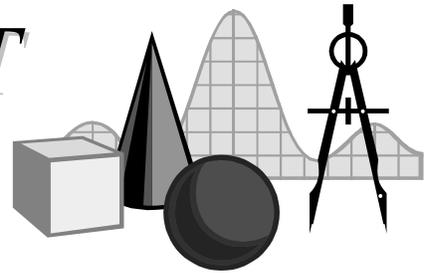# TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

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Regional Professional Development Program
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Learning multiplication is a challenge all students must accomplish. We want each and every one of our charges to not only memorize their multiplication facts and have instant recall of them, but also to understand conceptually what multiplication is. There are many techniques to accomplish this. In this issue of *Take It to the MAT* we will focus on arrays, their relationship to multiplication, and their links to future mathematics concepts.

Arrays can be constructed in a variety of ways. Three of these are shown at right: tokens, a grid, or intersecting lines. Each of the array models for multiplication describe the same situation. Or does each represent two situations? Are these arrays models for $3 \times 4 = 12$ or $4 \times 3 = 12$? Or both? Take a moment to think about it, then we'll get back to our discussion.
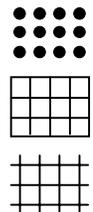
We'll use tokens to develop our model of multiplication; get yourself a handful. Now then, grab five tokens and arrange them in front of you. How did you do it? If you did not place them in a line like this, ●●●●●, please do so now. How many tokens do you have? Right, five.

Now add five tokens to the ones you have. You may have lain them out like this: ●●●●●●●●●●. Remember, though, we're building a multiplication model here. So rearrange them and you should have something like this: ●●●●● ●●●●● .

The big question becomes, is that 2 times 5 or 5 times 2? Well, we put down five tokens two times. Two times we placed five tokens on the table. No matter how we arrange our words in describing the model, the same pair of words always result—*two times*. This model is for 2×5.

Going back to the diagram at the beginning, what are we modeling? Correct, 3 times 4. There are 3 rows of 4 tokens. We would have placed a row of four tokens *three times*. The grid model is really another form of the token model. The intersecting line model is more of a "shortcut" manner to model multiplication without manipulatives or graph paper.

Another way to think of the model is *rows by columns*. The first factor is the number of rows, the second is the number of columns. This manner of describing the array is useful in that it connects to future mathematics concepts that students will experience, particularly *matrices*. (It's interesting that we sometimes set up our classrooms in "rows" when they should really be called "columns")

A *matrix* is an array of numbers that represent a collection of information in a more condensed form. Matrices are described by their *dimensions*, given as *rows × columns*. Thus, the matrix

$\begin{bmatrix} 1 & 2 & 5 & 6.2 & 9 \\ 0 & 4 & 12 & 8 & 1 \end{bmatrix}$ would be classified as a two by five (2×5) and $\begin{bmatrix} \frac{1}{3} \\ 0 \\ \frac{2}{5} \end{bmatrix}$ as three by one (3×1).

While the difference between 3×4 and 4×3 when using a model may seem trivial at first, but a standard must be set. The sooner students consider arrays as rows by columns, the easier the transition will be when they reach higher-level mathematics.