Dear Family,

The next unit in your child's course of study in mathematics class this year is ***Bits and Pieces II: Using Fraction Operations***. This is the second of three number units that focus on developing concepts and procedures for computing with fractions, decimals, and percents.

UNIT GOALS

In this unit, the focus is on understanding and developing systematic ways to add, subtract, multiply, and divide fractions. While working on this unit, students investigate interesting problem situations to help them develop algorithms for fraction computation. In addition, students will use benchmarks and number and operation sense to estimate solutions for computations to help them decide if their answers are reasonable.

HELPING WITH HOMEWORK

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

- What models or diagrams might be helpful in understanding the situation?
- What models or diagrams might help decide which operation is useful in solving a problem?
- What is a reasonable estimate for the answer?
- What strategies or algorithms would help you solve this problem?

In your child's notebook, you can find worked-out examples from problems done in class, notes on the mathematics of the unit, and descriptions of the vocabulary words.

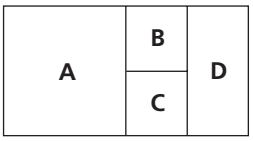
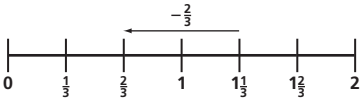
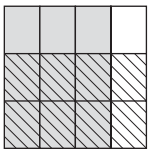
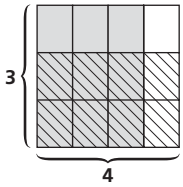
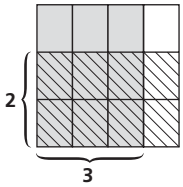
HAVING CONVERSATIONS ABOUT THE MATHEMATICS IN *BITS AND PIECES II*

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

- There are various logical procedures for computing with fractions. At times, students may be working with ideas and algorithms that are different from the ones you learned. Be open to these approaches. Encourage your child to share these methods with you as a way to help them make sense of what they are studying.
- Ask your child to tell you about a problem that he or she has enjoyed solving. Ask for an explanation of the ideas in the problem.
- Look over your child's homework and make sure all questions are answered and explanations are clear.

A few important mathematical ideas that your child will learn in *Bits and Pieces II* are given on the back. As always, if you have any questions or concerns about this unit or your child's progress in class, please feel free to call.

Sincerely,

Important Concepts	Examples
Addition and Subtraction of Fractions Students model problems to develop meaning and skill in addition and subtraction. Students learn to find common denominators so that the numerators can be added or subtracted.	To find the sum of A + B on the rectangle, or $\frac{1}{2} + \frac{1}{8}$, 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 $\frac{4}{8}$ and they write the number sentence, $\frac{4}{8} + \frac{1}{8} = \frac{5}{8}$.  The *number-line model* helps connect fractions to quantities. This illustrates $1\frac{1}{3} - \frac{2}{3} = \frac{2}{3}$. 
Developing a Multiplication Algorithm Students use models to see that they can just multiply the numerators and multiply the denominators of proper fractions.	An area model can show $\frac{2}{3} \times \frac{3}{4}$. Shade a square to show $\frac{3}{4}$. To represent taking $\frac{2}{3}$ of $\frac{3}{4}$, cut the square into thirds the opposite way and use hash marks on two of the three sections. The overlap sections represent the product, $\frac{6}{12}$.  The **denominators** partition and repartition the whole. Breaking the fourths into three parts each makes 12 pieces. In the algorithm, you multiply the denominators (3 × 4) to resize the whole to have the correct number of parts.  denominator → $\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4} = \frac{6}{12}$  numerator → $\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4} = \frac{6}{12}$ The **numerator** is keeping track of how many of the parts are being referenced. You need to take 2 out of 3 sections from each part. This can be represented by the product of the numerators 2 × 3.
Developing a Division Algorithm Students may have various ways to think about division of fractions. Our goal in the development of algorithms is to help students develop an efficient algorithm.	**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 that if you have 7 one-ninth-sized pieces and want to find out how many groups of 3 one-ninth-sized pieces you can make, then $\frac{7}{9} \div \frac{3}{9}$ has the same answer as $7 \div 3 = 2\frac{1}{3}$. **Multiplying by the Denominator and Dividing by the Numerator** With $9 \div \frac{1}{3}$, you can reason: 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 are 9×3, or 27, $\frac{1}{3}$s in 9. $9 \div \frac{1}{3} = 9 \times 3 = 27$. With $\frac{2}{3} \div \frac{1}{5}$, we can reason that $1 \div \frac{1}{5}$ is 5, as $\frac{2}{3} \div \frac{1}{5}$ should be $\frac{2}{3}$ of this, or $\frac{2}{3}$ of 5, or $\frac{10}{3}$. We could also rename $\frac{2}{3} \div \frac{1}{5}$ as $\frac{10}{15} \div \frac{3}{15}$ and see this as 10 fifteenths divided by 3 fifteenths, which is the same as $10 \div 3$, or $\frac{10}{3}$. Notice that this requires us to multiply the number of $\frac{2}{3}$s by 5. With $\frac{2}{3} \div \frac{4}{5}$, we can reason that this should be $\frac{1}{4}$ of $\left(\frac{2}{3} \div \frac{1}{5}\right)$, or $\frac{1}{4}\left(\frac{10}{3}\right) = \frac{10}{12}$. Notice that this reasoning requires us to multiply the denominator of $\frac{2}{3}$ by 4. In short, to compare $\frac{2}{3} \div \frac{4}{5}$ we compute $\frac{2}{3} \times \frac{5}{1} \times \frac{1}{4} = \frac{10}{12}$. That is, we multiply the numerator of $\frac{2}{3}$ by 5 and the denominator by 4. **Multiplying by the Reciprocal** We see that $\frac{2}{3} \div \frac{4}{5}$ (see above) gives the same result as $\frac{2}{3} \times \frac{5}{4}$.

On the **CMP Parent Web Site,** you can learn more about the mathematical goals of each unit, see an illustrated vocabulary list, and examine solutions of selected ACE problems. **http://PHSchool.com/cmp2parents**