Dear Family,

The next Unit in your child's mathematics class is ***Let's Be Rational: Undertsanding Fraction Operations.*** This is the second of three number units that focus on developing concepts and procedures for fractions, decimals, and percents.

Unit Goals

In this Unit, your child will focus on understanding and developing systematic ways to add, subtract, multiply, and divide fractions. While working on this Unit, students will investigate many interesting problem situations that help them to develop algorithms for fraction computation. In addition, students will use number sense, benchmarks, and operation sense to estimate solutions, helping them to decide if exact answers are reasonable. Students will compute with decimals and percents in a later Unit, *Decimal Operations*.

Homework and Having Conversations About the Mathematics

You can help your child with homework and encourage sound mathematical habits during this Unit by asking questions such as:

- What models or diagrams might help you understand the situation and the relationships between the quantities in the problem?
- What models or diagrams might help you decide which operation is useful when solving a problem?
- What is a reasonable estimate for the answer?
- What strategies or algorithms can help you solve this problem?

You can help your child with his or her work for this Unit in several ways:

- There are many approaches for adding, subtracting, multiplying, and dividing fractions. Your child may use different ideas and algorithms from the ones you learned. Be open to these approaches. Encourage your child to share these methods with you to help them make sense of what they are studying.
- Ask your child to tell you about a problem that he or she enjoyed solving. Ask him or her to explain the ideas in the problem.
- Look over your child's homework and make sure all questions are answered and explanations are clear.

In your child's notebook, you can find worked-out examples, notes on the mathematics of the Unit, and descriptions of the vocabulary words.

Common Core State Standards

While all of the Standards for Mathematical Practice are cultivated by teachers and developed by students throughout the course, students spend significant time modeling mathematics in *Let's Be Rational* with diagrams, number lines, and symbolic representations. The Unit focuses on understanding when and how to use algorithms for computing with fractions with all four operations (addition, subtraction, multiplication and division).

A few important mathematical ideas that your child will learn in *Let's Be Rational* are on the next page. As always, if you have any questions or concerns about this Unit or your child's progress in the class, please feel free to call.

Sincerely,

<table>
<tr><th>Important Concepts</th><th>Examples</th></tr>
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Addition and Subtraction of Fractions
Students model and symbolize problems to develop meaning and skill in addition and subtraction.

Students find common denominators so that the numerators can be added or subtracted.

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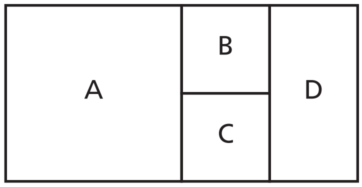
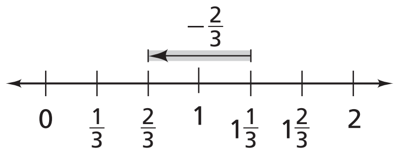


To find the sum of A + B, or $\frac{1}{2}+\frac{1}{8}$, on the rectangle, students need to use equivalent fractions to rename $\frac{1}{2}$ as $\frac{4}{8}$. The area model helps students visualize A, $\frac{1}{2}$, as 4 eighth-size sections, or $\frac{4}{8}$. Students can write the number sentence $\frac{4}{8}+\frac{1}{8}=\frac{5}{8}$ to see why they need to rename fractions when adding and subtracting.

The *number-line model* helps students make the connection between fractions and numbers or quantities. This number line illustrates $1\frac{1}{3}-\frac{2}{3}=\frac{2}{3}$.



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Developing the Multiplication Algorithm
Students notice that multiplication is easier for proper fractions than for other types of fractions because they can just multiply the numerators and multiply the denominators of the factors.

Models can support students in understanding why this works.

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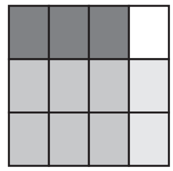
An area model can show $\frac{2}{3}\times\frac{3}{4}$. Shade $\frac{3}{4}$ of a square. To represent taking $\frac{2}{3}$ of $\frac{3}{4}$, cut the square into thirds the opposite way, and shade two of the three sections in a different color. The overlap sections represent the product, $\frac{6}{12}$.



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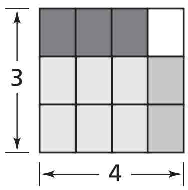
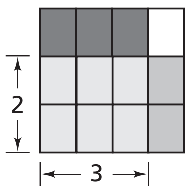
The <u>denominators</u> partition and repartition the whole. Breaking each of the fourths into three parts makes 12 pieces. When you multiply the denominators (3×4) in the algorithm, you resize the whole to have the correct number of parts.



$\frac{2}{3}\times\frac{3}{4}=\frac{2\times3}{3\times4}=\frac{6}{12}$



$\frac{2}{3}\times\frac{3}{4}=\frac{2\times3}{3\times4}=\frac{6}{12}$

The <u>numerator</u> keeps track of how many of the parts are being referenced. You need to consider 2 out of 3 sections for each $\frac{1}{4}$ of the square. This can be represented by the product of the numerators 2×3.

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Developing a Division Algorithm
As students work toward trying to develop and use algorithms, they may need to continue drawing pictures to help them think through the problems.

Our goal in the development of algorithms is to help students develop efficient algorithms. Students may have various ways to think about division of fractions.

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Multiplying by the Denominator and Dividing by the Numerator: The reasoning for $9 \div \frac{1}{3}$ is: I have to find the total number of $\frac{1}{3}$'s in 9. There are three $\frac{1}{3}$'s in 1, so there must be 9×3 $\frac{1}{3}$'s in 9. $9 \div \frac{1}{3} = 9 \times 3 = 27$.

With $\frac{2}{3}\div\frac{3}{4}=\frac{2}{3}\times4\div3$, multiplying by 4 tells how many $\frac{1}{4}$'s are in a whole. Dividing by 3 adjusts this to account for grouping 3 of the $\frac{1}{4}$'s in this problem. Multiplying by the denominator of the divisor, then dividing by the numerator is the same as multiplying by the reciprocal of the divisor. So, $\frac{2}{3}\div\frac{3}{4}=\frac{2}{3}\times4\div3=\frac{2}{3}\times\frac{4}{3}$.

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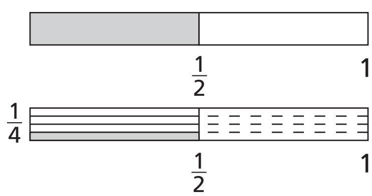
Multiplying by the Reciprocal: If students draw a diagram for $\frac{1}{2}\div4$, they may reason, "I divided the $\frac{1}{2}$ into four parts so I could find $\frac{1}{4}$ of the $\frac{1}{2}$." Here students relate the problem $\frac{1}{2}\div4$ to $\frac{1}{2}\times\frac{1}{4}$. This type of reasoning, the diagram, and the number sentences help students move from the division problem to multiplying by the reciprocal.



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Common Denominator Approach: Students rewrite $\frac{7}{9}\div\frac{1}{3}$ as $\frac{7}{9}\div\frac{3}{9}$. The common denominator allows the reasoning: if you have 7 ninth-size pieces and want to find how many groups of 3 ninth-size pieces you can make, then $\frac{7}{9}\div\frac{3}{9}=7\div3=2\frac{1}{3}$.

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