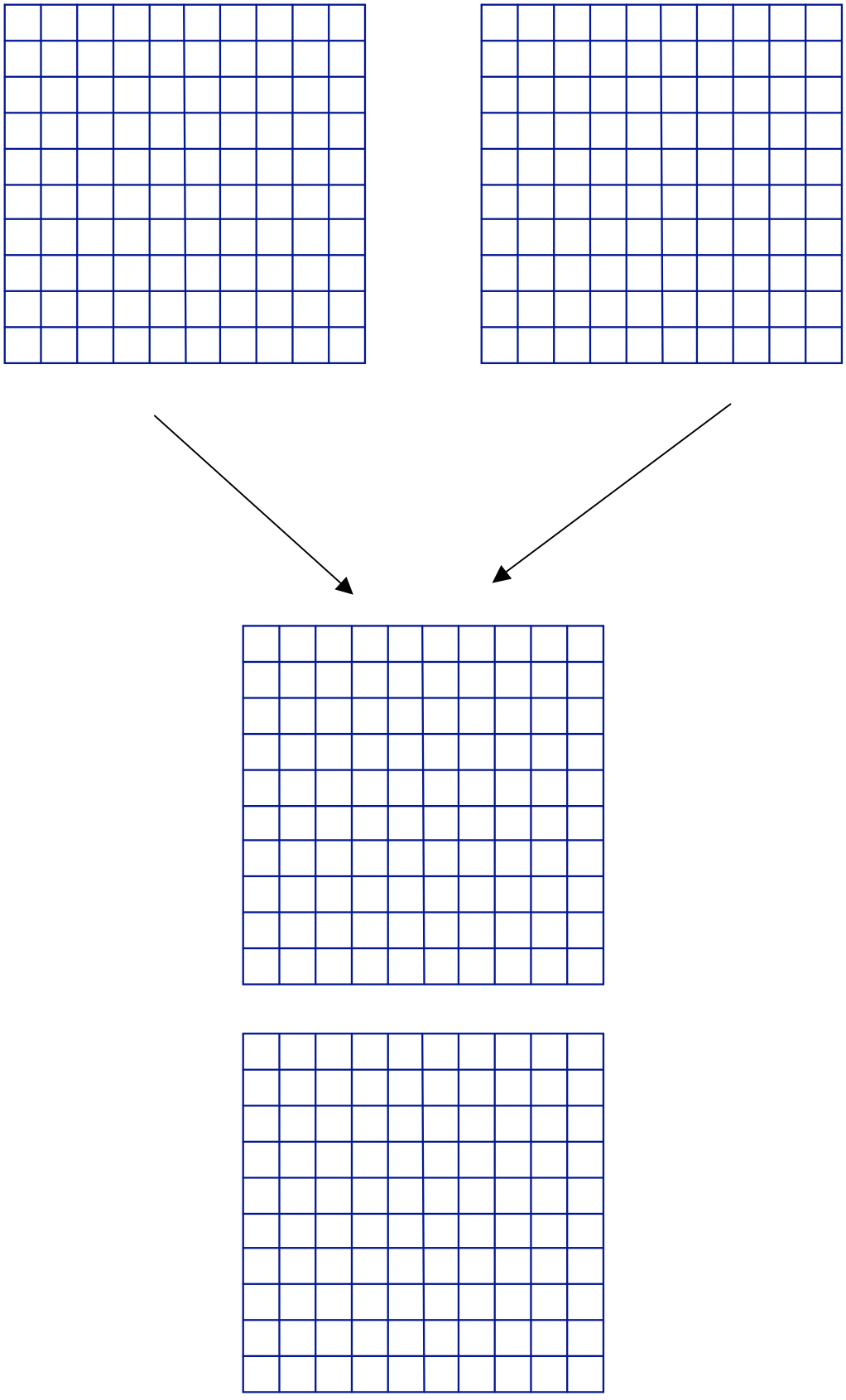



Chase's plant was .25 units on Monday. It grew .3 units in two weeks. How tall was his plant at the end of two weeks? Show how to solve this problem on the number line.



# Decimal Addition and Subtraction Board



# Mental Math: Find the sum or difference without using fraction circles or paper and pencil

| | |
|---|---|
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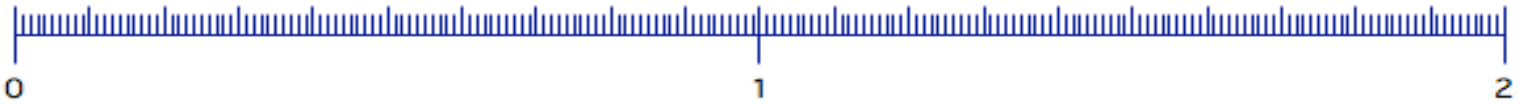
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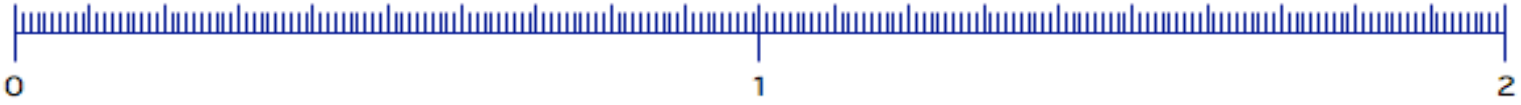
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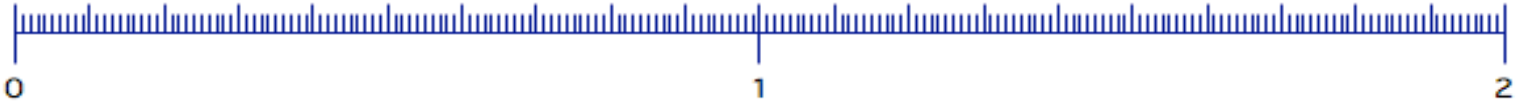
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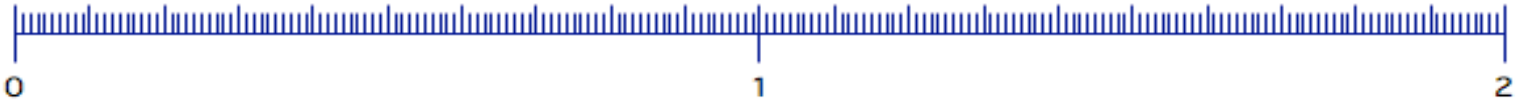
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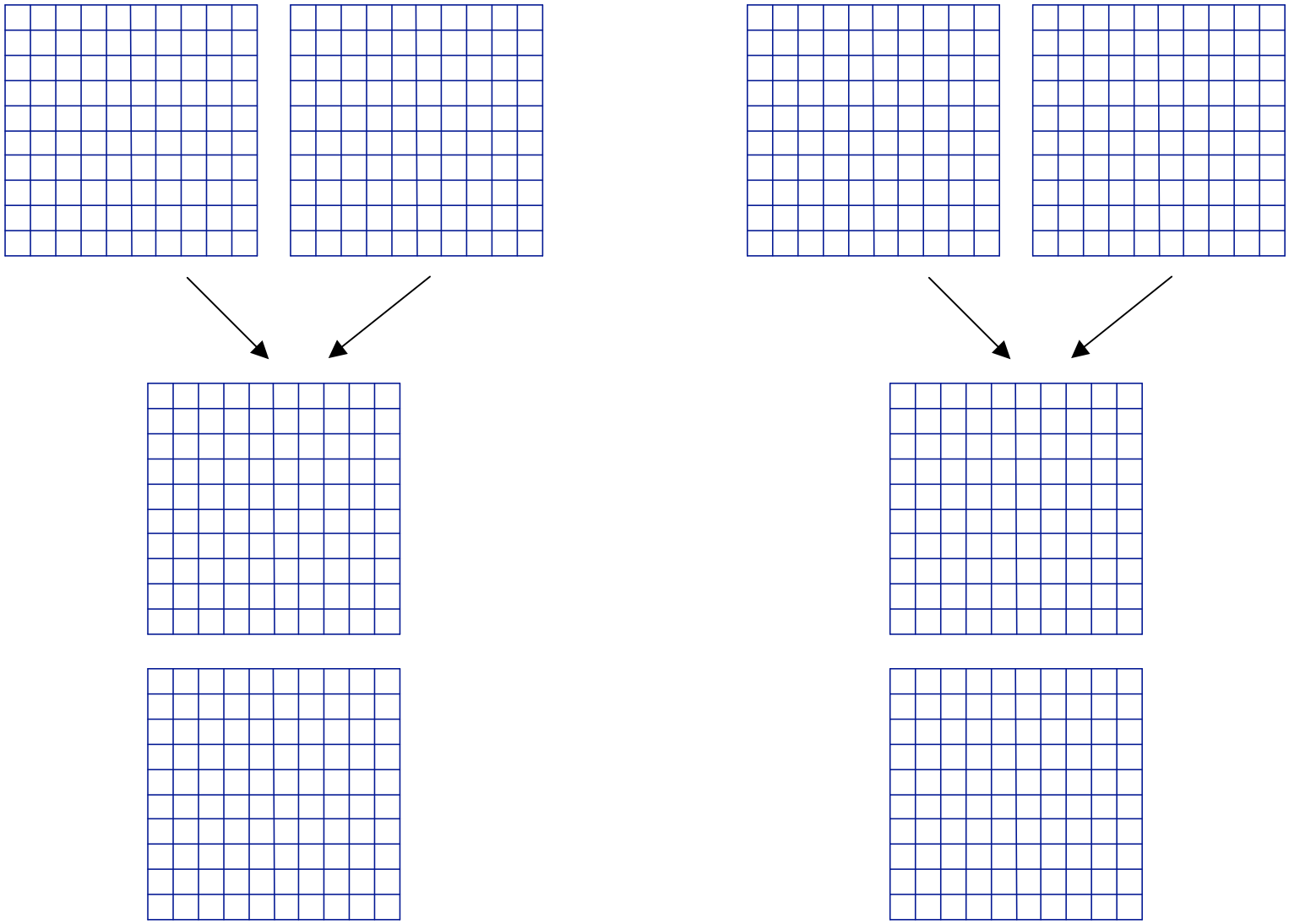
**Addition/Subtraction Boards**



# 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: