Fractions ExplorAction 1

Explore Unit Fractions

Students find pairs of Cuisenaire® Rods that have a relationship that can be expressed in terms of a unit fraction. In this activity, students will use Cuisenaire Rods to—

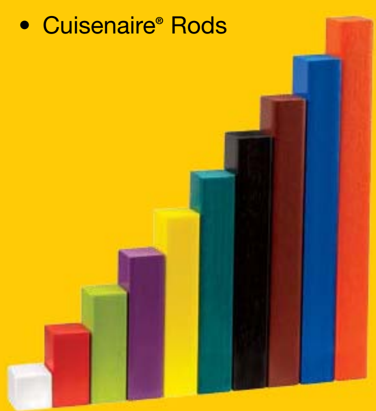
- explore the meaning of fractions,
- determine that the same fraction name can describe different rod pairs, and
- develop a mental picture of fractional parts of a whole.

Common Core State Standard

3.NF.A.1 Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by *a* parts of size 1/*b*.

Materials

- Cuisenaire® Rods



Investigate

Have students explore the following problem.

How many Cuisenaire Rod pairs can you find to show the fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, and $\frac{1}{8}$?

If necessary, help students get started. Ask students to find a rod that is half the length of the orange rod, and have them explain their thinking. Verify with students that the yellow rod is half as long as the orange rod. Have students demonstrate that this can be recorded as *yellow is $\frac{1}{2}$ of orange, orange is 2 of yellow.*

Ask students to find all other pairs of rods in which one rod is half the length of the other. Have students record their findings in the two ways you have described. Verify that students understand the task and that they record their findings appropriately.

purple is $\frac{1}{2}$ of brown, brown is 2 of purple
red is $\frac{1}{2}$ of purple, purple is 2 of red
green is $\frac{1}{2}$ of dark green, dark green is 2 of green
white is $\frac{1}{2}$ of red, red is 2 of white

Have students continue their exploration. Prompt them as follows.

- Work with a partner. Find a rod pair in which one rod is a third as long as the other. Record your findings in two ways.

Example:

white is $\frac{1}{3}$ of green, green is 3 of white

red is $\frac{1}{3}$ of dark green, dark green is 3 of red

- Find as many more rod pairs as you can that show $\frac{1}{3}$. Record each pair in two ways.
- Now, look for rod pairs that show $\frac{1}{4}$ and record each of those in two ways.
- Continue finding and recording rod pairs for all the fractions listed above until you think that you have found all the pairs possible for each fraction.
- Be ready to explain why you think you have found all possible rod pairs for each of the fractions.

Think and Share

Write the following fractions across the board: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$. Have students share their recordings by listing their sentences under the appropriate fraction. The list might begin to look like this:

$\frac{1}{2}$

white is $\frac{1}{2}$ of red, red is 2 of white
red is $\frac{1}{2}$ of purple, purple is 2 of red
green is $\frac{1}{2}$ of dark green, dark green is 2 of green
purple is $\frac{1}{2}$ of brown, brown is 2 of purple
yellow is $\frac{1}{2}$ of orange, orange is 2 of yellow

$\frac{1}{3}$

white is $\frac{1}{3}$ of green, green is 3 of white

Use prompts such as these to promote class discussion:

- What patterns do you notice for each fraction? For all of the fractions?
- How do you know that the list for (name a fraction) is complete?
- Why isn't the black rod on this list? For what fraction could we use the black rod?
- How can the same rod be used to represent two different fractions?
- Why are some fractions represented by fewer rod pairs than others?

Teacher Talk

In the activity, students discover that a given fraction can be represented by a variety of different rod pairs. Though they might begin their investigations in random fashion, students will usually develop an organized approach.

For example, when searching for rod pairs for $\frac{1}{4}$, students might—

- Start with the shortest rod (white), place four of them in a train, find the train is equal in length to a purple rod, and conclude that white is $\frac{1}{4}$ of purple.
- Move on to the next shortest rod (red), place four of them in a train, and find that red is $\frac{1}{4}$ of brown.
- And when they try to repeat the process for the next shortest rod (light green), they discover that the four-rod train is longer than an orange rod, so they look no further.

Students who use this approach recognize that the denominator of the fraction indicates how many of the shorter rod to put down—that is, the number of equal-sized parts needed to make the whole.

Extend

Have students list some real-life examples of fractions. Then have students think about the following question: *Does $\frac{1}{2}$ mean the same thing in all real-life examples?* Have students prepare visual presentations to support their answers.

Students might report the following:

- Each example is about a different thing; $\frac{1}{2}$ means different things in different examples.
- The whole can be a different size in each example, so in different examples $\frac{1}{2}$ can be different amounts.
- $\frac{1}{2}$ means the same thing no matter what the example is, because $\frac{1}{2}$ is just a number. It is just a position on a number line.

Look for presentations from students that involve showing that a fraction $\frac{1}{b}$ is the quantity formed by one part when a whole is partitioned into b equal parts.