

Before we begin, make the pieces to play some fraction games:

You need for each player, squares the same size in 4 colors, and a plastic bag or envelope to hold the pieces. For today's workshop, take one of each color.

1. Leave the white square alone. It is one whole.
2. Fold and neatly tear the green, blue, and pink squares in half, down the middle.
3. Fold & tear your blue rectangles in half to make four small blue squares.
4. Same with your green. Then fold and tear again to make eighths.

At home, you can use any black or white for the whole squares, and three or four other colors. Just make sure everyone's halves are the same color, and everyone's quarters, and eighths. At home, you can use a fourth color and make sixteenths, too.

Activity 1: Naming and showing

Each time you build a fraction, build it on the whole white square, to see what's missing. Don't let the smaller squares overlap, and don't build down the middle. To show $\frac{1}{2}$, for instance, put the pink rectangle to cover up the left, right, top, or bottom half of the white square. E.g. If I say, if I say, "Show me $\frac{3}{4}$," it should look like this, with all the white space together.



Begin with teaching the names and showing why the fourths are called fourths, eighths are called eighths, etc. Explain how in English $\frac{1}{2}$ is not called one-tooth. showing $\frac{1}{2}$, $\frac{2}{2}$, $\frac{1}{4}$, $\frac{2}{4}$, and $\frac{3}{4}$ and asking the student to name the quantity.

(I apologize here for letting Microsoft Word do what we should never do: write fractions different formats. E.g. Microsoft is converting $\frac{1}{2}$ to $\frac{1}{2}$.)

Then have the student show quantities you name. To get relationships clear, ask them sequences like this: "Show me $\frac{1}{4}$ Good. If that's $\frac{1}{4}$, show me $\frac{3}{4}$ Good. If that's $\frac{3}{4}$, show me $\frac{3}{8}$ Good. ..." and so on.

Activity 2: Building a Whole

Activity 3: Showing Equivalences

Ask the students to show you $\frac{1}{2}$. Then ask "How many fourths are equal to $\frac{1}{2}$? How many fourths cover up $\frac{1}{2}$?... Yes, $\frac{2}{4}$ is equal to $\frac{1}{2}$. So we say this fractions are equivalent."

Remember, a basic principle of multisensory math is to "Build it, Draw it, Write it." So have them sketch, like my drawing above, both the fractions and the equivalences, then write the expressions.

Activity 4: Showing addition of fractions

Activity 1 from Marilyn Zecher of the Atlantic Seaboard Dyslexia Education Center, Multisensory Math workshop presented to GiftsNVA homeschool group. Activity 2 from Andrea Prejean, of American University, "Decimals, Fractions, Decimals, Percents & Word Problems Workshop," presented at the Lab School of Washington workshop, Feb. 3, 2000. All other activities

Let the student first build addition problems with a common denominator. Practice aloud, and draw and write.

When you are read to teach addition of fractions with unlike denominators, like $1/4 + 1/8$, begin by showing many different examples of 2 pieces different sizes to show that adding two pieces of different sizes is tricky: e.g. $1/2$ cake plus $1/2$ of a cake is two pieces, but $1/8 + 1/8$ is also two pieces. Review the meaning of denominator (how many equal pieces there are in one whole.) Build, draw, and write to explain the concepts in your math book, so the student sees why we need a common denominator.

Then say “Show me $1/4 + 1/8$ Do we have $2/4$? ... No, not quite. Hard to add these pieces because they are not the same size. [pause to let them think.] What if we could change that $1/4$ into eighths? How many eighths would it be? Build that.... Yes, $1/4 = 2/8$, so now we have $2/8 + 1/8$. Are the pieces the same size? ... Yes. So we can add them. What’s the sum of $2/8$ and $1/8$?... Good.” Do this many times with different problems. Reinforce this by doing it with fraction circles and round stickers that you’ve precut into halves, quarters, eighths, and later thirds and sixths.

Activity 5: Showing multiplication of fractions

First, review the meaning of multiplication, repeated addition. Practice with blocks, beans, or anything. Show me 6 three times... $6 \times 3 = 18$. Show me 2 four times. $2 \times 4 = 8$.” Etc.

Next with the fraction squares: “Please show me $1/4$ three times. What is $1/4 \times 3$? [Pause] Good. Now show me $1/4$ two times... What is $1/4 \times 2$? [Pause] Good. Now show me $1/4$ one time. What is $1/4 \times 1$? ... [Pause] Good. Now show me $1/4$ half a time? What is half of $1/4$? $1/4 \times 1/2$ is ? Yes, $1/8$.” Practice with others, like $1/2 \times 1/4$?

Then you can go on to $1/2 \times 1/2$ (one half time), $1/4 \times 1/2$, etc.

Then try $3/4 \times 1/2$ by asking, “Show me $3/4$ one time. Show me $3/4$ half a time. I mean, show me half of $3/4$?” Discuss as if dividing those 3 fourths between you and the student: “You get one, I get one. But what about the third one? How can we divide it between us? What’s equivalent to $1/4$? Yes $2/8$. We each get an $1/8$”

Never assign a problem you haven’t tried out ahead of time with the squares. Always practice building these problems yourself first.

Activity 6: Showing division of fractions

Try problems like this: “Show me $3/4$ Good. Can you divide three ways? Good.”

Draw and write $3/4 \div 3 = 1/4$. Then try others, dividing $1/2$ by 4, $1/4$ by 2, etc.

After many problems dividing a fraction by a whole number, you can have them prove by building that $3/4 \div 3 = 3/4 * 1/3$. Use lots of examples and practice building to build this concept: make, draw, and write.

Then to show dividing a fraction by a fraction, take your time. This confuses some kids, because until we divide fractions, dividing always gave us an answer (quotient) that was larger than the number we started with (dividend), e.g. $12 \div 3 = 4$.

So why does dividing a fraction by a fraction give us a larger quotient? Build it and see:

Review the meaning of division: dividing by 3 can mean dividing into 3 groups, but it can also mean dividing into groups of 3. Practice this with bean or counters.