



# FAQs:Mathematcs Curriculum Study

## About the Study

### What is the High School Transcript Study?

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The Nation's Report Card™ presents results from the National Assessment of Educational Progress (NAEP). NAEP is a continuing and nationally representative assessment of what our nation's students know and can do in mathematics, reading, science, writing, geography, U.S. history, civics, and other subjects. Results can be used by teachers, principals, parents, policymakers, and researchers to assess progress and develop ways to improve education in the United States.

NAEP is a congressionally authorized project of the National Center for Education Statistics (NCES) within the Institute of Education Sciences (IES) of the U.S. Department of Education.

### What is the High School Transcript Study?

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The High School Transcript Study (HSTS) collects and analyzes transcripts from a representative sample of America's public and private high school graduates. The study examines the types of courses that graduates took during high school, how many credits they earned, and the grade point averages (GPAs) they earned. The HSTS also explores the relationship between coursetaking patterns and student achievement, as measured by the NAEP.

### What is the Mathematics Curriculum Study?

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The Mathematics Curriculum Study (MCS) is an extension of the previously released NAEP High School Transcript Study (HSTS), which examined the types of courses that graduates took during high school. The MCS expands upon this information and explores the relationship between student coursetaking and achievement by examining the content and challenge of Algebra I and Geometry courses. Textbooks from those courses were analyzed to identify the mathematics topics covered and the difficulty of the review questions accompanying each chapter.

### How many schools and students participated in the study?

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The results presented in this report are based on approximately 17,800 high school graduates from roughly 550 public high schools across the country.

# About Textbook Coding

## What if a student took algebra I or geometry before entering high school?

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The MCS only examined the algebra I and geometry courses that students took during high school (i.e. between ninth and twelfth grades). If a student took an algebra I or geometry course before ninth grade, then that student was not part of the respective algebra I or geometry analyses.

Note that, in 2005, approximately 20 percent of high school graduates took algebra I before the ninth grade. Not knowing the measures of mathematics topic content and cognitive challenge for the algebra I courses taken before the ninth grade may have impacted the algebra I results presented in the MCS report.

## How does the Mathematics Curriculum Study relate to the Common Core of Standards for mathematics courses?

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The product of a collaboration of the Council of Chief State School Officers and the National Governors Association, the Common Core State Standards for Mathematics (CCSSM) is a recent effort to define a national mathematics curriculum or standards for what students should know and be able to do. The CCSSM contains an elaborate framework of subject matter knowledge and practices.

As with previous guidelines and standards, CCSSM specifies standards for each year from kindergarten through eighth grade. Standards for high school, however, are much less prescriptive, with content areas grouped into conceptual categories that cover the whole of high school mathematics but may possibly cross course boundaries.

The CCSSM is structured around six “conceptual” categories – number and quantities, algebra, functions, geometry, modeling, and statistics and probability – that spans traditional high school courses typically taken over at least three years. The algebra I and geometry courses covered by the MCS, along with algebra II, would be the major source of exposure to the first four categories for most high school graduates.

# About the Results

## What results does the Mathematics Curriculum Study report?

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The report splits results into three sections. The first section examines profiles of the mathematics topics taught in average Algebra I, Geometry, and Integrated Mathematics courses. It also examines the content and rigor of Algebra I and Geometry courses. The second section compares the school titles of their algebra I and geometry courses to the content and rigor of those courses. The third section relates students’ mathematics coursework to their NAEP mathematics performance.

All results presented in this report are at the national level, with some additional analyses broken down by student race/ethnicity. Both the curriculum topics and course levels discussed in the results were developed specifically for this study.

## How are curriculum topics defined in the results?

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The six curriculum topics presented in the report are broad categories of mathematics topics that are covered in algebra I and geometry courses. These six curriculum topics are elementary and middle school mathematics, introductory algebra, advanced algebra, two-dimensional geometry, advanced geometry, and other high school mathematics. A table with a brief description of these curriculum topics follows:

- Elementary and middle school mathematics: Basic arithmetic and pre-geometry;
- Introductory algebra: Pre-algebra, basic algebraic equations, and basic number theory;
- Advanced algebra: Advanced equations, basic functions, advanced functions, and advanced number theory;
- Two-dimensional geometry: Basic geometry concepts and properties of shapes;
- Advanced geometry: Three-dimensional geometry, coordinate geometry, and vector geometry; and
- Other high school mathematics: Trigonometry, pre-calculus, statistics, validation and structuring, discrete mathematics, finite mathematics, and calculus.

## How are course levels defined?

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Course levels are rankings of algebra I and geometry courses that high school graduates took, based on the combination of content and challenge of each course, as determined by the textbooks used. Courses were assigned only one course level. There are three course levels—beginner, intermediate, and rigorous—for both Algebra I and Geometry courses. A table with a brief description of these course levels follows:

- Beginner: Covers more introductory material and less advanced material than an intermediate course;
- Intermediate: Contains a balanced mix of both introductory and advanced material; and
- Rigorous: Covers more advanced material and less introductory material than an intermediate course

## Which NAEP results are reported?

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NAEP scores can be reported for those students who participated in both the 2005 MCS and NAEP twelfth-grade mathematics assessment. Instead of reporting the overall scores, the subscale scores for both algebra and geometry were reported. The subscale scores allowed for comparisons of students' algebra and geometry scores on the NAEP assessment compared to the course level of their Algebra I and Geometry courses, respectively. Both sets of subscale scores are reported on a 0-300 point scale.

## What information do the results provide for parents?

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Parents will find that not all Algebra I and Geometry classes are the same. Results from the MCS show that the title a school assigns an Algebra I or Geometry class does not necessarily reflect the content taught within the class.

To understand what their children are learning in their mathematics classes, parents can take a close look at the textbooks the classes use. They can see what topics are covered, what exercises their children are asked to perform, and what skills are required to solve them. Parents can ask themselves: "Does the algebra I textbook discuss advanced equations and functions? Does the geometry textbook cover a lot of elementary and middle

school mathematics topics? Do the textbook exercises ask for simple recall of facts or encourage developing strategies for solving problems?"

## What information do the results provide for teachers?

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Teachers can glean the fact that algebra I and geometry courses that emphasize advanced mathematic content and more challenging exercises can raise students' mathematics performance. Results from the study show that students who took rigorous level Algebra I and Geometry courses tended to take more advanced mathematics coursework and score higher on the NAEP mathematics assessment. Teachers can review the textbooks used in their courses and decide if they include advanced content and challenging exercises. If not, then teachers may want to supplement the textbooks with material that emphasizes advanced content. Materials that include classroom examples and provide homework problems that emphasize problem solving, or require students to prove theorems rather than plug in formulas, may help to boost the rigor of their courses.

## What information do the results provide for education policymakers?

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Education policymakers may realize the need to define and increase the level of challenge of the curricula for Algebra I and Geometry courses taught within their schools. Results from the study show that approximately four-fifths of "honors" Algebra I classes and two-thirds of "honors" Geometry classes are not rigorous level courses. Students and their parents expect that courses reflect the mathematical content and challenge suggested by their course titles. Mislabeled courses may result in students not receiving the instruction they expected. Schools can pay greater attention to clearly communicating what curricula is taught in all levels of their Algebra I and Geometry classes, while ensuring the curricula is truly being taught. Taking such measures can better prepare their students for future mathematics courses.

## Does NCES plan to release information about which schools used the textbooks analyzed in this study?

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No, the data disclosure policies established for both NAEP and HSTS prohibit the release of confidential data that may be used to identify participating schools or students. Therefore, NCES cannot disclose the textbooks used for algebra I and geometry courses by the schools that participated in the study.