The Metric System: Effects on Teaching Mathematics

Eugene P. Smith
NCTM President

This article is reprinted, with permission of the author, from *Newsletter, The National Council of Teachers of Mathematics,* March 1974.

The move to the metric system is well under way, and many of you are already collecting aids and developing ideas for teaching the metric system. These are essential tasks, but have you also considered the implications of teaching mathematics *outside* the system of measurement?

Of the seven basic units in the International System, the meter and the kilogram - and the measures derived from them - will receive the greatest attention in teaching mathematics. Since subunits and multiples of these two units are related by powers of ten, the learner must understand the decimal numeration system, including decimal fractions, if he is to change from one related unit to another - for example, from centimeters to meters. The teacher must not only provide readiness experiences for learning the metric system but also consider whether children of differing abilities can understand decimal fractions well enough to change from one unit to another. Also, the teacher must help youngsters understand the new vocabulary.

Most of our needs for fractions arise from using the English system of measurement. After the metric system is in widespread use, what need will we have for fractions in daily life? If would seem that skill work with common fractions could be virtually eliminated. But for the algebra student, how much readiness for manipulating algebraic fractions is provided by the work with fractions in arithmetic? If such work does provide readiness, could (or *should*) the skill development be delayed until the student is ready for algebra? Can all common fractions be eliminated? This is not likely, for we shall still sometimes need them for describing ratios and parts of a whole.

And how about the stock exchanges? Will they convert to a decimal system for stock quotations instead of the more difficult multiples of 1/8? I see no reason why they could not even use multiples of 10¢ instead of the decimal equivalents of eighths.

Recently a home economist raised this problem: "Should measuring cups go metric? If so, should they be graduated in milliliters or in decimal fractions of a liter?" She argued that milliliters should be used, since whole numbers are more easily understood than decimal fractions. Should cookbooks of the future use metric measures rather than cups?

The problems of the stock market and the cookbook are typical of the wide-ranging questions that must be answered before we can make curriculum decisions about teaching measurement. In order to help eliminate the unnecessary use of common fractions, should we, as mathematics teachers, make proposals to the stock exchanges, the home economists, and other groups?

There is no longer any doubt *whether* Canada will move to the metric system—the only question is *when*. It is time for us to look, not merely at teaching the metric system, but at the effects this move will have on teaching *all* mathematics.

Stretch Your Sketching Skill

Wayne J.P. Turley
Western Canada High School
Calgary

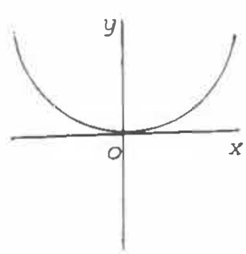
A number of elementary techniques are available for sketching graphs but, to our knowledge, they have not appeared in any definitive fashion in textbooks. This presentation is an attempt to ameliorate that situation.

The rules of thumb which follow are non-rigorous suggestions that usually assist the student in determining the nature of the graph.

1. DEGREE: The degree of the equation suggests the number of "bends" the resulting curve has. The degree of the equation is determined by the highest power of the independent variable (i.e., x). Therefore, in $y=x^2$ (degree two) there is one bend and in $y=x^3+3x$ (degree three) there are two bends, but in $y=2x - 3$ (first degree) there are no bends. It appears that the number of twists in the curve is one less than the highest power of the independent variable, that is, if $f(x)=ax^n + bx^{n-1} + ex^{n-2} + . . . + wx$, then we should expect that there should be n-1 bends. Of course, if f(x) equals x to the three quarters, we cannot use the rule, so perhaps we should restrict the domain of n to the set of positive integers.

2. NUMERICAL COEFFICIENTS: The numerical coefficient of the highest power of the independent variable also helps determine the complexion of the graph. In the quadratic function we have a "smile" in the sketch of

$y = x^2$



positive coefficient
concave upwards