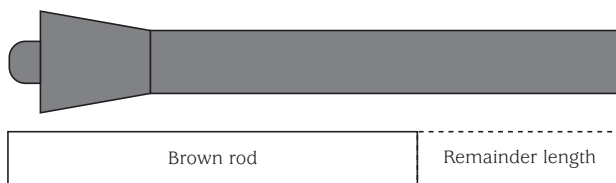


Overview

In this activity, students use Cuisenaire rods to measure items with different lengths. By approaching the task from a measurement perspective, students begin to understand equivalencies as being different ways to name the same quantity.

1. Provide students with an item that is 12-cm long, such as a Mr. Sketch marker, and a supply of rods. Ask them, “How many brown rods long is the marker [or the item you have chosen]?” Some students will say, “One brown rod plus a purple rod”; some will say, “One and one half brown rods.” After students justify their responses, remind them that the denominator of the fraction was two because the purple rod that measured the “remainder length” was $\frac{1}{2}$ of the measuring unit, the brown rod:



We call the extra the “remainder length” to provide a connection to students’ experiences with division. Guide students to find that the remainder length is $\frac{1}{2}$ of the brown rod; thus, the entire length of the item is $1\frac{1}{2}$ brown rods long.

Materials

Measuring with Cuisenaire Rods recording sheet, 1 copy per student (see **Reproducible 3a**)

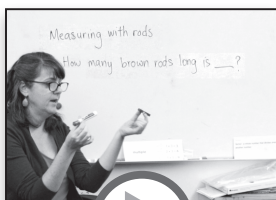
Cuisenaire rods, 1 set per pair of students

items for measuring

Manipulative Note

Cuisenaire rods are wooden or plastic blocks that range in length from 1 to 10 cm. Each rod of a given length is the same color. That is, all the 1-cm rods are white, all the 2-cm rods are red, all the 3-cm rods are light green, and so on.

VIDEO CLIP 3a



Introducing Activity 3.1: Measuring with Cuisenaire Rods

In this clip, Ms. Thompson introduces her fourth graders to Activity 3.1. Students make an estimate of the length of a marker using brown rods as their measurement unit. What does Ms. Thompson learn about her students' understanding of fractions and measurement during this introduction?

For commentary on the above, see the Appendix: Authors' Video Reflections.

2. Have students record the length of the first item on the *Measuring with Cuisenaire Rods* recording sheet in the column labeled *First Way*. (See Figure 3–1; also available as Reproducible 3a.)
3. Call students' attention to the fact that when they used the purple rod to measure the remainder length of the item, the denominator of the fraction was two because they used the rod that was $\frac{1}{2}$ of the brown rod.

REPRODUCIBLE 3A

Measuring with Cuisenaire Rods

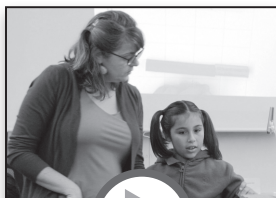
Date: _____

Name: _____

Item Being Measured	First Way	Second Way	Third Way
marker			
pencil			
book			

Figure 3–1. Measuring with Cuisenaire Rods (Reproducible 3a)

VIDEO CLIP 3b



"How Many Brown Rods Long Is the Marker?"

Just before this clip, Edwin states that the marker was one brown and one purple rod long. Ms. Thompson agrees with Edwin and then calls Sarah up to name the purple rod in relation to the brown rod. Sarah provides the correct fraction name for the purple rod but is not able to provide a complete answer to the question, "How many brown rods long is the marker?" How does Ms. Thompson press her students to come to a complete answer to the question?

For commentary on the above, see the Appendix: Authors' Video Reflections.

VIDEO CLIP 3c

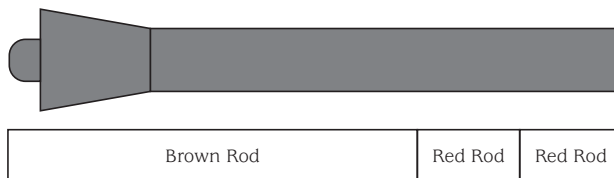


Different Names for the Remainder Length

This clip opens with Ms. Thompson reminding students of their task for Activity 3.1. Then we see a group of fourth graders working on the task—specifically how to measure the "remainder length" of the marker. How can their explorations with the different rods be used to support their understanding of equivalent fractions?

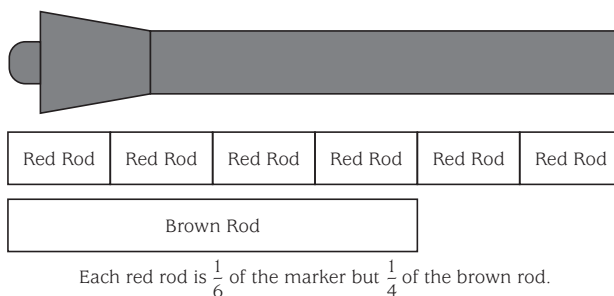
For commentary on the above, see the Appendix: Authors' Video Reflections.

4. Next, instruct students to measure the marker again. They should still use one brown rod as the measurement unit, but this time they should use the red rods to measure the remainder length. After the students have found that the marker is the same length as one brown rod and two red rods, ask them to determine the correct fraction name for the red rods.



After everyone agrees that the marker is $1\frac{2}{4}$ brown rods long, point out that the denominator of the remainder length is four because the red rod is $\frac{1}{4}$ of the brown rod. Record in the column labeled *Second Way*.

Some students may initially think that the red rod is $\frac{1}{6}$ of the brown rod. This confusion usually indicates that they are comparing the red rods with the length of the marker and not with the length of the brown rod, and that they have found that six red rods are the same length as the marker:



This confusion is not unusual. It provides an opportunity for teachers to acknowledge the correct reasoning that students are using while stressing the importance of understanding the measurement unit—in this case, the brown rod.

Like before, call students' attention to the fact that the denominator of the remainder length is now four, because they have used the rod that is $\frac{1}{4}$ of the brown rod.

Item Being Measured	First Way	Second Way	Third Way
marker	1 brown + 1 purple $1\frac{3}{2}$	1 brown + 4 whites $1\frac{4}{8}$	1 brown + 2 reds $1\frac{2}{4}$
pencil	2 browns + 1 green	2 browns + 3 whites $2\frac{3}{8}$	1 brown + 1 black + 4 whites
book	3 browns	2 browns + 1 black + 1 white	2 browns + 1 green + 1 red

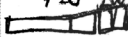
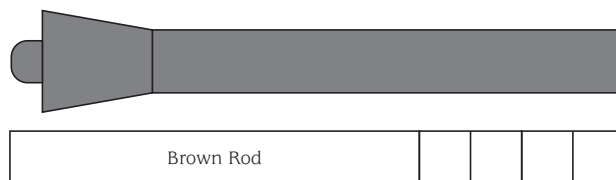
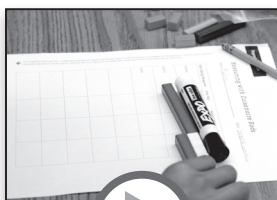
Item Being Measured	First Way	Second Way	Third Way
marker	$1\frac{1}{2}$ 	$1\frac{4}{8}$ 	$1\frac{2}{4}$ 
pencil	$1\frac{1}{8}\frac{1}{10}$ 1 brown 1 white 1 orange	1 brown 5 reds 1 white	1 brown 1 blue 2 whites
book	$3\frac{5}{8}$ 3 brown 5 whites	2 brown 1 black 1 purple 2 whites	$2\frac{1}{7}\frac{1}{2}$ $\frac{2}{8}$

Figure 3–2. Measuring with Cuisenaire Rods, completed student samples.

- Finally, direct students to measure once again, but this time have them measure the remainder length with the 1-cm white rods. Again, ask students to find the fractional value of the white rod and the length of the marker, and to justify why one white rod is $\frac{1}{8}$ of the brown rod and the marker is $1\frac{4}{8}$ brown rods long:



VIDEO CLIP 3d



What Do We Call Four White Rods?

Emily and her partner have found that the marker is one brown rod and four white rods long, but she is unsure of what to name the white rods. How does Ms. Thompson guide the students to help them name the white rods? How can Ms. Thompson's approach help students create a generalization about naming fractions?

For commentary on the above, see the Appendix: Authors' Video Reflections.

VIDEO CLIP 3e



Making Monica's Thinking Public

Ms. Thompson calls on Monica to show the class how she determined that the brown rod and four white rods was $1\frac{4}{8}$. How does Ms. Thompson make Monica's thinking public and accessible to the rest of the class?

For commentary on the above, see the Appendix: Authors' Video Reflections.

6. Have students measure additional items using the brown rod as the measure unit. As they measure items that are not exactly the same length as one or more brown rods, tell them to find all the different ways to name the remainder lengths. This process helps students understand why $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ are the same number but different names for the number or length. It also provides students with opportunities to work with equivalencies such as $\frac{1}{4} = \frac{2}{8}$ and $\frac{3}{4} = \frac{6}{8}$.

VIDEO CLIP 3f



Using the Rods to Show How $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ Are Equivalent

In this clip, we see Diego share something he noticed about the equivalency between one purple rod, two red rods, and four white rods, all of which equal $\frac{1}{2}$ of the brown rod. Ms. Thompson follows Diego's discovery by calling on Celeste to explain Diego's thinking. How do the materials support Diego and Celeste as they share their thinking with their classmates?

For commentary on the above, see the Appendix: Authors' Video Reflections.