A Union of Professionals
Common Core
State Standards

Dear Parents and Caregivers,

Thank you for the support you give to your child's learning. Earlier this year, you received a flyer from the PTA telling you about the Common Core State Standards which identify what students in each grade will learn. These standards are unlike any previous ones in that they have the energy of 46 states behind them and a nation striving to prepare our children for the jobs of the 21st century. The math standards are research-based and have the backing of educators and mathematicians. They purposely ask teachers to slow the pace of instruction on important math ideas so children have a better chance to learn them well.

During the year, we will be letting you know about a few major expectations in mathematics. We know that some things are quite different from how we were taught. These flyers are meant to help you recognize the strategies we will use to build understanding before they learn the common methods most adults learned in school. These strategies allow students to make sense of numbers along the way. They help develop the underlying mathematical ideas that the standards stress, in addition to arithmetic and problem solving. I welcome any questions you may have. This flyer addresses **fractions**, one of fifth grade's difficult math topics for many students.

Students will extend their knowledge of multiplication to multiply fractions (5.NF.4)

One of the difficulties students have with fractions is understanding that while numbers multiplied by a whole number have a larger result, numbers multiplied by a fraction have a smaller result. The key is to think about what the operation means and visualize what is happening, as well as to talk about it. For 3 x 4 we say three *groups of* four are 12 and we may illustrate with a drawing:

O O O O
O O O O 3 x 4 = 12
O O O O

For $\frac{1}{4}$ x 12, we use the same language and say one-fourth of a *group of* 12 is 3 (or, one-fourth *of* 12 is 3). How do we illustrate that? To think about $\frac{1}{4}$ we understand that the group of 12 is partitioned into four equal parts. We want to know how large one of those parts is. We will separate 12 into four equal rows.

O O O
O O O
O O O
O O O

$\frac{1}{4}$ of 12 = 3

$\frac{1}{4}$ x 12 = 3

The student can now ask, "How many are in each of the four equal rows?" Each row represents $\frac{1}{4}$ of the circles. We are developing meaning with visuals and language. It is important to see the connection between 3 groups of 4 and $\frac{1}{4}$ group of 12 and to see both as multiplication: 3 x 4 and $\frac{1}{4}$ x 12.

Students learned in whole number multiplication that $\frac{1}{4}$ x 12 = 12 x $\frac{1}{4}$. The answer is the same even if you switch the order of the numbers. Students may make sense of 12 x $\frac{1}{4}$ by reasoning that every four $\frac{1}{4}$s make one whole (1) and conclude there are three wholes. This reasoning shows a basic understanding of how fractions relate to a whole number. Multiplying a whole number and a fraction is the first step in multiplying with fractions.

Let's look now at a fraction multiplied by a fraction. The visualization and reasoning are more complex. Think about $\frac{1}{4}$ x $\frac{2}{3}$. Use sense-making language. With whole numbers we might say "4 groups *of* 3." Read this as one-fourth *of* two-thirds. This provides a clue that the answer will be less than $\frac{2}{3}$.

Modeling the multiplication

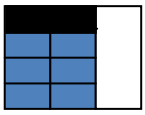
Step 1. Shade $\frac{2}{3}$.

$\frac{2}{3}$ shaded

Step 2. What is $\frac{1}{4}$ of the shaded area? Divide it into four equal parts or fourths.

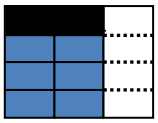
$\frac{2}{3}$ divided into fourths

Step 3. Shade one of the fourths.



$\frac{1}{4}$ of $\frac{2}{3}$ shaded

Step 4. Now, what part of the *whole figure* did we mark as $\frac{1}{4}$ of $\frac{2}{3}$? To find out, partition the *whole* figure into equal units. We extend the lines we used to show fourths. Now there are 12 equal parts. We figured out that $\frac{1}{4}$ of $\frac{2}{3}$ is 2 of 12 parts. (This lays the foundation for why we need a common denominator.)



$\frac{1}{4}$ x $\frac{2}{3}$ = $\frac{2}{12}$ This may also be written as the equivalent fraction $\frac{1}{6}$.

Ask your child whether he or she can show you the other $\frac{10}{12}$ or $\frac{5}{6}$. For $\frac{10}{12}$ each box is counted. For $\frac{5}{6}$ each one-sixth is equal to two boxes.

Interpret division of a whole number by a unit fraction, and compute such quotients.(5.NF.7b)

The standards ask for only the first step in understanding division of fractions in fifth grade. This involves a whole number and a fraction, not two fractions. How will your students be asked to think about this so it makes sense?

Once again, we ask them to connect to what they know about whole number division. They learn that when we divide 24 by 6 we may be asking how many groups of 6 are there in 24? Students can:

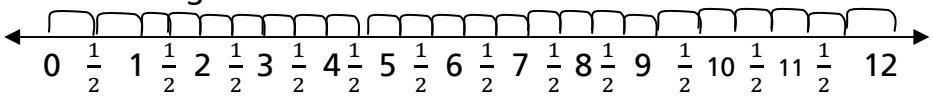
- Lay out rows of buttons with six buttons in each row until they have 24 and count the rows
- Repeatedly add 6 to get to 24
- Use a number line and show jumps of 6, starting at zero
- Skip count by 6 until they get to 24
- Think about what multiplied by 6 equals 24

These methods show a progression from thinking with addition to thinking with multiplication and division.

With a fraction, the same thinking can be used.

How many lengths of ribbon $\frac{1}{2}$ yard long are there in 12 yards of ribbon?

- Use a number line and jump backwards by halves. Start at 12. How many halves to get to zero?



$12 \div \frac{1}{2} = 24$

- Use reasoning in this situation. There are two half-yards in $\frac{1}{2}$ 9 $\frac{1}{2}$ 10 $\frac{1}{2}$ 11 $\frac{1}{2}$ 12 every yard. Two half-yards in each of 12 yards is like multiplying 2 x 12.

- Think about how number triads work: 2 x 4 = 8, so 8 ÷ 2 = 4. In the same way, if $\frac{1}{2}$ x 24 = 12, then 12 ÷ $\frac{1}{2}$ = 24. Students should think about concepts they already know about whole-number multiplication and division and use them. They must make sense of the strategies and be able to explain why they work.

Family Practice: Are you cooking or baking? Ask how much flour you should use to make half a recipe. The recipe calls for 4 cups of flour. How much baking powder would you need to triple the cookie recipe? It calls for $\frac{1}{4}$ tsp of baking powder. Ask if a group of four friends orders a pizza that costs $10, and each agreed to pay $\frac{1}{4}$ the cost, how much does each person owe?

Website with some fraction activities:
http://cs.gmu.edu/cne/modules/dau/algebra/fractions/frac4_frm.html

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Fifth Grade Teacher