Rational Number Project

Initial Fraction Ideas
Lesson 17: Overview

In order to make sense of the number line model for fractions students will make connections between the paper folding model for fractions and the number line model for fractions.

Materials
• Student Pages A - C

Teaching Actions

Warm Up

The picture represents a length of 2 feet. Label: 0 feet; 1 foot; 2 feet. Partition each foot into 2 equal parts. What fraction is each part?

Large Group Introduction

1. Imagine that you are walking along one of the lakes in Minneapolis. The distance from your car to the ice cream stand is about 2 miles.

2. Explain that if one mile is represented by one paper strip, how many paper strips are needed to show 2 miles? How can you label the picture of the paper strips to show 0, 1 and 2 miles?

3. You walked \( \frac{1}{4} \) mile from your car to the ice cream stand when you met two of your friends. Ask students where \( \frac{1}{4} \) is on this picture? Encourage different students to explain

Comments

In this lesson, students build on paper folding pictures to draw number lines that are simpler versions of the pictures for paper folding model. This lesson may take 2 days to complete.

You may want to act this out in front of the picture projected on the Smart Board.

Successful students often partition 4ths by first partitioning the unit length into half and then each half into halves again.
Teaching Actions

their reasoning for locating ¼ between 0 and 1 and how they partitioned the length between 0 and 1 into 4 equal parts.

4. You continued walking with your friends. When you walked 1 ¼ miles you ran into your teacher. Locate 1 ¼ miles on the picture. (Students now have to partition the length between 1 and 2 into 4 equal parts).
Encourage different students to explain their reasoning.
Ask: Why is 1 ¼ between 1 and 2 on the picture?

5. Explain that instead of drawing the whole rectangle for each paper strip we use to model fractions, we can just draw a horizontal line to show each paper strip and use “tick” marks to show each partition.

6. Draw these two pictures or project them on the Smart Board while students follow along with Student Page A.
Ask students to build the number line below their picture of the paper-folding strip on Student Page A.

| 0 | 1/4 | 1 | 1 1/4 | 2 |
miles | mile | miles |

7. Ask: How are the two pictures alike? How many units are shown in the paper-folding picture? How many units do you see on the number line? Where should we put the
<table>
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<td>numbers 0, 1 and 2 on the number line? What do the arrows mean on the number line?</td>
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<td>8. Ask: Can anyone show me with loops, how to count the number of partitions between 0 and 1 on the paper folding picture? How can we label the other equal partitions on the paper-folding picture between 0 and 1? How can we label the partitions between 1 and 2?</td>
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<td>9. Ask students to remind you how this number line is like the picture of the paper folding. How many equal lengths are there between 0 and 1 on the number line? Can you show with loops? What does that tell you about the name for each partition? What fraction should we put under the first tick mark – the end of the first length? The second tick mark? Continue to name all partitions.</td>
<td>Address a common error in the warp up where students ignore the units on the number line and consider the whole line as the unit.</td>
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<td>10. Suggest that another student thought that the place they labeled ¼ should be 1-eighth because he counted 8 loops from 0 to 2. What do you think about that?</td>
<td>Before going on to the small group work, point out that the length of the unit can vary with a number line. Both examples below are number lines with 2 units shown. But the units are different lengths.</td>
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<td>11. Say: I see a difference between the number line picture and the picture for paper folding strips. What do the arrows at the ends of the line mean?</td>
<td>You may want to end the lesson here and use the wrap up section as the next day’s lesson.</td>
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<td>12. Repeat for the other 3 problems on Student Page A as needed. Have students build matching number lines with labels under each picture of paper-folding strips.</td>
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# Teaching Actions

## Small Group/ Partner Work

13. Assign Student Pages B and C.

## Wrap Up

14. Ask students to explain how they labeled selected answers to problems on Students Pages B and C. For Page C reflect on students’ work by looking to see if

- Students identified 0, 1 and 2 as needed?
- Students partitioned 4ths by dividing lengths into half and then half again?
- Students were able to partition into 3rds accurately using two tick marks between 1 and 2 to equally partition the length into 3 equal parts?
- Students completed the partitioning first and then located the fraction on the number line?

Show a blank number line. Ask students to draw a blank number line on their paper. Explain that you want to model 2 feet of string. Ask students to show 0 feet, 1 foot and 2 feet on the number line. (Observe if students see the need for equal units.)

Ask students to find these fractions on the number line by partitioning each unit into the needed number of partitions. Where would \(1 \frac{1}{2}\) feet be on the number line? Where would \(\frac{3}{4}\) of a foot be on the number line? Why is \(1 \frac{1}{2}\) between 1 foot and 2 feet while \(\frac{3}{4}\) is between 0 and 1?

Challenge students by asking: Where is \(\frac{3}{8}\) on the number line?

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<td>This list represents successful strategies for partitioning number line to show fractions.</td>
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Observe which students are able to partition and which ones are still struggling. The last number line lesson will try a different translation (Fraction circles to number line) to help students still making errors with the partitioning.
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<td>number line?</td>
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**Translations**
- Context to Picture to picture to verbal
- Picture to picture to symbol
- Picture to symbol
The picture represents a length of 2 feet. Label: 0 feet; 1 foot; 2 feet. Partition each foot into 2 equal parts. What fraction is each part?
Each problem tells the story of a bug walking along a length. A number line is shown to represent the path the bug walks. Your job is to figure out what fraction the bug walked. Be prepared to explain your thinking.

Problem 1: A ladybug is walking along a strip of wood that is 2 yards long starting at 0 yards. It stops at the first dot. What fraction of 1 yard is that? Label that point. The ladybug continues its stroll down the strip of wood. He gets to the 1-yard marker and continues to the next dot. How far did the bug walk? Label that point.

Problem 2: A caterpillar is slowly strolling along a windowpane that is 1 meter in length. He started at the very left edge of the pane. It stops at the dot shown on the number line. What fraction of 1 meter did the caterpillar walk?

Problem 3: The grasshopper stood perched on a branch of a bush. It jumped toward the next bush that was 2 yards away. He didn’t jump very far. The dot on the number line represents how far he jumped. What fraction of a yard did the grasshopper jump? Label that point.

Problem 4: A snail slowly crawled along a log about 1-meter long starting at the very left end of the log. After 5 minutes he didn’t get very far. The dot shows how far he crawled. What fraction of a meter did the snail crawl?
Imagine a bug crawling along a length. With your partner, label the number of units needed then partition the line into equal parts to show how far the bug crawled. Don’t forget to show where the bug started – use the number 0. Clearly label the fraction on the number line to show how far the bug crawled.

Bug started at the end of log. It then crawled $\frac{1}{2}$ yards.

```
  0  \  \   \  \  \  \         \   \  \   \     \  \  \   \  \       \  \   \  \  \\
```

Bug started at the end of log. It then crawled $\frac{1}{3}$ yards.

```
  0  \  \   \  \  \  \         \   \  \   \     \  \  \   \  \       \  \   \  \  \\
```

Bug started at the end of log. It then crawled $\frac{3}{4}$ of a yard.

```
  0  \  \   \  \  \  \         \   \  \   \     \  \  \   \  \       \  \   \  \  \\
```

Bug started at the end of log. It then crawled $2 \frac{1}{4}$ yards.

```
  0  \  \   \  \  \  \         \   \  \   \     \  \  \   \  \       \  \   \  \  \\
```