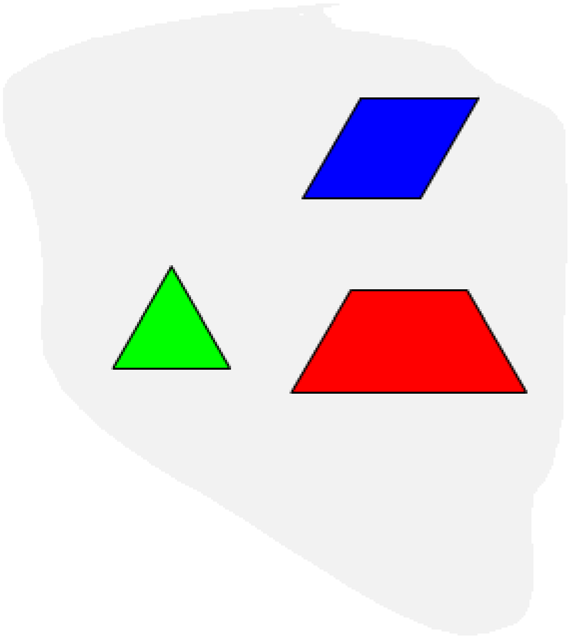
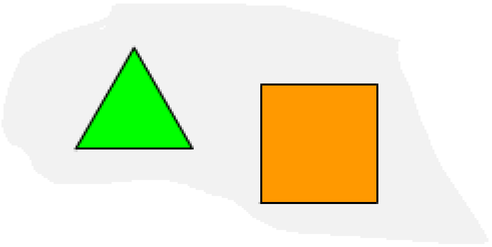
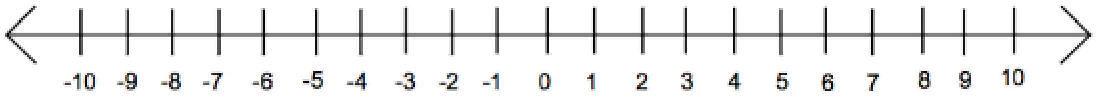


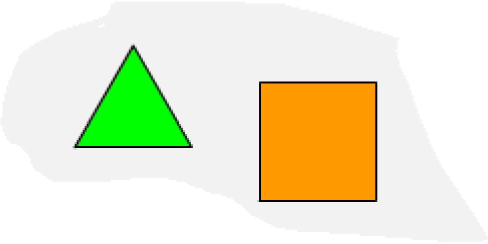


I Fall To Pieces

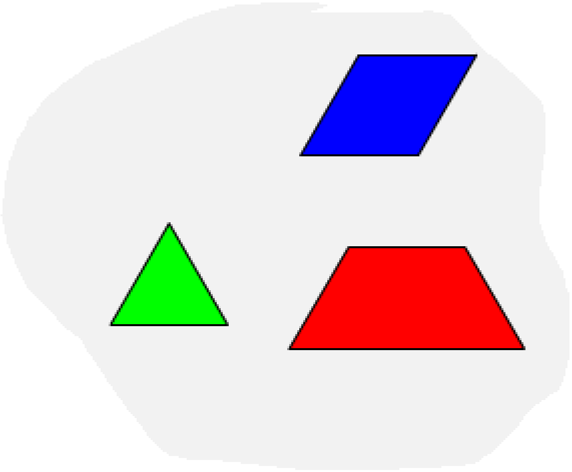
Staying Rational Dealing With Fraction Models

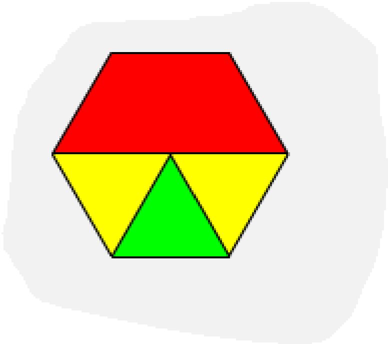


What's up with all the fraction models?



- Models build conceptual understanding.
- Models create a cognitive connection…just in case one cannot recall the algorithm
- Computation without connections works with the "good memorizers."

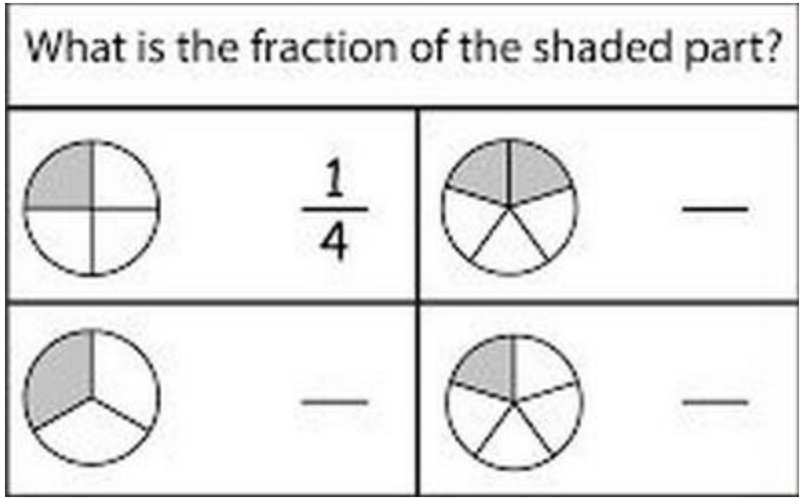


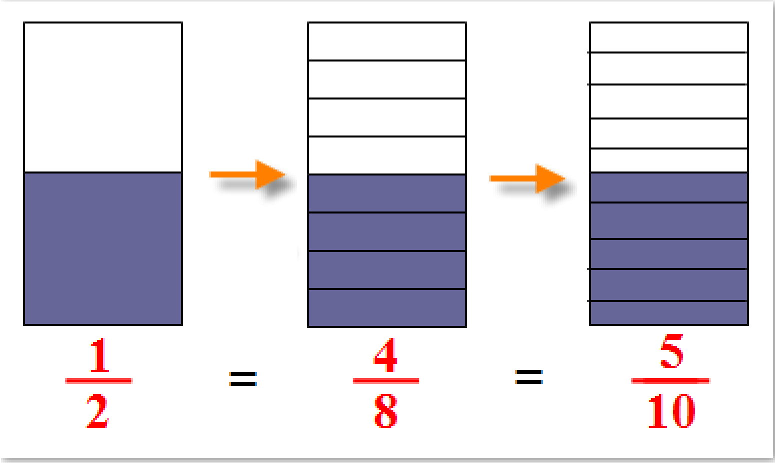


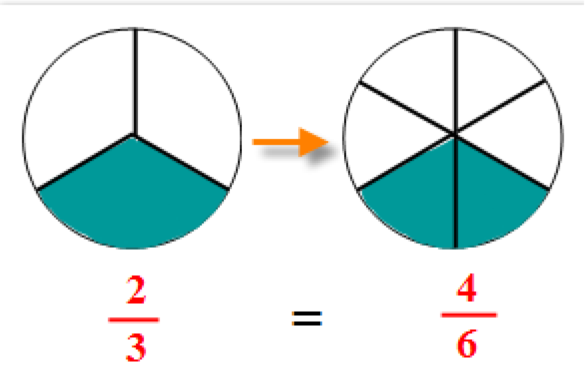
It's easy in the beginning with part-whole….

And we show equivalence…

The part-whole relationship is easily illustrated.

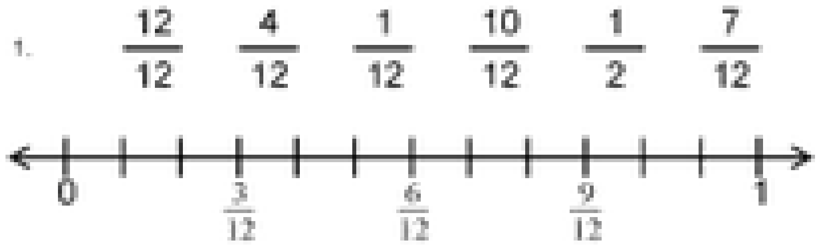






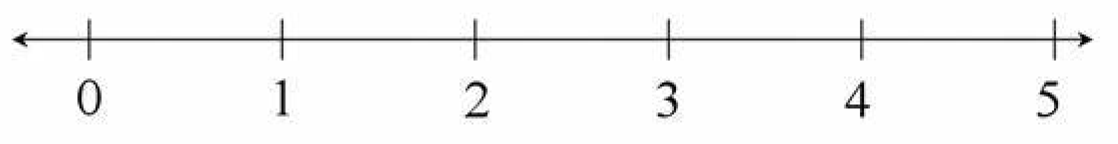
Fraction as a number? Not so much, but we're getting better….

Number lines illustrate a fraction as a numerical value…

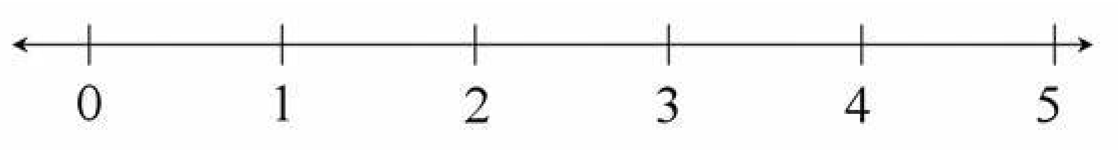


...and that there can be fractions larger than one!

a. Mark and label points on the number line for $\frac{1}{2}$, $\frac{2}{2}$, $\frac{3}{2}$, $\frac{4}{2}$, $\frac{5}{2}$, and $\frac{6}{2}$.



b. Mark and label a point on the number line for $\frac{11}{3}$. Be as exact as possible.



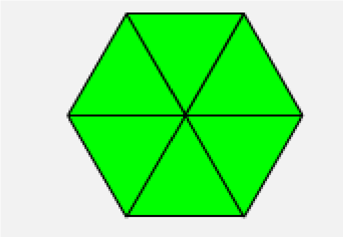
Source: illustrativemathematics.org

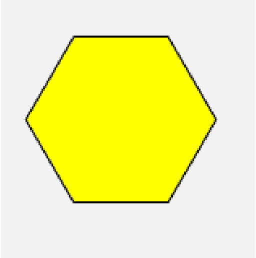
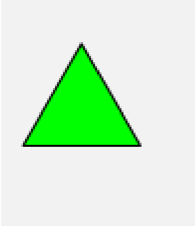
(and that equivalent fractions can have more than one name)

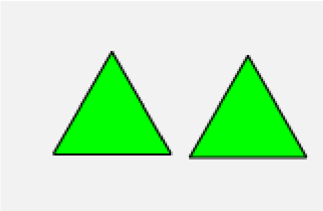
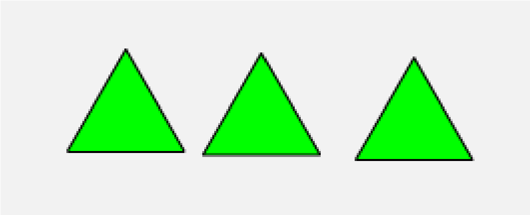
Now to the operations……

Manipulatives are not new when teaching fractions

For example, find the sum of $\frac{2}{6}$ and $\frac{3}{6}$

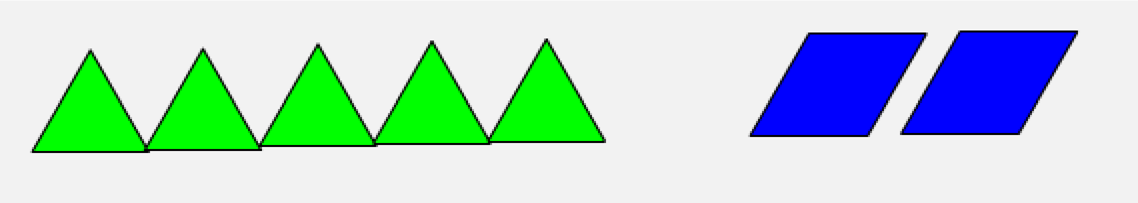


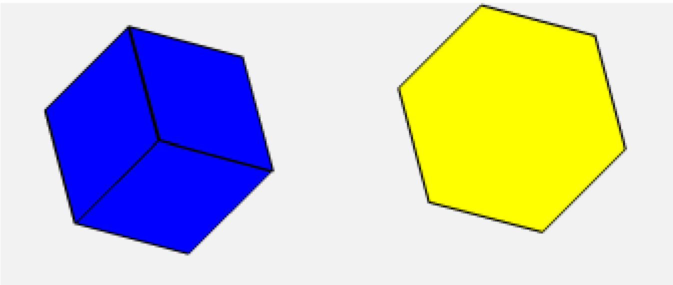
If  =1, then:  $=\frac{1}{6}$

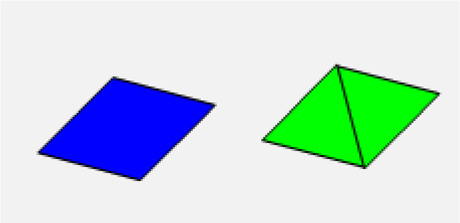
So  Added to  Gives us $\frac{5}{6}$

And if denominators are different….

$$\frac{5}{6} - \frac{2}{3}$$







Number Lines?

$\frac{2}{6}+\frac{3}{6}$

$\frac{5}{6}-\frac{2}{3}$

$\frac{5}{6}+\frac{7}{6}$

Adding Pieces and Parts…

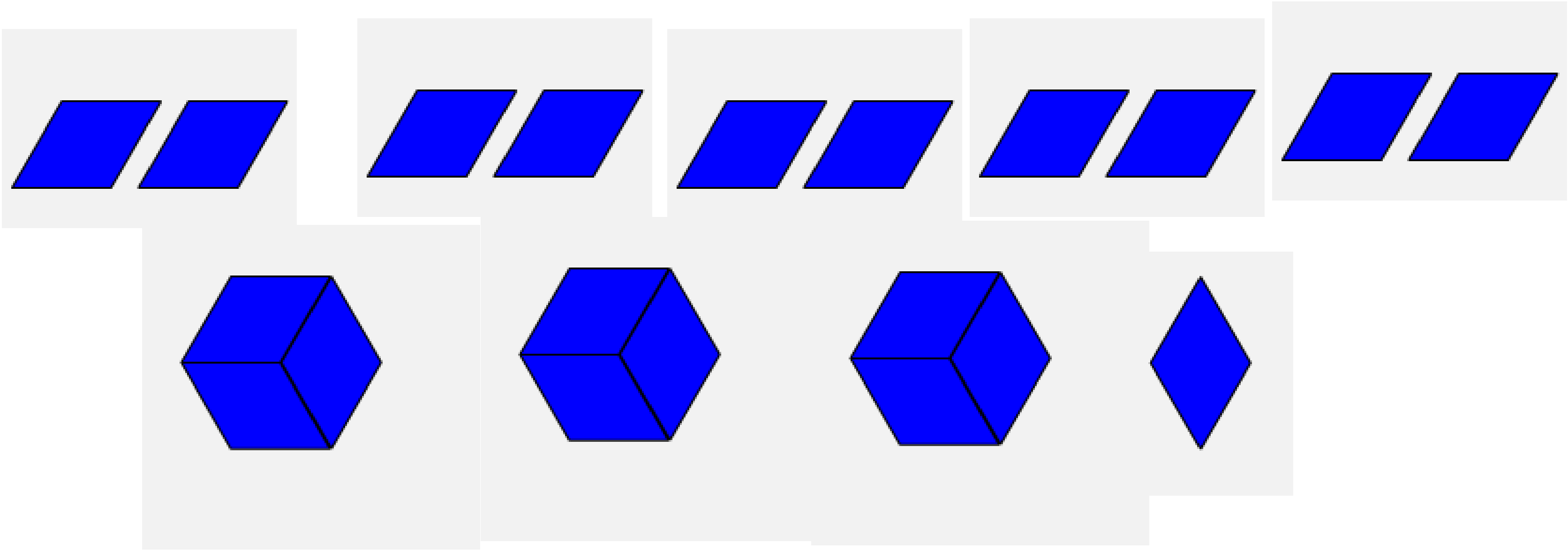
- Develop the concept with manipulatives
- Illustrate “fraction as a number,” using number lines
- Move to the algorithm…why?...because it’s efficient and works well for all numbers, not just the pretty ones
- Beware of tricks that get the answer. How we get the answer DOES matter. If you can’t explain the math behind the procedure, it’s best not to use that procedure.

Multiplication and Division

Multiplication begins by multiplication of a fraction by a whole number.

$$\frac{2}{3} \times 5$$

5 groups of $\boldsymbol{\frac{2}{3}}$

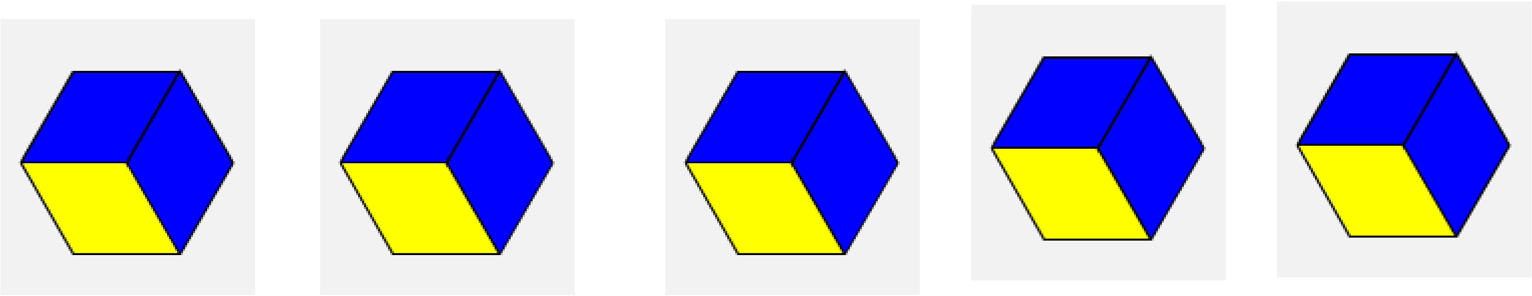


Multiplication on a number line…

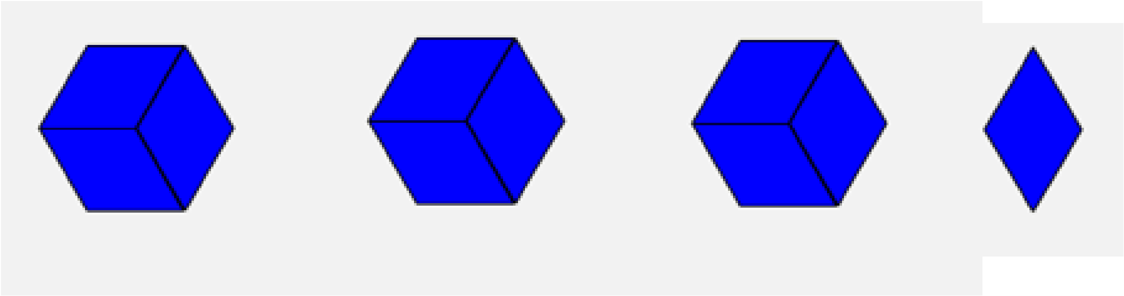
$$\frac{2}{3} \times 5$$

On the other hand…

$5 \times \frac{2}{3}$ Means if you have 5 wholes, what is $\frac{2}{3}$ of that amount?



Count the blue parallelograms, and you will see that there are 10 of them, resulting in $\frac{10}{3}$

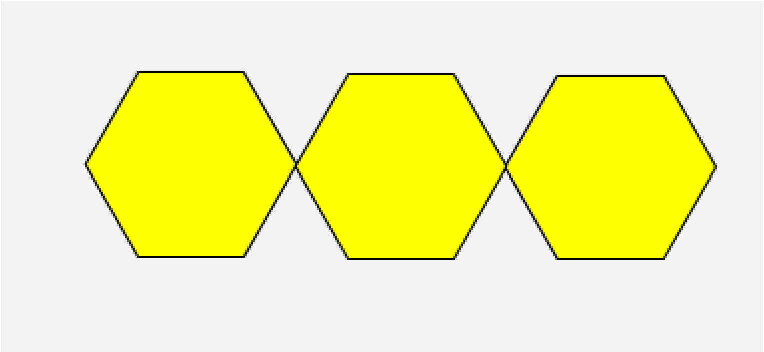


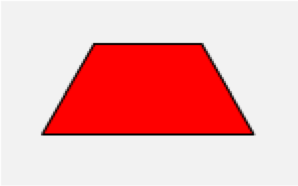
While $5 \times \frac{2}{3}$ can be illustrated on a number line, it is more useful for showing reasonableness of an answer after learning the traditional algorithm.

Division of fractions and whole numbers… Whole number divided by a fraction

- $3 \div \frac{1}{2}$

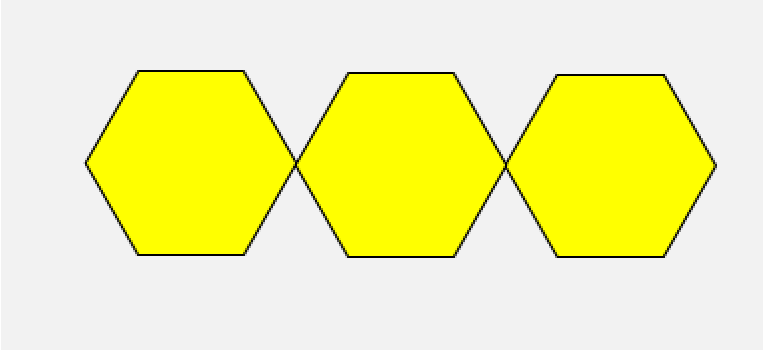
How many one-halves are there in 3?

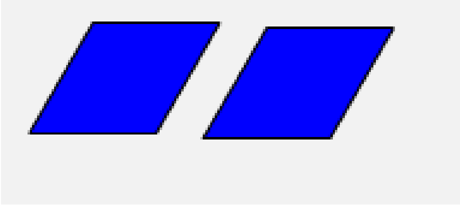




$3 \div \frac{2}{3}$

How many two-thirds are there in 3?





Bar Models are also effective in illustrating…

- $3 \div \frac{1}{2}$ How many one-halves are there in 3?

$3 \div \frac{2}{3}$ How many two-thirds are there in 3?

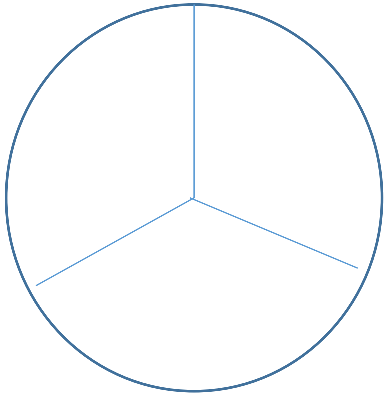
Number lines can also work, but choose units carefully.
Essentially, bar models work similarly to number lines.

Division of fractions…fraction divided by a whole number.

$$\frac{1}{2} \div 3$$

How many threes are there in one-half?

After a party, there were two-thirds of a pizza left over. This pizza was to be shared equally between 4 kids. What fraction of a pizza did each child receive?



$$\frac{2}{3} \div 4$$

Take the 2/3 of the pizza that remains into 4 equal parts. Each of those parts is what fraction of a whole pizza?

A bar model would also work in this type of problem.

And to finish up 5th grade, let's multiply some fractions…area model works well…

$$\frac{2}{3} \times \frac{3}{4}$$

What is two-thirds of three fourths?

But so can a number line…

$$\frac{2}{3} \times \frac{3}{4}$$

What is two-thirds of three fourths?

And it works for fractions larger than one…

$$\frac{\mathbf{7}}{\mathbf{2}} \times \frac{\mathbf{2}}{\mathbf{5}}$$

And here's the number line…

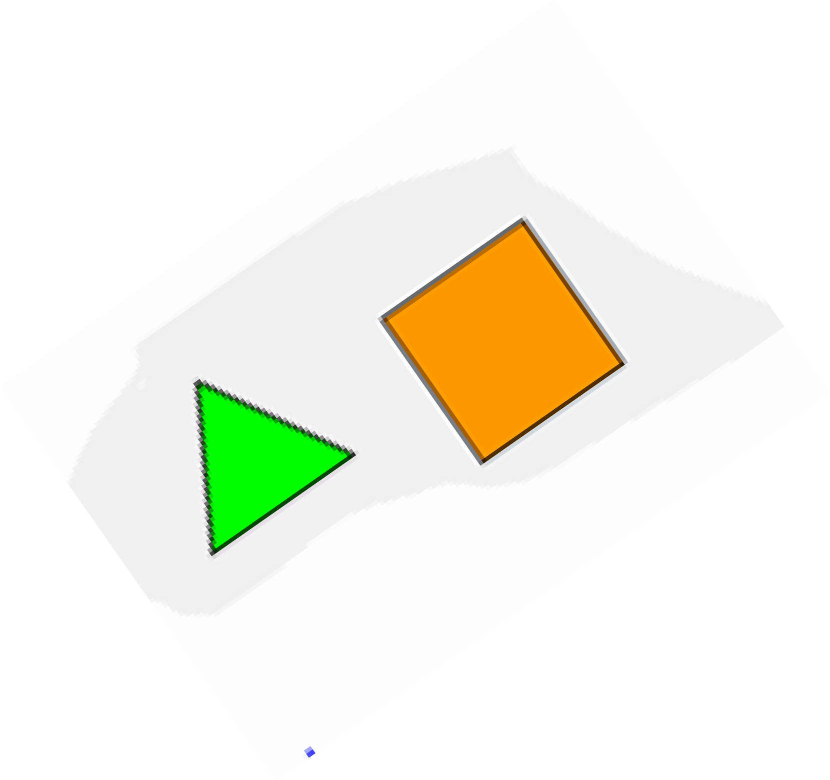
$$\frac{7}{2} \times \frac{2}{5}$$

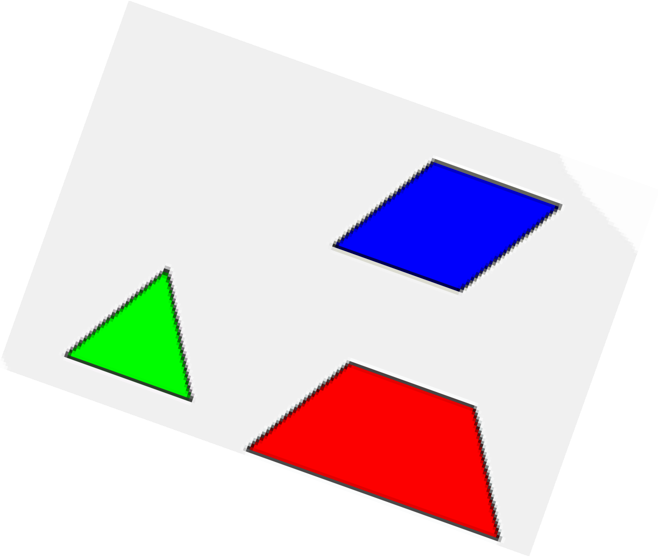
Can multiple models work for fractions?

- **Yes, most models will work for most operations, but not all are clear and simple to understand.**
- **The purpose of a model is to make a connection and to develop conceptual understanding**
- **If the model complicates, rather than assists, it is probably not an effective model.**
- **The ULTIMATE GOAL is *efficient computation*, most likely through the traditional algorithms that we know and love.**

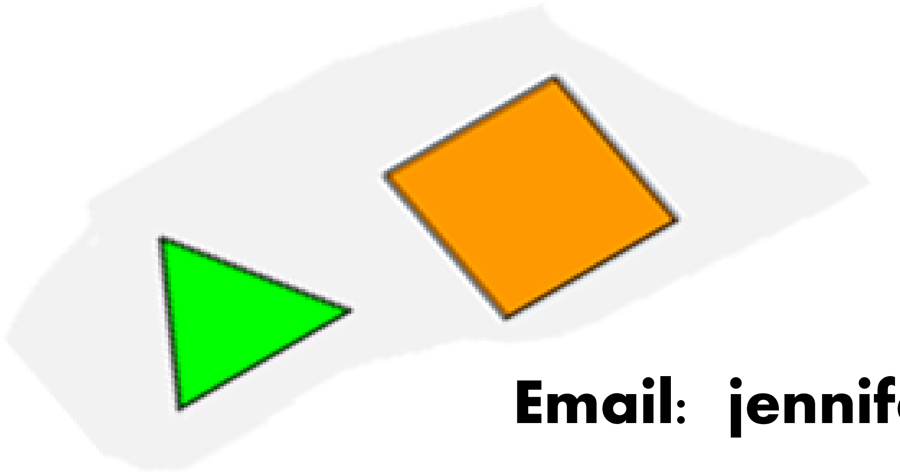
Stay Rational

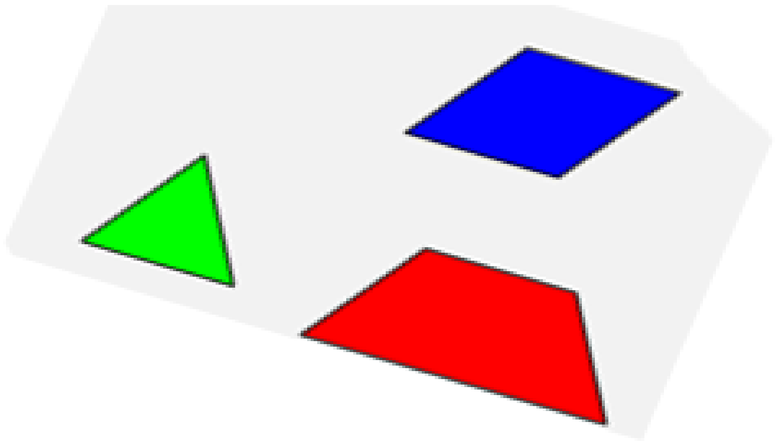
- Use modeling wisely, and our students will stop “falling to pieces” over fractions.





Information and References..





Email: jennifer.axley@blountk12.org

References:

- **Developing Essential Understanding of Rational Numbers Grades 3-5; Barnet-Clarke, Fisher, Marks, Ross; NCTM; 2010**
- **Uncomplicating FRACTIONS to Meet Common Core Standards in Math, K-7; Small; NCTM, Nelson Education; 2014**