Fractions

Objective: Investigate fraction relationships.

Materials: Cuisenaire rods
Activity Sheets
Centimeter grid paper
Markers

Procedures:

1. Give participants time to explore the Cuisenaire rods before beginning this activity.

2. Have participants set out the dark green rod. This will represent the whole. Use of the term **WHOLE** is preferred since one is often confused with the 1 in $\frac{1}{2}$ or $\frac{1}{4}$.

3. Find a rod that is $\frac{1}{2}$ of the whole (the light green rod). Explain why this rod is $\frac{1}{2}$ of the whole.

4. Find $\frac{1}{3}$ of the whole (the red rod). Explain why the red rod is $\frac{1}{3}$ of the whole.

5. In this initial stage you should only ask children to find unit fractions, and as the appropriate rods are found have the children explain why their rod represents the requested fraction.

6. Two points should be stressed during this activity:
   a. The correct number of pieces have to make up the whole.
   b. Those pieces must all be the same size (same color trains).

7. You should also give examples where the participants match a brown whole with a red rod and two light green rods laid end to end, and discuss why these do not represent thirds even though you have three parts to make a whole.

8. Use a brown whole with two purple rods and discuss the fact that even though they are the same size as the whole, they are not thirds since the whole does not have three parts even though the parts are equal in size.

9. Have participants put all rods aside and pick another color to represent the whole. Repeat this activity several times with different colored rods to represent the whole. Students do not need to know the relative length of the rods; however, the teacher must so that the children will not be asked to find fractional parts of rods that are not available.

10. Once the concept of unit fractions is well established, participants can begin to count by unit fractions.

11. Take out the dark green rod as the whole. Find the rod that is $\frac{1}{3}$ of the whole (red).

12. Take out the rest of the red rods. If one red rod equals $\frac{1}{3}$, what would we call two red rods? $\frac{2}{3}$ Place the second red rod end to end with the red rod and name it $\frac{2}{3}$. Continue placing red rods end to end and count by thirds.

13. Be sure to go beyond 1 to at least 2 wholes or more. Each time you reach a unit, be sure to point out that this is another way of saying a whole. For example, $\frac{3}{3}$ is one whole, $\frac{6}{3}$ is two wholes, etc. The concept of mixed fractions can also be introduced at this point.

14. After counting by thirds, at least through $\frac{8}{3}$, go back and discuss a new way to name fractions such as $\frac{4}{3}$ ($1\frac{1}{3}$) and validate that response using the rods.

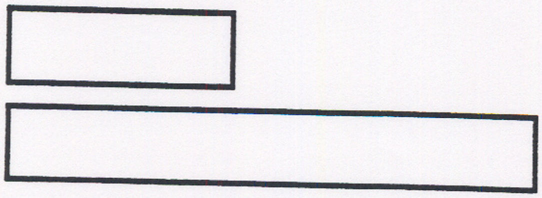
15. Continue counting with the rods using the new name for the rods ($\frac{1}{3}$, $\frac{2}{3}$, 1, $1\frac{1}{3}$, $1\frac{2}{3}$, etc.) From here on, be sure to use both types of names for counting rods. Repeat this exercise using different rods as the whole and different fractional parts.

16. Up to this point symbols have not been used to represent the fractions. The concept of a fraction should be developed and the students should be able to use the correct oral language for the concept before they worry about the written concept. After the previous activities have been mastered orally using many different rods, it is time to connect the usual fraction notations to these concepts.

17. Repeat the previous activities but write the fraction being used on the overhead as you say is aloud. Bring up at this point the terms **numerator and denominator**. It should be obvious that the numerator tells how many unit fractions you have and the denominator names what kind of unit fractions you have. Using the same rod as a whole, count and write several sequences which will help to cement the concept of numerator and denominator.

18. Write the fraction $\frac{7}{3}$ on the overhead and name the blue rod as a whole.

19. Have the participants find the appropriate rod for $\frac{1}{3}$ and count to $\frac{7}{3}$ using unit fractions without saying the name $\frac{7}{3}$ aloud. This reinforces the connection between the written fraction and the concrete representation. At this time the pictorial representation should be demonstrated by the trainers using a piece of centimeter graph paper to represent the fraction $\frac{7}{3}$ by coloring 3 squares light green then coloring 7 squares directly below.



20. At this point, additional practice will be needed and can be provided by using Identify and Count With Unit Fractions Activity Sheet. Participants will be asked to complete the activity and show the pictorial representation using graph paper and markers.

Extensions:

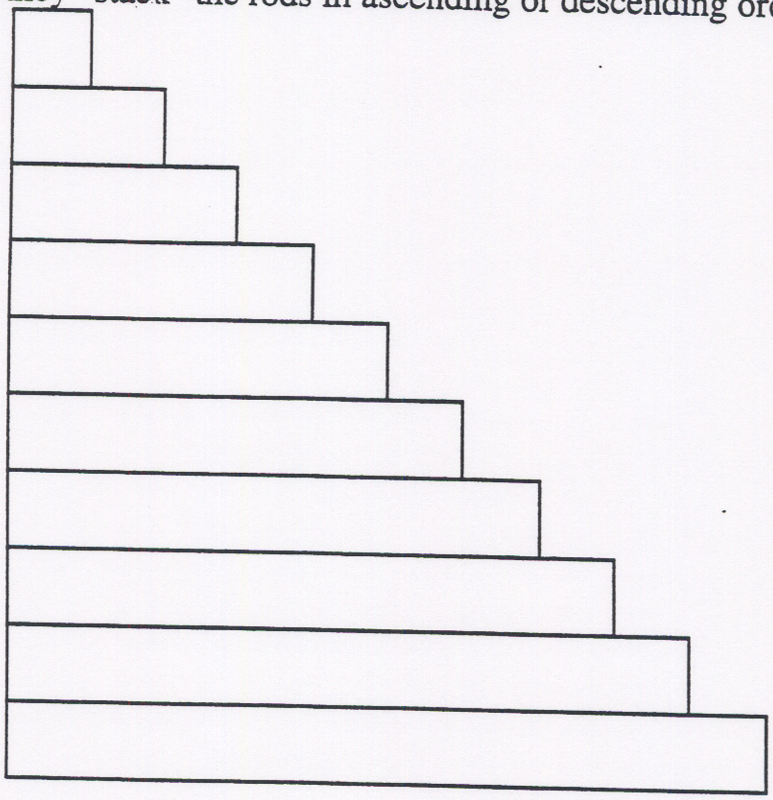
1. Use pattern blocks to explore fractions.

2. Investigate equivalent fractions.

Notes:

1. This activity was developed by Jon Van de Walle and Charles S. Thompson and published in the December 1984 issue of The Arithmetic Teacher (Let's Do Fractions with Fraction Strips).

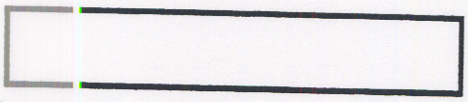
2. While participants are exploring the Cuisinaire rods, circulate to observe what they are doing. They are ready to investigate fraction relationships when they "stack" the rods in ascending or descending order.



3. It is easy to get into trouble with Cuisinaire rods if you ask for fractional parts that can not be represented with a particular rod. Plan carefully.

4. Students who are color blind may have trouble correctly naming the rod colors. Give them centimeter grid paper on card stock and have them cut out the different rod lengths and write the color on them.

Identify and Count With Unit Fractions

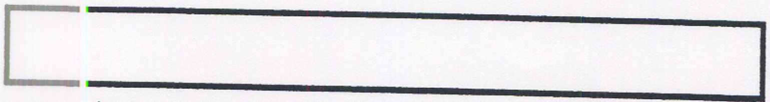
If  is one whole, make all possible one color trains.

If $\frac{1}{3}$ is the __________ rod, then it takes __________ to make $\frac{2}{3}$.
(color) (how many)

If $\frac{1}{3}$ is the __________ rod, then it takes __________ to make $\frac{5}{3}$.
(color) (how many)

If $\frac{1}{2}$ is the __________ rod, then it takes __________ to make $\frac{3}{2}$.
(color) (how many)

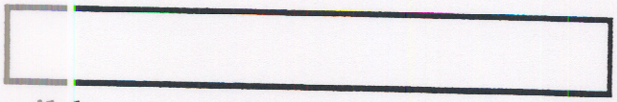
If $\frac{1}{6}$ is the __________ rod, then it takes __________ to make $\frac{5}{6}$.
(color) (how many)

If  is one whole, make all possible one color trains.

If $\frac{1}{5}$ is the ________ rod, then it takes ________ to make $\frac{4}{5}$.
(color) (how many)

If $\frac{1}{2}$ is the ________ rod, then it takes ________ to make $\frac{3}{2}$.
(color) (how many)

If $\frac{1}{10}$ is the ________ rod, then it takes ________ to make $\frac{7}{10}$.
(color) (how many)

If  is one whole, then make all possible one color trains.

If $\frac{1}{4}$ is the __________ rod, then it takes __________ to make $\frac{3}{4}$.
(color) (how many)

If $\frac{1}{2}$ is the __________ rod, then it takes __________ to make $\frac{5}{2}$.
(color) (how many)

If $\frac{1}{8}$ is the __________ rod, then it takes __________ to make $\frac{7}{8}$.
(color) (how many)

Identify and Count With Unit Fractions

If ________________________ is one whole, make all possible one color trains.

If $\frac{1}{3}$ is the ______________ strip, then it takes __________ to make $\frac{2}{3}$.
(color) (how many)

If $\frac{1}{3}$ is the ______________ strip, then it takes __________ to make $\frac{5}{3}$.
(color) (how many)

If $\frac{1}{2}$ is the ______________ strip, then it takes __________ to make $\frac{3}{2}$.
(color) (how many)

If $\frac{1}{6}$ is the ______________ strip, then it takes __________ to make $\frac{5}{6}$.
(color) (how many)

If ________________________________ is one whole, make all possible one color trains.

If $\frac{1}{5}$ is the __________ strip, then it takes __________ to make $\frac{4}{5}$.
(color) (how many)

If $\frac{1}{2}$ is the __________ strip, then it takes __________ to make $\frac{3}{2}$.
(color) (how many)

If $\frac{1}{10}$ is the __________ strip, then it takes __________ to make $\frac{7}{10}$.
(color) (how many)

If ____________________________ is one whole, then make all possible one color trains.

If $\frac{1}{4}$ is the ______________ strip,then it takes __________to make $\frac{3}{4}$.
(color) (how many)

If $\frac{1}{2}$ is the ______________ strip, then it takes __________to make $\frac{5}{2}$.
(color) (how many)

If $\frac{1}{8}$ is the ______________ strip, then it takes __________to make $\frac{7}{8}$.
(color) (how many)