TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

Regional Professional Development Program
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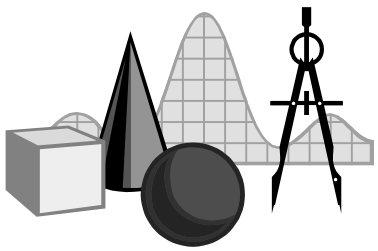

With this issue of *Take It to the MAT,* the Regional Professional Development Program begins its third year of providing teachers with a periodical addressing mathematics instruction. All editions of Take It to the MAT—elementary, middle school, and high school—for 2001–2002 will be published tri-weekly. We hope you find the topics interesting and useful. —Eds.

What is *algebra* and why is it important for students to know? Algebra is not simply a course that students take in 8th or 9th grade. Algebra is a way of thinking, a gateway from arithmetic to higher level mathematics. All students should learn to think algebraically, to move from the concrete to the abstract.

Open nearly any algebra text and the first topic presented is *variables*. This is not a coincidence—algebra is, at its heart, the study of relationships between variables. We use letters to represent numerical quantities, but this "new" idea of variables is not new at all. Students have been using variables since the early grades.

Let's examine two exercises, one from a first grade book, the other from a first-year algebra text.

Write the missing number. $8 + \_\_ = 10$	Solve for x: $8 + x = 10$

Which is which? Which requires algebraic thinking? Similar exercises exist for subtraction, multiplication, division, and problem solving in algebra and in elementary textbooks.

Later in elementary school, usually 4th or 5th grade, students learn that the area of a rectangle is the product of its length and width. They often are presented with the formula, $A = l \times w$. This formula is a variable equation, such as $A = lw$, composed solely of variables. The sole difference between the fifth-grade formula and the algebraic equation is the lack of a multiplication sign, multiplication being implied when two variables or a numeral and a variable are written together without a space between them.

Caution must be taken when we use the term *variable*. In the first example where we fill in the missing number, or solve for *x,* the value of the blank/*x* is **not** variable in the literal sense as something that varies. It is an unknown which we determine to be two. While the blank/*x is* a variable by name and definition, its value does not and cannot vary. An equivalent term to use, and one that should be used in this case, is *unknown*. The blank/*x* is a specific, but unknown, value.

In the second example of the formula for the area of a rectangle, there is a relationship expressed between three variables—*A*, *l*, and *w*. In this case, *A*, *l*, and *w* **are** truly variable; their values are not only unknown, but can take on infinitely different possibilities so long as the equation is true.

Problem solving can help develop algebraic thinking, and can be done in increasing levels of depth. Consider the formula $A = lw$. We can ask students, "If $A = 36$ square inches, what could l and w be?" "If length is twice width, what can you say about the area?" "If both the length and width of a rectangle are doubled, what happens to the area?"

While 8th/9th grade Algebra 1 has been dubbed "the gateway course" in mathematics, algebraic reasoning must begin much sooner, as early as the primary grades.