

California's Demanding Mathematics Standards

California's public schools are changing not only how they teach math, but also what they expect students to learn. In December 1997, following a lively public debate, state leaders adopted challenging new math standards.

To implement these new standards, the State Board of Education approved a new Mathematics Framework for California Public Schools in 1999. The standards and framework laid the foundation for a system that also includes new state-approved textbooks and teacher training. Local school districts are now beginning to choose textbooks and train teachers in the new curriculum.

One of the most ambitious new requirements is that all students—whether they think they are college bound or not—learn Algebra 1. Beginning algebraic concepts have been taught in most California elementary and middle schools for more than a decade. But now school districts are expected to offer Algebra 1 to the vast majority of students by the eighth grade. Whether students take it in middle school or later, algebra is a high school graduation requirement for the class of 2004 and beyond. It is also included in the California High School Exit Exam, which students—beginning with the class of 2006—must pass to receive their diplomas.

Why is it important for students to learn algebra?

Algebra is considered a gateway into the higher level math and science courses needed for entrance to many colleges. In a study by the Public Policy Institute of California, researchers found that the higher the level of math courses students take in high school, the greater chance those students will attend and graduate from college and find better paying jobs in the future. College entrance exams, such as the SAT and ACT, test heavily on algebra, making it difficult to score well without knowledge of the subject. More generally, higher level math also helps students learn logic and abstract reasoning skills that are not only useful in math and science, but also apply to other areas, such as essay writing in which students must alternate between ab-

stract concepts and specific supporting evidence. Those skills can help students succeed in their jobs and their lives even if they do not continue their education beyond high school.

What about basic arithmetic?

The study of mathematics includes more than basic arithmetic skills. The framework lists five areas of math called “strands.” These strands define what students from kindergarten through seventh grade need to learn, including:

- Number sense, which is basic arithmetic and includes fractions, decimals, and mastery of adding, subtracting, multiplying, and dividing without the aid of a calculator;
- Algebra and functions;
- Measurement and geometry;
- Statistics, data analysis, and probability; and
- Mathematical reasoning or the thinking skills that go beyond mathematics, such as learning how to judge arguments based on logic.

Students begin learning simple math concepts in kindergarten. For example, a kindergarten teacher could show her class three objects—a blue basketball, a white tennis ball, and a blue school bus—and ask: “If we want to collect blue things, which of these items should we collect?” Thus “sets,” a basic algebraic concept, is introduced.

What are middle school and high school students expected to learn?

By sixth or seventh grade, students should be focusing on more formal algebraic concepts—often called pre-algebra. In the state's new framework, students are expected to take Algebra 1 in eighth grade, followed by Geometry in ninth grade and Algebra 2 in 10th grade. These courses are also required for admission to the state's public universities and many other private and out-of-state public universities. California community colleges expect entering students to pass a test based on Algebra 2 or take a remedial course.

Some schools offer Integrated Math I, II, and III instead. Integrated math is also based on the state standards but combines math concepts instead of separating them into distinct courses, such as Algebra 1 and Geometry. Because of this approach, students may need to go beyond Integrated Math I to learn all of Algebra 1.

What about students who excel in math?

If your student excels in math and needs courses not offered in your school, see if a school official can arrange for special math instruction. Many middle schools allow advanced students to take high school math courses. Similarly, high school administrators can often arrange for students to take math courses at a community college or through computerized instruction.

What about students who have difficulty learning algebra?

Experts agree that moving from arithmetic to algebra is one of the toughest transitions students have to make. That is why it is important to introduce algebraic concepts early and focus on them as part of pre-algebra in sixth and seventh grade.

State leaders expect schools to offer math through Algebra 2 or Integrated Math III to all students, including English language learners and students in Special Education. The framework advises teachers to test struggling students to determine what is keeping them from understanding the material. It suggests teachers develop approaches for each individual student and seek help from others, including parents, Special Education specialists, and math experts.

How can I find out more?

Talk to your school counselor or administrator to make sure that your student is on track with the right math courses. Find out if your school's math teachers have degrees or credentials to teach in math, or if they are participating in professional development. Ask if your child can participate in student tutoring offered by your school or district.

You can also find the Mathematics Framework for California Public Schools on the web at www.cde.ca.gov/cfir/ (most public libraries have Internet access). For background on academic standards, go to: www.edsource.org/edu_sta.cfm

For research supporting the importance of higher level math, see Research Brief, Issue 48 (July 2001): "Higher Math in High School Means Higher Earnings Later" by the Public Policy Institute of California, which can be reached at 415/291-4400 or on the web: www.ppic.org

Are all schools and teachers ready to teach the new standards?


It takes time—typically three to five years—for new academic standards to be fully developed for classroom use. Teachers need training, curriculum needs to be developed, and textbooks need to be written and purchased. A shortage of teachers with credentials to teach in math also continues to be a problem.

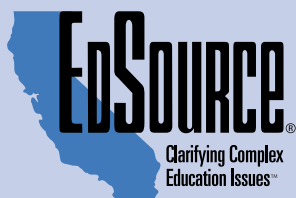
The state has approved some professional development programs to train teachers in the new math standards. However, not all schools have funding or choose to offer such programs. If you want to know what your district is doing to ensure the new standards are reaching the classroom, talk to your school's principal or other administrator.

How do parents know if students are learning the math standards?

Each spring, through the state's Standardized Testing and Reporting (STAR) program, California tests all students in second through 11th grade in a number of subjects, including math. Individual results are mailed to parents in late summer. The state also ranks schools based on all their students' performance on STAR. Your school's ranking can be found on the web: www.ed-data.k12.ca.us

STAR has two kinds of tests that include math:

- California Achievement Tests, Sixth Edition, survey form (CAT/6), which compare California children's basic math skills to those of a sampling of other students in the nation.
- Standards tests, which are the only tests that measure progress toward the state's new academic standards. Student test scores are described as "far below basic, below basic, basic, proficient, or advanced." The state's goal is for all students to score proficient or advanced.
- The Spanish Assessment of Basic Education, Second Edition (SABE/2) also tests basic math skills and compares California students to a sampling of students from other states. SABE/2 is written in Spanish and is an *additional* test that native Spanish speakers take during their first year in California public schools. High school students also receive their individual test results on the California High School Exit Exam. The math portion of that exam is based on the state's standards through Algebra 1. 



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