

18. RECIPROCAL

Materials:

- Paper and pencil
- Fraction Box
- Cardboard arrow
- Reciprocal

Presentation:

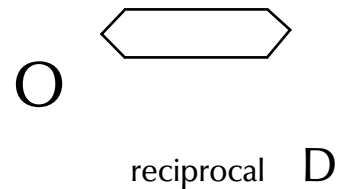
1. Take out three circles from the fraction box. What are these? Three whole numbers. Can I write this as a fraction?

Yes: $\frac{3}{1}$ ○ ○ ○

2. Can we write any whole number as a fraction? Yes. Discuss with students.
3. Place the cardboard arrow on the floor.

4. Take out 2 whole circles and one half.

Arrange them as shown.



Two is the reciprocal of one half.



One half is the reciprocal of 2.

5. Write labels: $\frac{2}{1}$ is the reciprocal of $\frac{1}{2}$
6. Continue with other whole numbers from 4 through 10, with the student writing statements in his/her notebook.
7. Put out $\frac{2}{3}$ on one side of the arrow and $\frac{3}{2}$ on the other side of the arrow. These fractions are reciprocals of each other.

The student writes a statement in his/her notebook.

8. Give the student one fraction and ask for its reciprocal.
9. After much practice, demonstrate multiplication of reciprocals, factor out, and multiply.

$$\frac{\cancel{2}}{1} \times \frac{1}{\cancel{2}} = \frac{1}{1} = 1$$

$$\frac{\cancel{3}}{1} \times \frac{1}{\cancel{3}} = \frac{1}{1} = 1$$

Continue with other equations until the student comes to the rule.

Rule: When reciprocals are multiplied, the product is always one whole.

19. DIVIDING A WHOLE NUMBER BY A FRACTION

Materials:

- Skittles from the Stamp Game
- Unit Beads
- Special Fraction Skittles
- Fraction Box
- Pencil and paper

Presentation:

1. Review division by a whole number with the skittles and golden beads:

$$6 \div 3 = 2$$

The answer is what one unit gets.

2. Continue: $2 \div 2 = 1$; $2 \div 1 = 2$.
3. $2 \div 1/2 = ?$

Use the special fraction skittle for $1/2$, but use only one skittle at first; hide the other. "The half skittle gets 2." Bring out the other half. The other half skittle should get 2. "If one half skittle gets 2, then ONE WHOLE skittle would get 4.

The answer is what ONE WHOLE skittle gets." Put the two together.

Do the same with fraction skittles in the fourths family.

4. Let's look at division by a fraction in another way, with the fraction pieces.

- a. The equation: $2 \div 1/2 = ?$

Place two whole circles. We want to divide the circles by a fraction with a denominator in the half family. Exchange each whole for two half circles. Then count how many one half circles there are. How many halves are there in 2?

There are four halves and that is our answer.

b. Another equation: $2 \div \frac{2}{3} = ?$

How many two thirds are there in 2? Place two whole circles. We want to divide the circles by a fraction with a denominator of 3. So exchange each of the whole circles for three thirds. Then count how many sets of two thirds there are in the two circles of three thirds. The answer is 3.

20. DIVIDING A FRACTION BY A FRACTION

Materials:

- Fraction Box
- Pencil and paper

Presentation: Distributive Division and Group Division

1. $2/3 \div 2/9 =$
2. There are no skittles for the ninths. Make ninths from paper. Place the two paper skittles on the rug. Take two thirds in fraction pieces. Distribute the two thirds between the two ninths. But the answer in a division problem is what ONE WHOLE skittle gets.

Bring out seven other paper skittles to make ONE WHOLE. Place them next to the two paper skittles already on the rug. Get out one third to go with each of the additional paper skittles. In all there are nine thirds, or three. One whole skittles gets three.

Presentation: Division of a fraction by a fraction in another way.

1. $2/3 \div 2/9 =$
2. Place two thirds in fraction pieces on the rug. Divide them by a fraction whose denominator is ninths. Get out a set of two ninths. Place it on top of the two thirds. Get out another set of two ninths and place it on top of the two thirds, next to the first set. Get out one more set of two ninths and fit it in. Show that there are three sets of two ninths in two thirds. Three is the answer.