Rational Number Project

Fraction Operations and Initial Decimal Ideas **Lesson 16: Overview**	**Materials**
Students make connections between adding and subtracting fractions using a symbolic procedure to using a number line.	∞ Large classroom display of the first 6 number lines on Student Page A ∞ Red ribbon ∞ Student Pages A-H. ∞ Transparencies of large group story problems

Teaching Actions

Warm Up

Tom was in a hurry when he was doing his homework. He has a picture that is partially drawn. What number is shown on the number line?

Large Group Introduction

1. Remind students that they are able to add fractions using fraction circles and with symbols. Explain that in this lesson, they will see how to model adding and subtracting fractions on a number line.

2. State clearly that the goal is for them to explain how to use a number line to model fraction addition and subtraction.

3. Direct students' attention to the 6 number lines on the board. Students should have Student Page A showing the same number lines.

Comments

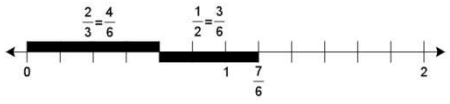
The purpose of this lesson is to reinforce students' understanding of the addition and subtraction procedure for fractions by making symbolic to picture translations using the number line as the picture.

Students understanding of the algorithm for adding and subtracting fractions is strengthened by asking them to make sense of adding and subtracting on a number line. Students use the algorithm to made sense of this new model. Consider what the students will need to do to use the number line to add and subtraction fractions:

∞ The decision as to what number line to use to add or subtract two fractions is equivalent to finding common denominator.

∞ Identifying each fraction as an equivalent amount on the number line relies on students' ability to find equivalent fractions symbolically.

Students should note that the lines are equal in length; the distance from 0 to 1 is the same. The lines are partitioned into different number of

Teaching Actions	Comments
Ask: How are these number lines alike and different?	equal parts.
4. Present this story problem: Jacob ran $\frac{2}{3}$ of a mile and stopped to tie his shoelaces. He then ran another $\frac{1}{2}$ of a mile. Did he run more or less than one mile?	
5. Estimate: Is the amount > or < 1? Greater or less than 2? More or less than $1\frac{1}{2}$?	
6. Show the ribbons cut into $\frac{2}{3}$ length and $\frac{1}{2}$ length. Place the ribbons on the first number line (no fractional amounts shown). Mark the spot on the number line that shows the length of the two ribbons combined.	Prepare 2 lengths of ribbon. One is $\frac{2}{3}$ the length of the unit of the number line you drew on the board. The other is $\frac{1}{2}$ the length of the unit.
7. Comment on their estimate. Ask: What is the exact amount? You know how to do this with fraction circles. You know how to do this with symbols. Now you need to figure out how to model this on the number line.	You may want at this point to step back and let students try to do this on their own as opposed to guiding them through the steps.
8. Ask: Which number line might be the best one to show how much Jacob ran in all? Try their suggestions. Ask students to explain their reasoning.	The idea is for students to build on their prior experience with equivalence and operating with fractions and symbols to see that the number line representing the common denominator is the best choice. For example a student working on $\frac{3}{4}+\frac{1}{3}=$ explained that he would use the "12 number line because they both go into it."
9. Move the ribbons to the number line partitioned into sixths. Ask: $\frac{2}{3}$ is equal to how many 6ths? $\frac{1}{2}$ is equal to how many 6ths? What is the total number of miles that Jacob ran?	
10. Ask: Why is the 6ths number line better for solving this problem than the number line showing 3rds? (Both fractions can be easily modeled on the number line showing 6ths).	Number line for $\frac{2}{3}+\frac{1}{2}$ 
11. Ask: How might you use symbols to show what you did on the number line?	

Teaching Actions

Comments

$$\left(\frac{2}{3}=\frac{4}{6} \quad \frac{1}{2}=\frac{3}{6} \quad \frac{4}{6}+\frac{3}{6}=\frac{7}{6}=1\frac{1}{6}\right)$$

12. Repeat for $\frac{1}{4}+\frac{7}{8}$

13. Ask: In what ways is adding fractions using the number line the same as using fraction circles? How is it the same as using just symbols?

14. Suggest that they imagine adding $\frac{3}{7}+\frac{1}{4}$ using a number line. Ask: What type of number line would you need to add these two fractions?

Small Group/Partner Work

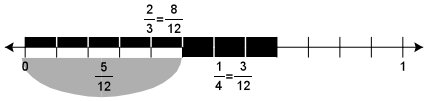
15. Provide practice using Student Pages B -H. As students work on these problems, stop by each group and ask students to explain what they are doing.

16. Student Pages F- H ask students to construct for themselves a way to model subtraction on the number line. On the first story problem students may draw in two lines and compare lengths; on the take away problem, students may draw one line and count back.

Students will need extra copies of the number lines (Student Page A). As you watch students do the class work notice if they are labeling the number lines. If not, encourage students to label the number lines to clearly show the numbers involved.

Take away model on the number line

$\frac{2}{3}-\frac{1}{4}$



Wrap Up

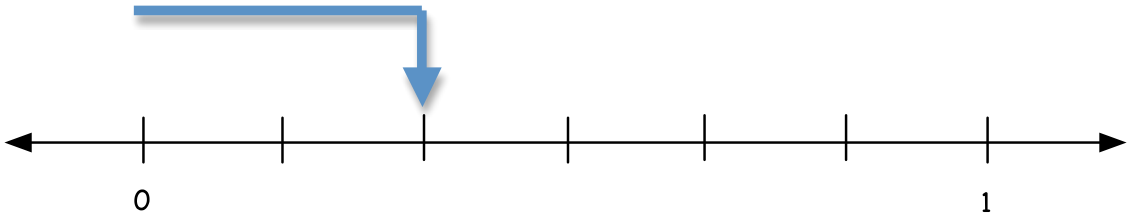
17. End class by sharing students' strategies for subtraction.

18. Help students to verbalize how finding answers on the number line is the same as adding or subtracting finding common denominators.

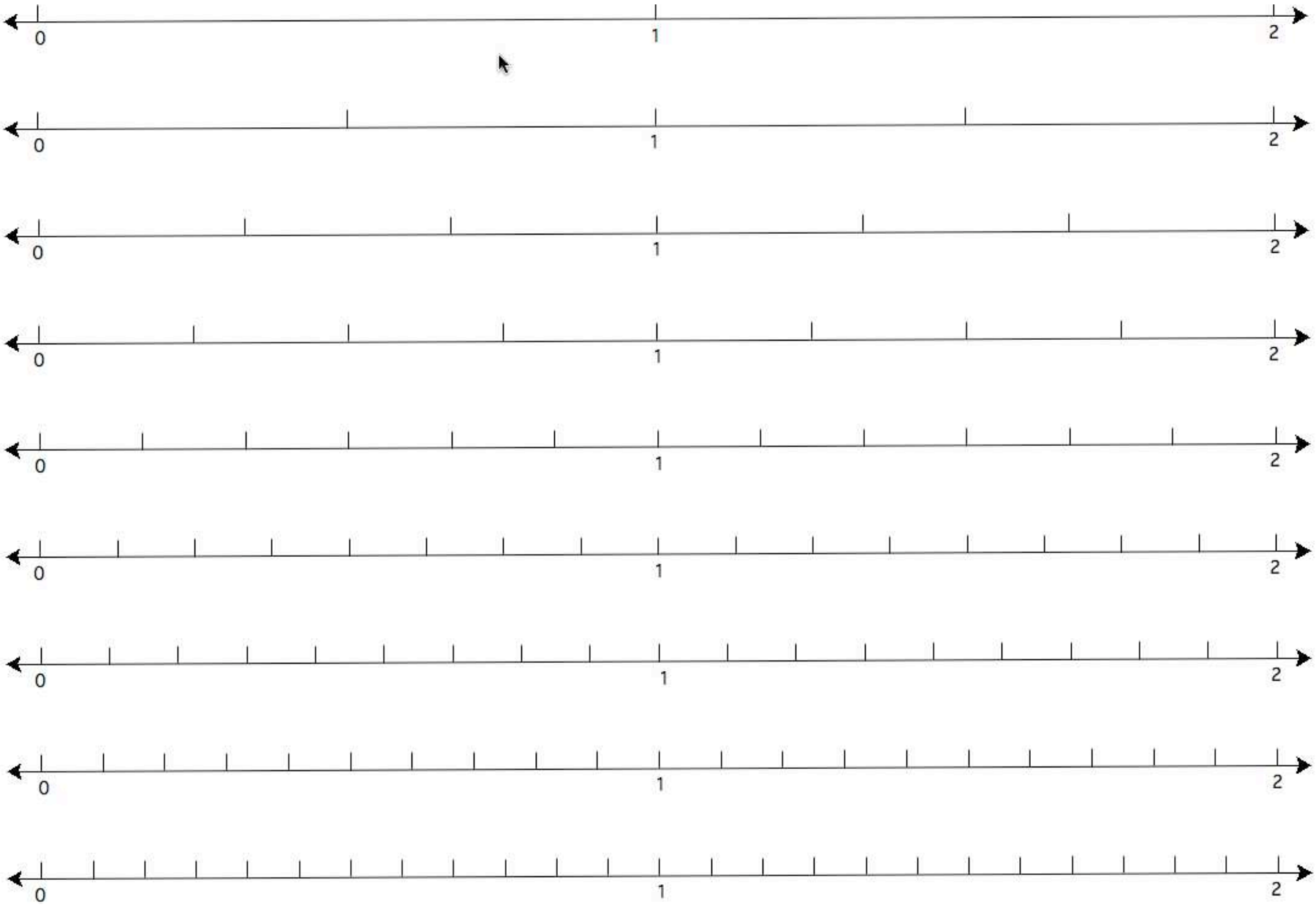
Translations:

- Real life to verbal to pictures to symbols
- Symbols to pictures to symbols

Tom was in a hurry when he was doing his homework. He has a picture that is partially drawn. What number is shown on the number line?



Name_____ Lesson 16 / Student Page A



Adding Fractions on the Number Line

In this activity you are to show that you understand how to use a number line to model the sum of two fractions. In your groups, talk with each to answer each question. Record your responses on this page. You will need additional copies of the number lines on Student Page A.

Problem: $\frac{3}{4}+\frac{1}{3}=$

1. Which number line will you use to model this problem? Explain why you chose that number line.

2. Where is $\frac{3}{4}$ on this number line? How do you know?

3. What will you do to *add on* the fraction $\frac{1}{3}$?. How will you show that on the number line?

4. How can you read the number line to determine the exact answer?

Problem: $\frac{2}{3}+\frac{2}{9}=$

1. Which number line will you use to model this problem? Explain why you chose that number line.

2. Where is $\frac{2}{3}$ on this number line? How do you know?

3. What will you do to add the fraction $\frac{2}{9}$? How will you show that on the number line?

4. How can you read the number line to determine the exact answer?

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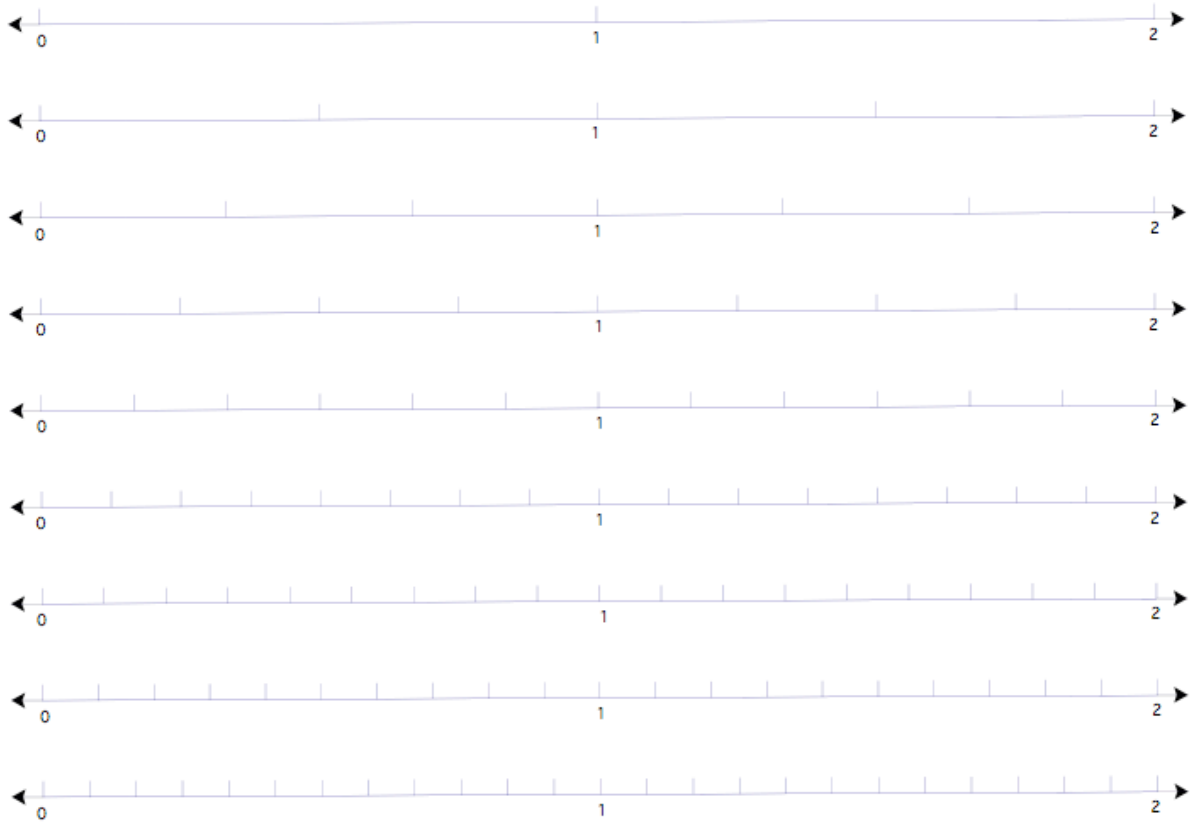
Adding Fractions on the Number Line

Show each problem on the best number line. Record your answer below each problem, showing the equivalent fractions you used.

$$\frac{3}{12}+\frac{1}{6}$$

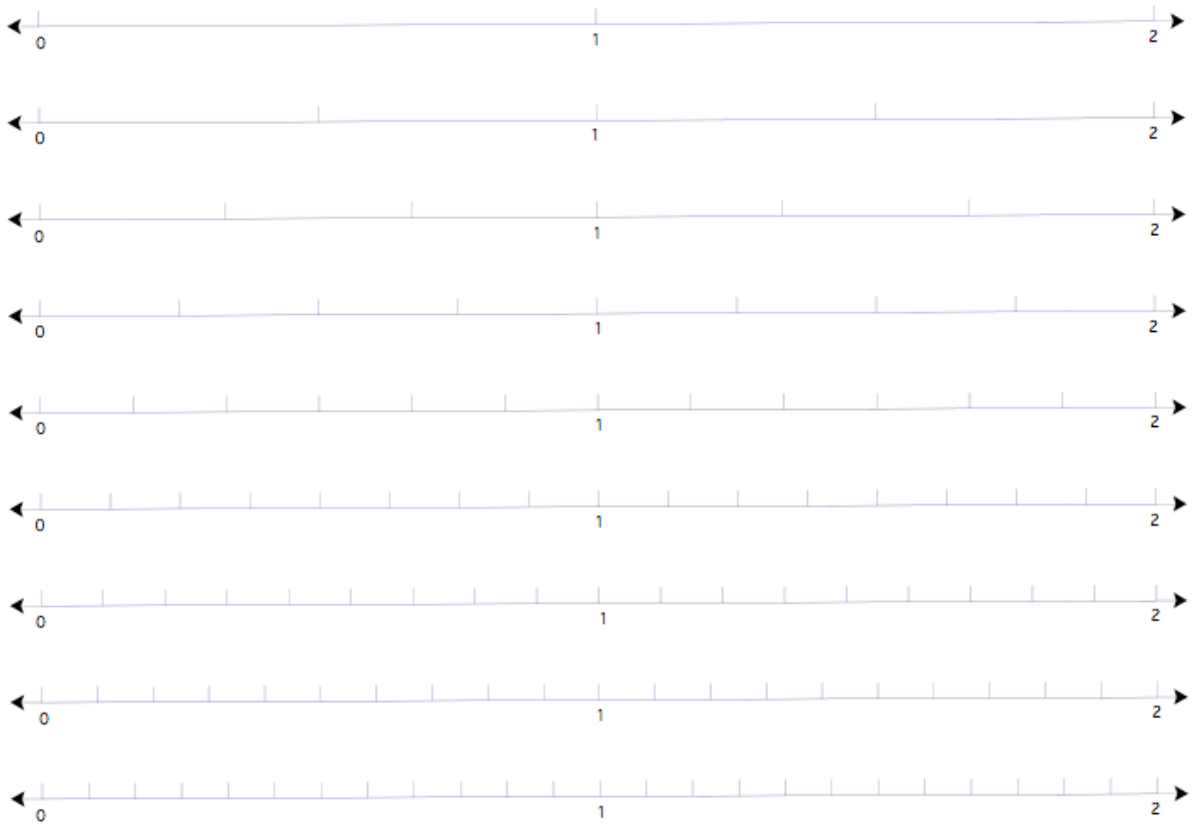
$$\frac{2}{3}+\frac{1}{2}$$



Name_____ Lesson 16 /Student Page E

$$\frac{2}{5}+\frac{1}{2}$$

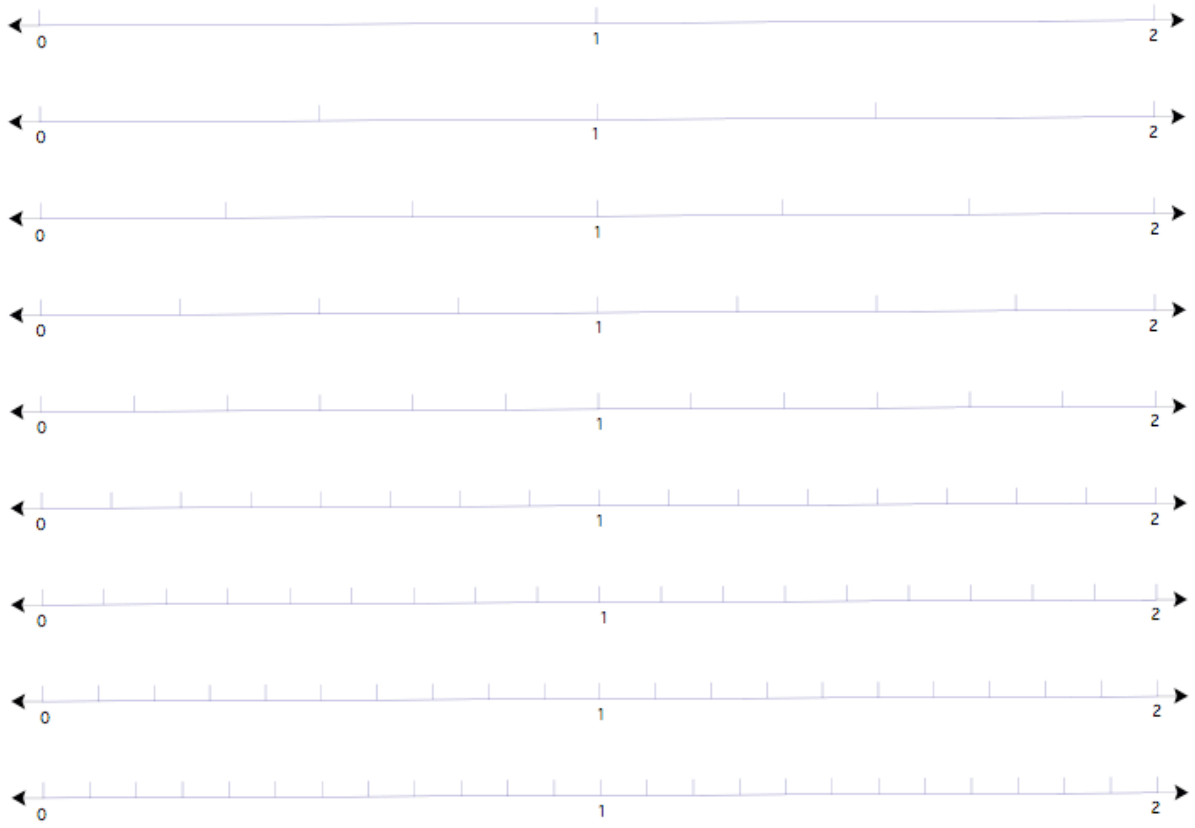
$$1\frac{1}{3}+\frac{2}{9}$$



How can you subtract using the number line?

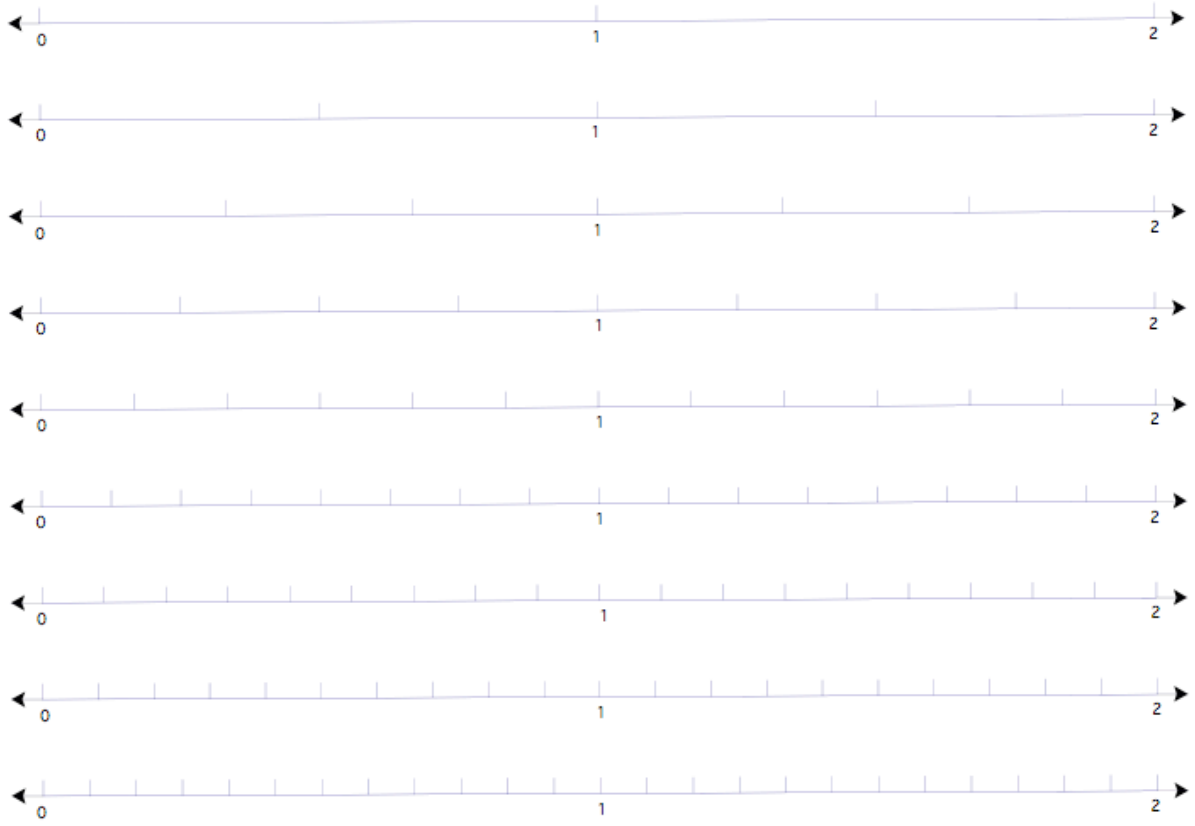
With your partner show how to solve each problem using the number line. Are you using the number line in the same way for each problem? Be ready to present your ideas to class.

Problem 1: Addis lives $\frac{7}{8}$ of a mile from school. Xander lives $\frac{1}{4}$ of a mile from school. Who lives farther from school? How much farther? Solve this problem on the number line of your choice.



Describe how you used the number lines to solve this problem:

Problem 2: Hannah lives $1\frac{4}{5}$ miles from school. She rides her bike everyday. On Monday her bike broke down after riding about $\frac{1}{2}$ of a mile. How far did she have to walk?



Describe how you solve the problem using the number line.

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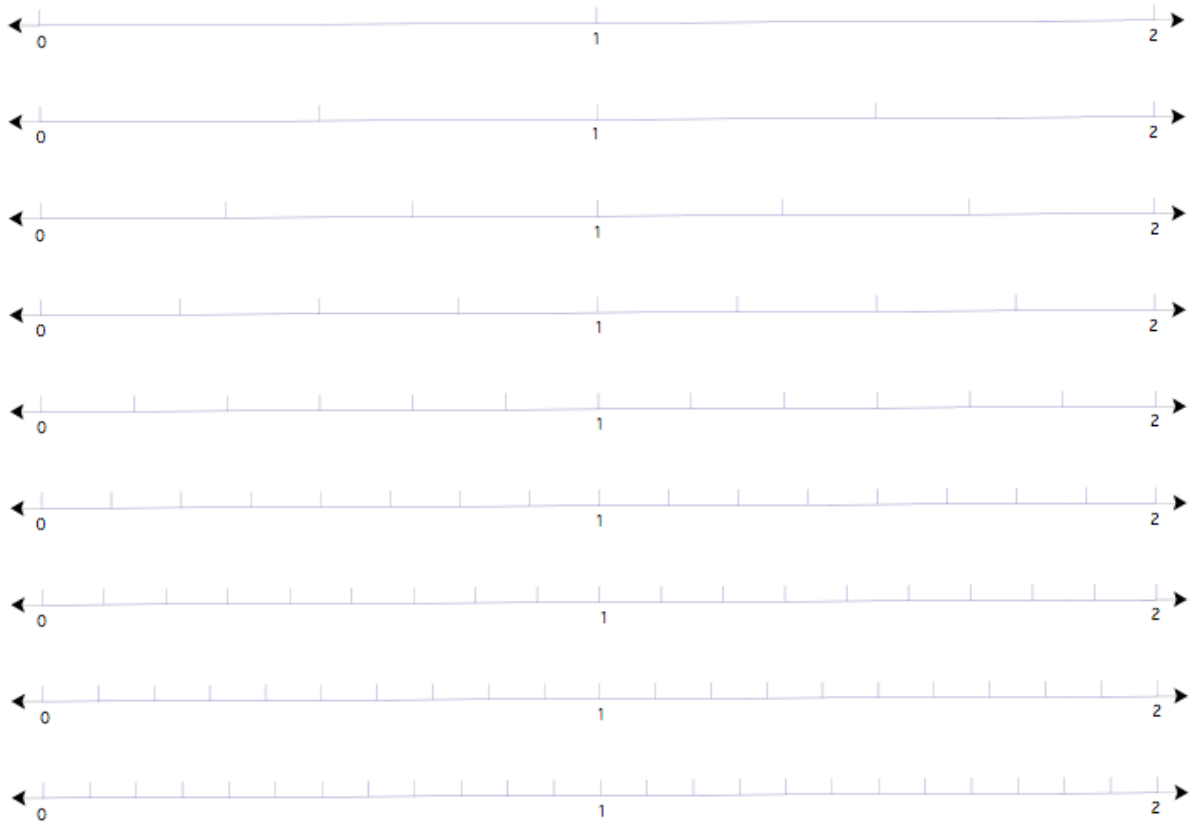
Problem 3: Solve these two problems on the number line.

$$1\frac{3}{4} - 1\frac{1}{2} \qquad 1\frac{2}{3} - \frac{4}{6}$$



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: