Monroe Public Schools
375 Monroe Turnpike
Monroe, CT 06468

Cindy Brooker
K-5 Math Coordinator
Tel: 203-452-2923 x 3040
Fax: 203-452-2444
E-Mail: cbrooker@monroeps.org

September, 2013

Dear Parents,

You might notice that your child is bringing home work that looks unfamiliar to you. They might be using a strategy that is different than others you have used in the past. This is because we are fully implementing the Common Core State Standards in math. Not only is some of the content different than in years past, but the depth and focus are also different.

Your child might be using a ten frame to make a ten and add or subtract. He or she might be asked to use an empty number line or an elapsed time number line to help when solving problems. The array model has been used for many years to represent multiplication. Although these terms may be new to you, please know that they are part of the problem solving approaches being taught across the nation. I have included an explanation of each of these strategies in this letter.

As the year progresses, you may encounter other unfamiliar terminology and strategies. Please feel free to speak with your child's teacher or to me to learn more about them.

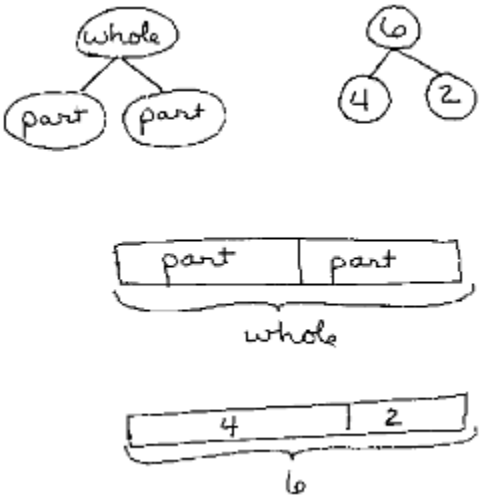
There are many websites devoted to demonstrating these strategies. Some of these are:

http://learnzillion.com/
http://letsplaymath.net/free-mostly-math-resources-on-the-internet/#lessons
http://www.thinkfinity.org/thread/12836
http://www.watchknowlearn.org/
https://www.teachingchannel.org/

Sincerely yours,

Cindy Brooker

Number Bonds



A number bond is a mental picture of the relationship between a number and the parts that combine to make it. The concept of number bonds is very basic, an important foundation for understanding how numbers work. A whole thing is made up of parts. If you know the parts, you can put them together (add) to find the whole. If you know the whole and one of the parts, you take away the part you know (subtract) to find the other part.

Number bonds let children see the inverse relationship between addition and subtraction. Subtraction is not a totally different thing from addition; they are mirror images. To subtract means to figure out how much more you would have to add to get the whole thing.

A Picture Is Worth More than Many Words

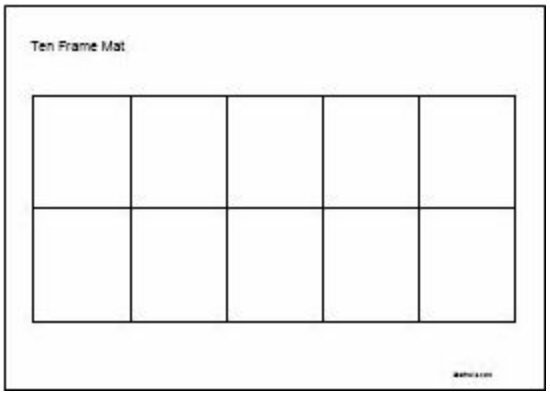
You can draw number bonds on paper using circles or bar diagrams. Imagine each circle to be a pile of blocks or other manipulatives, and think of the bar as the blocks lined up in a row. Even a young student who does not understand math notation can clearly see the connection between these numbers: the whole (6) has been pulled apart into two piles (4 and 2), and the piles can be pushed back together to make the whole.

Math textbooks often try to communicate the same concept using *four-fact families*. A four-fact family looks like this:

4 + 2 = 6
2 + 4 = 6
6 – 4 = 2
6 – 2 = 4

The idea of the four-fact family is to help students realize that once they know one of the facts in the family, they know all of them. Many students never see the connection, however, and think of these equations as separate little bits of abstract information, all of which have to be memorized. This can overload their minds and make them give up on math. On the other hand, number bonds connect to the student's understanding at a deeper level, showing all four of the fact family relationships in a single picture.

Ten Frame



A ten frame is a simple graphic tool that allows people to "see" numbers. Ten frames and dot cards can be used to develop students' subitizing skills, the ability to "instantly see how many". This skill plays a fundamental role in the development of students' understanding of number.

Understanding that numbers are composed of tens and ones is an important foundational concept, setting the stage for work with larger numbers. A strong sense of "ten" is a prerequisite for place-value understanding and mental calculations.

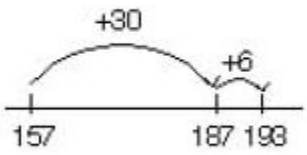
This You Tube Video introduces the ten frame and explains how this tool is useful for students just beginning to learn about numbers.

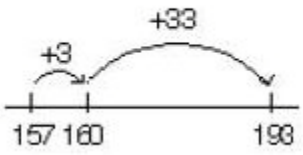
http://www.youtube.com/watch?v=p6RaMGDPfJg&NR=1

Empty Number Line

The empty number line, or open number line as it is sometimes referred to, was originally proposed as a model for addition and subtraction by researchers from the Netherlands in the 1980s. A number line with no numbers or markers, essentially the empty number line is a visual representation for recording and sharing students' thinking strategies during the process of mental computation.

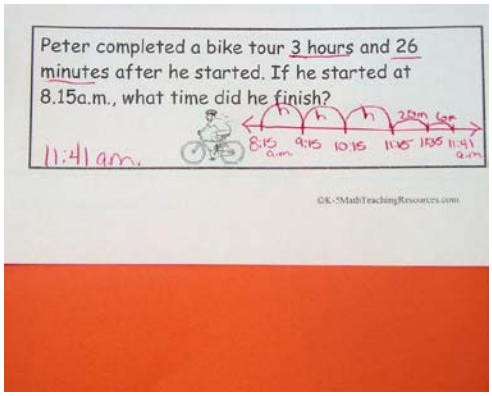
One of the interesting things about mental calculations is that we do not all think the same way. The empty number line allows students to see the variety of ways that the same question can be solved. For example, to solve 157 + 36 one student may begin at 157, add 30, then 6 while another may start at 157 and break the 36 into 3 and 33. This turns the question into the problem of adding 33 to 160. Writing equations horizontally forces students to look at the numerals, whereas written vertically students tend to immediately turn to the procedural algorithm.

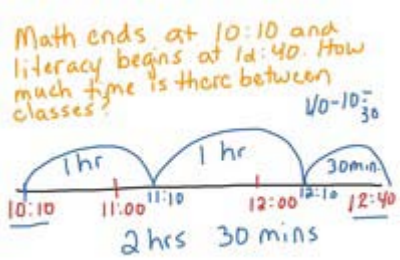




Elapsed Time Number Line

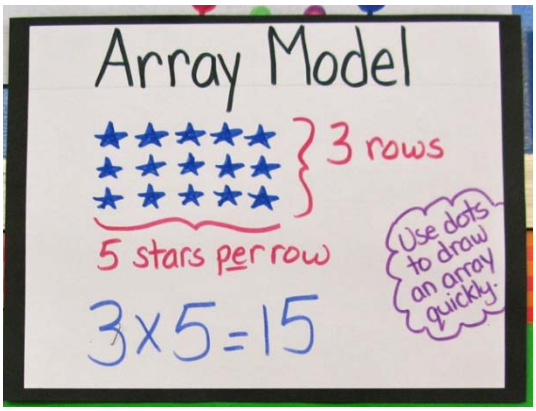
Once students are confident with using the number line for showing their thinking strategy they can use it to support them while solving a range of problems in different contexts (e.g. elapsed time, money, measurement, and fractions).





Array Model

Multiplication can be defined in terms of repeated addition. For example, 3 × 5 can be viewed as 5 + 5 + 5. A rectangular array provides a visual model for multiplication. For example, the product 3 × 5 can be represented as:



An equivalent area model can be made in which the dots of the array are replaced by unit squares.

Besides representing 3 × 5 as an array of 15 unit squares, this model also shows that the area of a rectangle with a height of 3 units and a base of 5 units is 3 × 5 square units, or 15 square units: