Preface

One of the provisions of the *No Child Left Behind* legislation is that every student in Grades 3 through 8 and those in a selected high school grade (as stipulated by each state) must pass yearly statewide assessments in mathematics. The good news for math teachers is that the National Council of Teachers of Mathematics, or NCTM, has produced a document that serves as a kind of de facto national curriculum that has guided states in the writing of standards upon which those assessments are based.

The bad news is that even with an influx of textbooks and materials that proclaim themselves to be "standards-based," those same math teachers have available to them very few examples of instructional techniques and insights that also reflect a standards-based philosophy. And the aforementioned book that the NCTM released, *Principles and Standards for School Mathematics* (2000), reads more like a series of teaching *pre*scriptions as opposed to more practical *de*scriptions.

What is needed for the everyday classroom is what this book, *Key Concepts in School Mathematics,* delivers. In its pages, the reader will find classroom-tested examples of standards-based lessons, hands-on activities, and graphing calculator applications and programs that may either be used verbatim or serve as an interpretation of a particular expectation to help the teacher pull his or her own standards-based lesson together.

A BRIEF OVERVIEW

The book joins forces with *Principles and Standards* and the rest of the mounting evidence from cognitive research that concludes that students are best taught math when they actually "do math" (Schoenfeld, 1985). The fact that one reads a book on riding a bicycle, for example, is no substitute for the experience of learning *how* to ride.

Key Concepts in Mathematics is a 10-chapter transitional supplement highlighting all 10 NCTM standards and affording many opportunities for students to "do math"—a resource that illustrates how to put guidelines into motion to move students toward a more inductive mode of thinking. There are two sections to the book: Chapters 1 through 5 (Content, or the skills-based, Standards) and Chapters 6 through 10 (Process, or the more abstract performance-based, Standards). The book is composed of inservice workshops, conference presentations, college seminars, and other direct input from experienced and highly esteemed colleagues.

TARGET AUDIENCE

One of the more ironic statements made by a participant at a workshop session recently hosted by yours truly was, "My students don't have time for thinking—they've got to get through the curriculum." What this time-challenged individual probably meant to say, however, was, "Yes, I see the need for creativity and for practicing critical-thinking problems with my students, but I've got a very tight schedule of topics to cover and almost no room available for such activities."

This person is echoing the pressure-filled sentiments felt by many in our profession of late—which is why *Key Concepts in Mathematics* might be a better fit in the everyday math classroom than at first thought. Its lessons and activities "compress" topic time, with lots of items either introduced or reviewed at once so that teachers do get some planning room at the end of a unit to review elusive topics or bring topics together with a real-world project. But those same lessons and activities also "connect" math concepts in some unique ways—encouraging better understanding, wider engagement, greater retention, and shorter review time prior to students' being subjected to taking the statewide assessments.

There are several potential audiences for whom *Key Concepts* can make a positive and immediate impact:

1. Preservice teachers and college instructors of such preservice courses
2. Beginning teachers incorporating a standards-based curriculum
3. Veteran teachers looking for fresh ideas that pull together old topics
4. Curriculum supervisors establishing more critical-thinking benchmarks

CALCULATORS IN USE

Because *Key Concepts in Mathematics* places such a high premium on participation, it follows that there will be numerous opportunities throughout the book in which some of today's available graphing calculator technology will play a strong supporting role. (Please be advised that the various technological applications and original programs will serve to enhance—and *never* replace—the mathematics in these pages.)

Three graphing calculators from the Texas Instruments line will be used: the TI-73 Explorer™, the TI-83 Plus, and the TI-84 Plus models.

Although interchangeable to a degree, the three calculators target different audiences. For example, the TI-73 Explorer is designed primarily for Grades 6 through 8, as it can be used with topics ranging from fractions through prealgebra and has a wide array of data analysis and graphing features.

The TI-84 Plus is actually an improved (with greater memory capacity and preloaded applications) version of the older, but still very highly regarded and popular, TI-83 Plus model. Both are designed primarily for Grades 9 through 12—thereby useful with upper-level topics, including those in statistics and

calculus—and are compatible with each other (which is why they will be referred to as "TI-83/84 Plus" throughout the book).

For those who might have occasion to use both the TI-73 and the TI-83/84 Plus, please locate the relevant input statement(s) in the left-hand column (steps for the TI-73) with the corresponding statement(s) in the right-hand column (steps for the TI-83/84 Plus):

TI-73		**TI-83/84 Plus**
1. 2nd MEM 6	=	2nd MEM 4
2. LIST	=	STAT 1
3. 2nd PLOT 1	=	2nd STAT PLOT 1
4. 2nd PLOT 4	=	2nd STAT PLOT 4
5. ZOOM 7	=	ZOOM 9

STARTING OVER

There are three steps involved for the TI-73 (and the corresponding steps for the TI-83/84 Plus in parentheses) that you can take to clear out all old input/output (the "Erase" phase) prior to doing something new with your graphing calculators:

1. Press 2nd PLOT, the number "4" (2nd STAT PLOT 4 for the TI-83/84 Plus), and ENTER to turn off old statistical graphs such as scatterplots, circle graphs, histograms, and so on.

2a. Press the "Y=" button, highlight with the arrow up/down to each previous entry, and CLEAR to remove all old functional graphs.

2b. In the rare case that a drawing such as a vertical line or a circle remains from past work, press DRAW, the number "1" (2nd DRAW 1 for the TI-83/84 Plus), and ENTER to remove it.

3. Press 2nd MEM, the number "6" (2nd MEM 4 for the TI-83/84 Plus), and ENTER to clear out all old lists from statistical tables.