

# An Overview

## Principles & Standards *for School* Mathematics

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Member NCTM Board of Directors 2000-2003

For information on purchasing *Principles and Standards for School Mathematics* in book, CD-ROM, or PDF (Portable Document Format), please visit <http://nctm.org/standards/> or call toll-free (800) 235-7566. Copies of this overview are also available in bulk quantities. To read the full document online, go to <http://standards.nctm.org/>

We live in a mathematical world. Whenever we decide on a purchase, choose an insurance or health plan, or use a spreadsheet, we rely on mathematical understanding. The World Wide Web, CD-ROMs, and other media disseminate vast quantities of quantitative information. The level of mathematical thinking and problem solving needed in the workplace has increased dramatically. In such a world, those who understand and can do mathematics will have opportunities that others do not. Mathematical competence opens doors to productive futures. A lack of mathematical competence closes those doors. Students have different abilities, needs, and interests. Yet everyone needs to be able to use mathematics in his or her personal life, in the work-place, and in further study. All students deserve an opportunity to understand the power and beauty of mathematics. Students need to learn a new set of mathematics basics that enable them to compute fluently and to solve problems creatively and resourcefully.

With the release of *Curriculum and Evaluation Standards for School Mathematics* in 1989, the National Council of Teachers of Mathematics (NCTM) moved to the forefront of efforts to improve mathematics education in the United States and Canada. The document marked a historical important first step by a professional organization to articulate extensive goals for teachers and policy makers in a school discipline. Since its release, the *Curriculum and Evaluation Standards* has provided focus, coherence, and new ideas to mathematics education. In 1995 its Board of Directors

appointed the Commission on the future of the Standards to recommend how NCTM might proceed in updating its existing *Standards* documents. As a result, the Standards 2000 project was begun in 1997, with the appointment of a Writing Group to produce an updated Standards

document and an Electronic format Group to produce an electronic enhanced version of that document. The Commission obtained input from many different sources to revise the Standards. The Writing Group consulted extensive collections of curriculum materials, state and provincial curriculum documents, research publications, policy documents, and international frameworks and curriculum materials.

Association Review Groups, a set of “white papers” commissioned by NCTM’s Research Advisor Committee, and conferences sponsored by the National Science Foundation and the Eisenhower National Clearinghouse furnished additional input.

The Writing Group finished a draft version of the new document in October 1998, and many groups and individuals re-viewed the printed draft and its electronic edition on NCTM’s Web site. The Writing Group substantially revised the document on the basis of the many hundreds of reactions received in response to the draft. The resulting book, *Principles and Standards for School Mathematics*, is a single resource that can be used to improve mathematics curricula, teaching, and assessment. The electronic edition of *Principles and Standards* has a rich array of examples to illuminate and extend the ideas presented in the printed text. Icons in the margins of the printed text indicate relevant electronic examples.

*Principles and Standards for School Mathematics* describes a future in which all students have access to rigorous, high-quality mathematics instruction, including four years of high school mathematics. Knowledgeable teachers have adequate support and ongoing access to professional development. The curriculum is mathematically rich, providing students with opportunities to learn important mathematical concepts and procedures with understanding. Students have access to technologies that broaden and deepen their understanding of mathematics. More students pursue educational paths that prepare them for lifelong work as mathematicians, statisticians, engineers, and scientists. This vision of mathematics teaching and learning is not the reality in the majority of classrooms, schools, and districts. Today, many students are not learning the mathematics they need. In some instances, students do not have the opportunity to learn significant mathematics. In others, students lack commitment or are not engaged by existing curricula.

Attaining the vision laid out in *Principles and Standards* will not be easy, but the task is critical important. We must provide our students with the best mathematics education possible, one that enables them to fulfill personal ambitions and career goals in an ever changing world.

*Principles and Standards for School Mathematics* has four major components.

First, the Principles for school mathematics reflect basic perspectives on which educators should base decisions that affect school mathematics. These Principles establish a foundation for school mathematics programs by considering the broad issues of equity, curriculum, teaching,

learning, assessment, and technology.

Following the Principles, the Standards for school mathematics describe an ambitious and comprehensive set of goals for mathematics instruction. The first five Standards present goals in the mathematical content areas of number and operations, algebra, geometry, measurement, and data analysis and probability. The second five describe goals for the processes of problem solving, reasoning and proof, connections, communication, and representation. Together, the Standards describe the basic skills and understandings that students will need to function effectively in the twenty-first century. Finally, the document discusses the issues related to putting the Principles into action and outlines the roles played by various groups and communities in realizing the vision of Principles and Standards.

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## The Technology Principle

***Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.***

Calculators and computers are reshaping the mathematical landscape, and school mathematics should reflect those changes. Students can learn more mathematics more deeply with the appropriate and responsible use of technology. They can make and test conjectures. They can work at higher levels of generalization or abstraction. In the mathematics classrooms envisioned in *Principles and Standards*, every student has access to technology to facilitate his or her mathematics learning. Technology also offers options for students with special needs. Some students may benefit from the more constrained and engaging tasks made possible with computers. Students with physical challenges can become much more engaged in mathematics using special technologies. Technology cannot replace the mathematics teacher, nor can it be used as a replacement for basic understandings and intuitions. The teacher must make prudent decisions about when and how to use technology and should ensure that the technology is enhancing students' mathematical thinking.

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