California's Math Pipeline: **The Grade 7 Pivot Point**

For students to be career- and college-ready when they complete high school, they must build a strong base of mathematics knowledge. The end of 7th grade provides an important moment to assess how prepared California's students are to succeed in the more advanced math curriculum that starts with algebra.

California's 1997 academic content standards in mathematics outline the stepping stones to algebra, and the Grade 7 Mathematics California Standards Test (CST) provides a benchmark measure of students' readiness.

In addition, 7th grade is the point where students' math course-taking paths clearly begin to diverge:

■ A small group of the most advanced 7th graders take Algebra I.

■ More than half of students will take Algebra I in 8th grade, with mixed success.

■ Another large portion will not be placed into a full Algebra I course—or otherwise complete the course—until 9th grade or later.

All of these students will be tested on 7th grade math content again, however, and their high school success depends on mastering it early.

■ Those who do not take a full Algebra I course in 8th or 9th grade will take the General Mathematics CST, which tests mostly 7th grade content.

■ All students will be tested on primarily 7th grade math content when they take the California High School Exit Examination (CAHSEE), which they must pass to get a high school diploma.

At a minimum, all California students are required to successfully pass Algebra I in order to receive a high school diploma. But Algebra I also functions as the gateway to more advanced math and science coursework. Where students stand at the end of 7th grade determines how quickly and successfully they get through that gateway. That makes 7th grade math an important *pivot point* in the K–12 math pipeline.

If California is going to increase the number of students who can succeed in sophisticated math and science courses in high school—and effectively pursue STEM degrees and careers after graduation—it must improve and accelerate many students' mathematical skills and understanding through 7th grade.

A growing number of 7th graders meet the state's expectations, but math achievement varies dramatically based on student ethnicity

Student achievement in 7th grade, as measured by the Grade 7 Mathematics CST, is a significant indicator of how students have fared in math through the elementary and middle grades. A small proportion of students do take the Algebra I CST instead of the grade-level CST—a practice that began in 2007—because they are already enrolled in a full Algebra I course.

■ % Scoring Below Basic/Far Below Basic on Grade-level CST ■ % Scoring Basic on Grade-level CST ■ % Scoring Proficient/Advanced on Grade-level CST ■ % Taking the Algebra I CST

All 7th Graders

2003
2010

In 2003, only 30% of 7th graders scored *proficient* or *advanced* on the grade-level math CST. By 2010, 46% did so, and an additional 7% took the Algebra I CST.

However, in 2010, 21% scored *below* or *far below basic* on the grade-level test.

Notably, 48% of students scoring far below basic *and 37% of those scoring* below basic *on the Grade 7 Math CST in 2010 were English learners.*
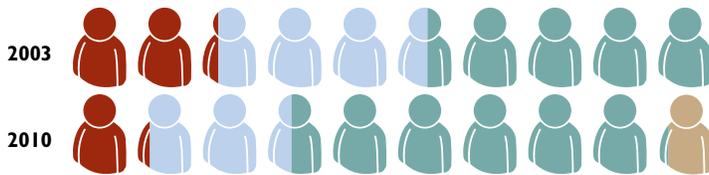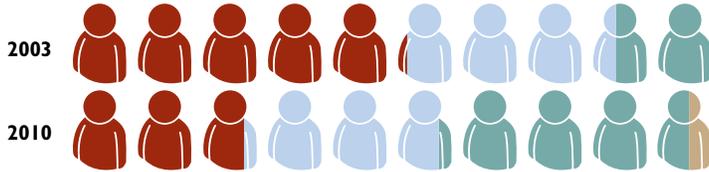
7th Graders by Ethnicity

Asian
2003
2010

Even in 2003, 59% of Asians scored *proficient* or *advanced.* In 2010, an additional 22% took the Algebra I CST.

White
2003
2010

In 2003, 44% of whites scored *proficient* or *advanced.* In 2010, 66% either scored *proficient* or *advanced* or took the Algebra I CST.

Latino
2003
2010

The percentage of Latinos who scored *proficient* or *advanced* more than doubled between 2003 and 2010 (16% to 38%).

African American
2003
2010

The percentage of African Americans scoring *proficient* or *advanced* rose 2½ times (12% to 31%).

But Latinos and African Americans were more likely to score *below* or *far below basic* in 2010 than Asians or whites were in 2003.

For 2010:

■ The percentages shown above for student achievement on the Grade 7 Mathematics CST differ from those reported by the state because they account for 7th graders who took the Algebra I CST. These were calculated by first multiplying the state-reported percent of students scoring at each achievement level by the total number of students tested (overall or in each subgroup) on the Grade 7 CST to find roughly how many students scored at each level. Then these numbers were divided by the sum of the number of students tested on the Grade 7 CST and the number of Grade 7 students tested on the Algebra I CST.

■ The percentage of students taking the Algebra I CST was calculated by dividing the number of students tested (overall or in each subgroup) on the Algebra I CST by the sum of the number of students tested on the Grade 7 CST and t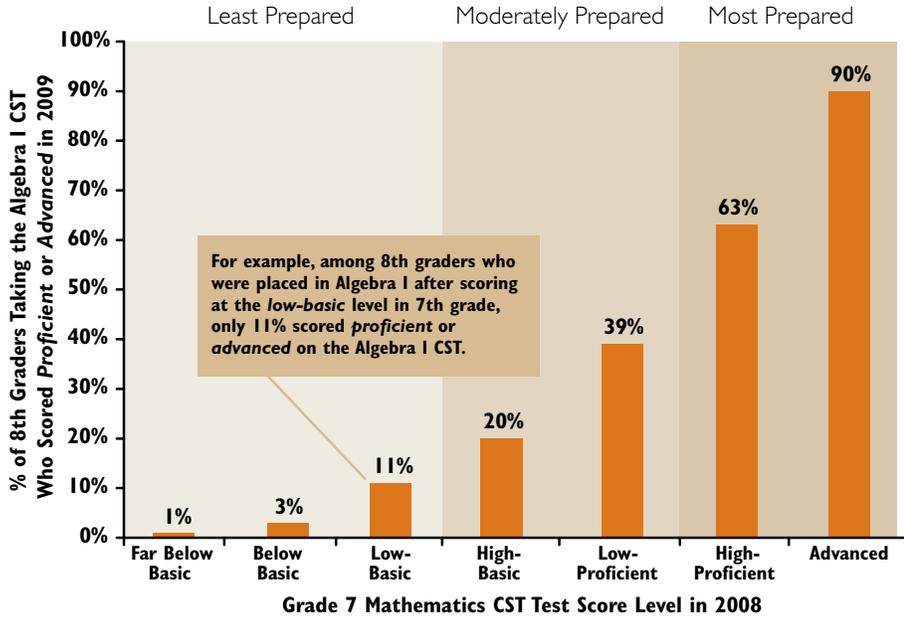he number of Grade 7 students tested on the Algebra I CST. Because 7th graders taking the Algebra I CST have performed extremely well to date—85% scored *proficient* or *advanced* in 2010—we count these students as "high achievers" in this graphic.

Mastery of 7th grade math concepts is a meaningful indicator of algebra readiness

Longitudinal data analysis from EdSource's 2010 report *Improving Middle Grades Math Performance* illustrates this connection. (For background, see the box on this page.)
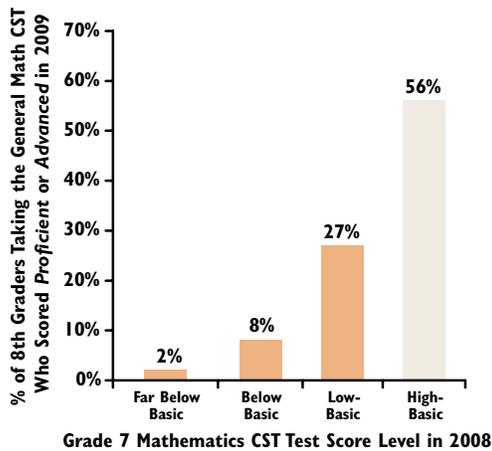
Among the 61% of students in the analysis who were placed in Algebra I in 8th grade, prior achievement mattered for success

Least Prepared   Moderately Prepared   Most Prepared

% of 8th Graders Taking the Algebra I CST Who Scored *Proficient or Advanced* in 2009

For example, among 8th graders who were placed in Algebra I after scoring at the low-basic level in 7th grade, only 11% scored proficient or advanced on the Algebra I CST.

Far Below Basic	Below Basic	Low-Basic	High-Basic	Low-Proficient	High-Proficient	Advanced
1%	3%	11%	20%	39%	63%	90%

Grade 7 Mathematics CST Test Score Level in 2008

Based on their Grade 7 CST scores:

The least prepared 8th graders had little chance of succeeding in Algebra I.

Moderately prepared 8th graders were clearly challenged by Algebra I, though most scored at least *basic*.

The most prepared 8th graders generally scored highly in Algebra I.

Among the 39% of 8th graders in the analysis who were not placed in Algebra I, the least prepared appear to have struggled with math concepts from earlier grades

% of 8th Graders Taking the General Math CST Who Scored *Proficient or Advanced* in 2009

Far Below Basic	Below Basic	Low-Basic	High-Basic
2%	8%	27%	56%

Grade 7 Mathematics CST Test Score Level in 2008

The vast majority of those with low scores in 7th grade proceeded to score below *proficient* on the General Mathematics CST in 8th grade. This test assesses content from grades 6 and 7, as defined by California's 1997 math content standards. In other words, the students who clearly struggled most to master this content initially appeared to still be struggling one year later.

Note: Grade 7 prior performance levels not shown: *low-proficient, high-proficient, advanced.*

The Analysis

At the 303 schools in EdSource's *Gaining Ground in the Middle Grades* study sample, 69,663 students took the Grade 7 Mathematics CST as 7th graders in 2008, followed by either the Algebra I CST or the General Mathematics CST as 8th graders in 2009.

EdSource and its research partners at Stanford University and the American Institutes for Research examined:

- How prepared these 8th graders were in math as measured by their grade 7 test scores;
- If they were placed in Algebra I; and
- How they scored in grade 8.

Test data used in this analysis came from a restricted-use longitudinal research file provided by the California Department of Education.

The lowest-achieving 7th graders are much less likely to pass the math section of the CAHSEE before high school graduation

	Averaged Grade 7 (ELA + Math) CST Scores 2003	These Students 5 Years Later…	% of Students Passing the Math Section of the CAHSEE by High School Graduation in 2008
Top Quartile (approximate)	360–600	→	99.6%
MEDIAN SCORE (APPROXIMATE)	325–359	→	99%
	290–324	→	93%
Bottom Quartile (approximate)*	255–289	→	**70%**
	150–254	→	**39%**

*HumRRO divided this subset of students into two groups, based on average Grade 7 scale score ranges roughly analogous to the *far below basic* and *below basic* performance levels on the Grade 7 Mathematics CST.

Note: The overall passage rate for students in the sample was 87% on the math section.

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Many students who score poorly in math in 7th grade continue to struggle with similar content through high school, according to the 2009 evaluation of the California High School Exit Examination (CAHSEE) prepared by HumRRO. The mathematics section of the CAHSEE also tests primarily 7th grade content.

The HumRRO report used longitudinal data for the class of 2008 to match students' 7th grade CST results (in 2003) with their CAHSEE results. It analyzed the relationship between students' averaged scale scores on the Grade 7 Math and English Language Arts CSTs with their CAHSEE passage rates by the end of high school.

The lowest-achieving 7th graders were much less likely to pass the math section of the CAHSEE before high school graduation. As is the case currently, there were considerable differences across ethnic groups in the proportion of students scoring at the lowest levels in 2003. African American and Hispanic 7th graders were much more likely to perform poorly than their Asian and white counterparts. Similarly, their chances of passing the CAHSEE by graduation were considerably lower.

Students' later prospects in math pivot on their success through 7th grade

For many years, California policy and debate around mathematics—especially in the middle grades—has focused on Algebra I. For example, California's school accountability policies have encouraged Algebra I in 8th grade, such that schools are penalized on the Academic Performance Index (API) when 8th graders take the General Mathematics CST. If an 8th grader scores *proficient* on the General Mathematics CST, the student's school only gets credit for a score of *basic*—one level lower—for state school accountability purposes.

However, careful placement into an appropriate math course in 8th grade—whether Algebra I or not—is essential to ensure that all 8th graders are not only challenged, but also have a meaningful chance of success. Placing all students into Algebra I in 8th grade regardless of their prior achievement sets up many students to fail—even though their prospects could be predicted based on their 7th grade scores.

Thus, 7th grade appears to be the crucial pivot point. Students' skill and understanding in math through 7th grade is both a benchmark indicator of the quality of students' educational experiences in math thus far and a meaningful predictor of their future success in the subject, including algebra.

Students who struggle the most in math in 7th grade often continue to struggle with similar content throughout high school. In the long run, strengthening math achievement *before and through* 7th grade—and narrowing gaps between different student groups—is essential to ensure that all students are prepared to advance toward college and career readiness. Even increasing first-time CAHSEE passage rates in 10th grade would be an important indication that efforts made years earlier to improve math achievement are paying off. Ideally, this would also result in fewer students placing into the lowest levels of developmental math at community college. ▯

To Learn More

■ Williams, Haertel, Kirst, Rosin, & Perry. (2011). *Preparation, Placement, Proficiency: Improving Middle Grades Math Performance.* Policy and Practice Brief. Mountain View, CA: EdSource. www.edsource.org

■ Becker, Wise, & Watters, Eds. (2009). *Independent Evaluation of the California High School Exit Examination (CAHSEE): 2009 Evaluation Report, Volume 1.* Alexandria, VA: HumRRO. See Chapter 4, "A Closer Look at Students Who Did Not Pass." www.cde.ca.gov/ta/tg/hs/evaluations.asp