Ban: Keep, Change, Flip

ALTERNATIVES TO TEACHING DIVISION WITH FRACTIONS

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Why? It works, right?

- Ask the student WHY they are able to flip. They don't know.
- Most students want to flip all fractions, even when adding or using proportions!
- They flip addition and subtraction!

- **Bottom line, "Don't ask why! Just flip and multiply" is meaningless to students.**

Option 1: Common Denominators

- Build on prior knowledge.
- Common denominators and elementary division concepts.
  - How many groups of $\frac{1}{4}$ can you get from $\frac{1}{2}$?
  - If you have $\frac{1}{2}$ and you split it into 2 equal groups, how much is in each group?

Example 1: $\frac{1}{2} \div \frac{1}{4}$

If we use elementary ideas, we would ask our students "how many one-fourths are in one-half." How do you know?

The students' explanation will reveal that the students split one-half into fourths, thereby creating common denominators.

$$\frac{1}{2} \div \frac{1}{4} = \frac{2}{4} \div \frac{1}{4} = 2$$

Example: $3 \div \frac{1}{3}$

When I present this problem to my students, I ask them how many thirds are in 1 whole?

Then, I ask them, how many thirds are in 2 wholes?

Finally, how many thirds are in 3 wholes?

They are drawing the images, breaking the wholes into pieces with denominators that are the same!

Example: $3 \div \frac{3}{4}$

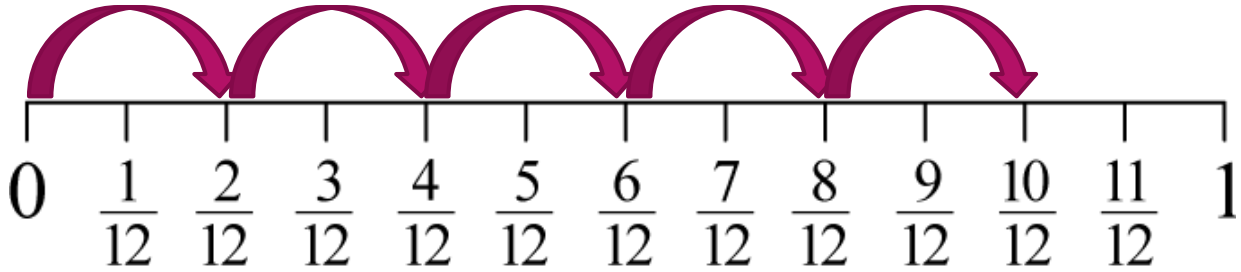
The question I pose to my students is "How many three-fourths can be cut from 3 wholes?"

The students want to split the 3 wholes into fourths creating $\frac{12}{4} \div \frac{3}{4}$

Example

How many groups of $\frac{2}{12}$ can be made from $\frac{10}{12}$?

$\frac{10}{12} \div \frac{2}{12} = \frac{5}{1} = 5$



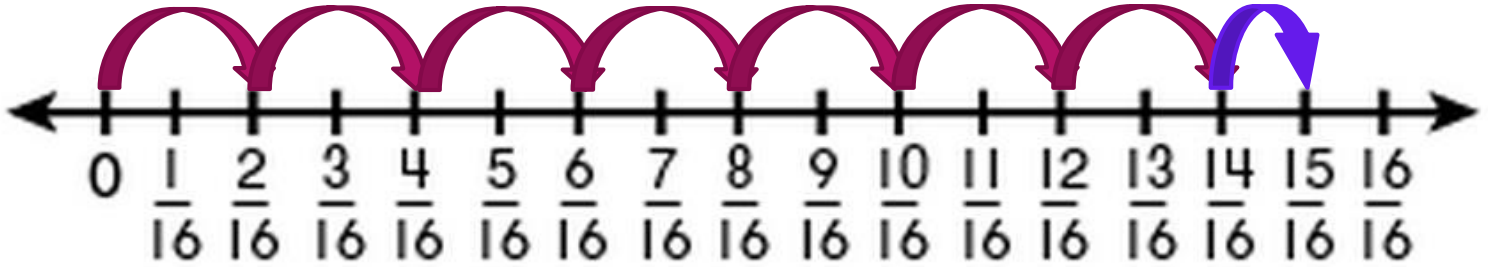
5 whole groups can be made

What if it doesn't come out even?

Once the students "get the hang" of making groups, I throw this at them:

$\frac{15}{16} \div \frac{2}{16}$ $\frac{15}{2} = 7\frac{1}{2}$ **The students WILL say that it is a half of a group!**

How many groups of two-sixteenths can we cut from fifteen-sixteenths?



What do we notice?

- By creating common denominators, the students use prior knowledge from adding/subtracting fractions and what they know about division, or making groups of things.
- Using the common denominator method also enables students who are struggling with abstract concepts to use models and concrete pictorial representations that make sense to them.
- You can *lead* them to the multiplicative inverse, but what good is it doing for the student to memorize yet another strategy?
- What about the denominator? Isn't it 1??

Option 2: Ratio Tables

- Ratio tables reinforce proportionality, and let's face it, they can use the practice!
- Reinforce multiplication of fractions: use models or drawings.

$\frac{1}{2}$	1	2			
$\frac{1}{4}$	$\frac{2}{4} = \frac{1}{2}$	1			

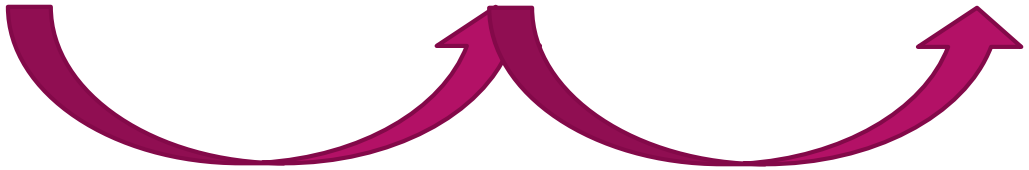
We're aiming for a 1 on the bottom because that is a unit rate, and relates directly to the common denominator strategy.

Let's double here.

Let's double again.

Remember $3 \div \frac{1}{3}$

3	6	9	
$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3} = 1$	



Double. Triple.

Here's another example:

3	6	12	4		
$\frac{3}{4}$	$\frac{6}{4} = 1\frac{1}{2}$	3	1		

What about mixed numbers?

$1\frac{1}{2}$	$\frac{3}{2}$	$\frac{6}{2} = 3$	6	$\frac{6}{17}$	
$4\frac{1}{4}$	$\frac{17}{4}$	$\frac{34}{4}$	$\frac{68}{4} = 17$	1	

$$\frac{3}{2} \div \frac{17}{4} = \frac{3}{2} \cdot \frac{4}{17} = \frac{12}{34} = \frac{6}{17}$$

Let's try one more…

$\frac{5}{6}$	$\frac{10}{6}$	$\frac{30}{6} = 5$	$\frac{5}{4} = 1\frac{1}{4}$			
$\frac{2}{3}$	$\frac{4}{3}$	$\frac{12}{3} = 4$	1			

How can we get to a 1?

What do we notice?

- Students become more flexible with number relationships.
- Students can transfer knowledge.
  - The ratio table strategy is used with percents of numbers, tax, tip, mark-up, etc.
- Students build a strong foundation, and/or reinforces, fraction number sense.

Thank You

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