NAEP 2012

Trends in Academic Progress

Reading 1971–2012 | Mathematics 1973–2012

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

U.S. Department of Education
NCES 2013–456

The Nation's Report Card

Contents

What Is The Nation's Report Card™?

The Nation's Report Card™ informs the public about the academic achievement of elementary and secondary students in the United States. Report cards communicate the findings of the National Assessment of Educational Progress (NAEP), based on assessments conducted periodically in reading, mathematics, science, writing, U.S. history, civics, geography, and other subjects.

NAEP collects and reports information on student performance at the national, regional, and—since 1990 for main NAEP—state levels. Main NAEP assessments track student performance in grades 4, 8, and 12. Since 1971, NAEP's long-term trend assessments have tracked student progress at ages 9, 13, and 17. These assessments are an integral part of our nation's evaluation of the condition and progress of education. Only academic achievement data and related contextual information are collected. The privacy of individual students and their families is protected.

NAEP is a congressionally authorized project of the National Center for Education Statistics (NCES) within the Institute of Education Sciences of the U.S. Department of Education. The Commissioner of Education Statistics is responsible for carrying out the NAEP project. The National Assessment Governing Board oversees and sets policy for NAEP.

Executive Summary

Since the 1970s, the National Assessment of Educational Progress (NAEP) has monitored the academic performance of 9-, 13-, and 17-year-old students with what have become known as the long-term trend assessments. Four decades of results offer an extended view of student achievement in reading and mathematics. Results in this report are based on the most recent performance of more than 50,000 public and private school students who, by their participation, have contributed to our understanding of the nation's academic achievement.

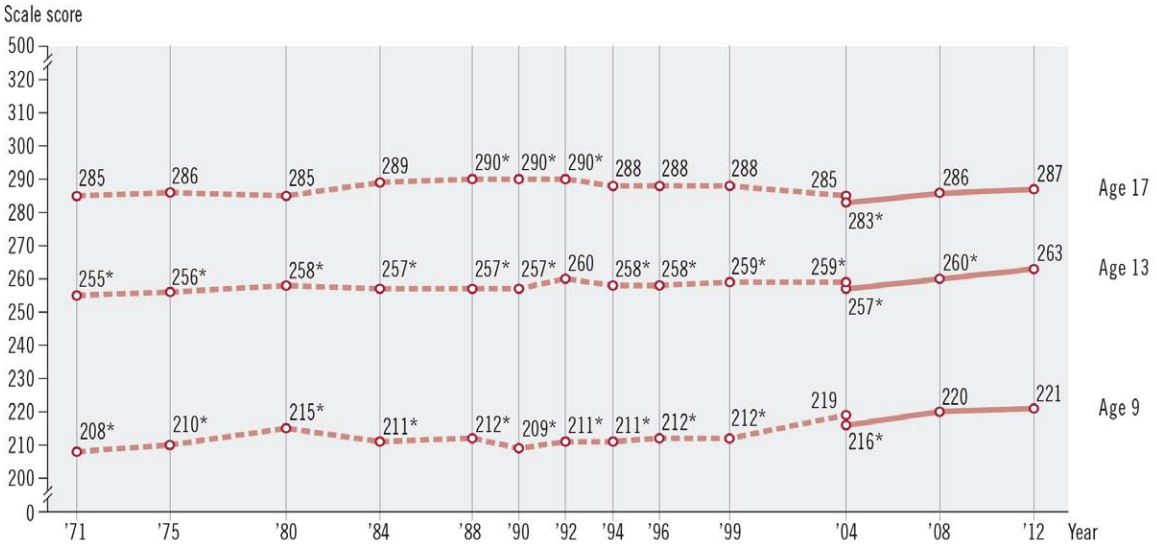
Nine- and 13-year-olds make gains

Both 9- and 13-year-olds scored higher in reading and mathematics in 2012 than students their age in the early 1970s (**figure A**). Scores were 8 to 25 points higher in 2012 than in the first assessment year. Seventeen-year-olds, however, did not show similar gains. Average reading and mathematics scores in 2012 for 17-year-olds were not significantly different from scores in the first assessment year.

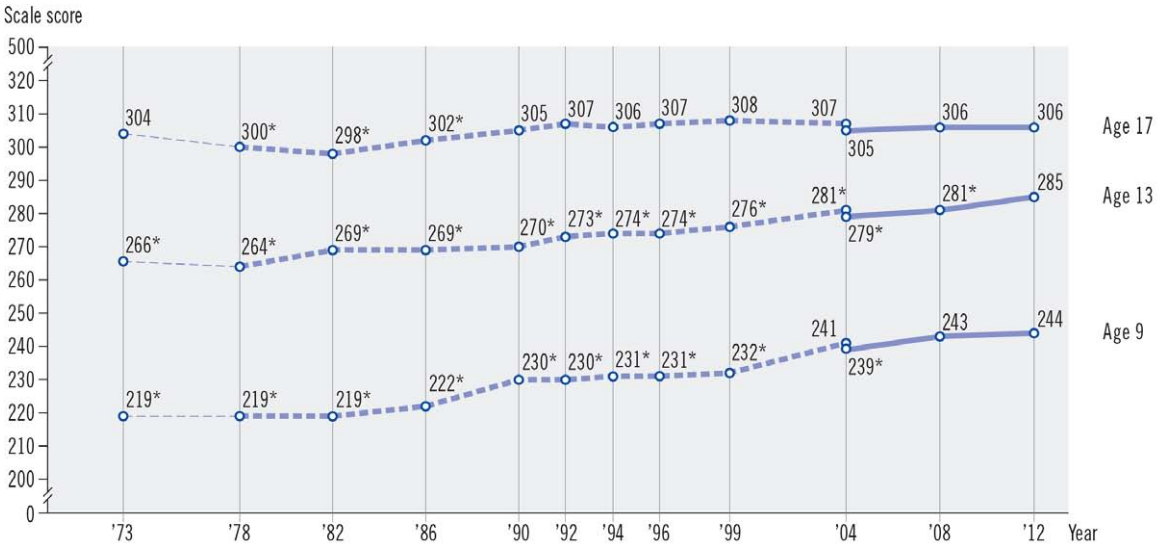
Since the last administration of the assessments in 2008, only 13-year-olds made gains—and they did so in both reading and mathematics.

Figure A. Trend in NAEP reading and mathematics average scores for 9-, 13-, and 17-year-old students

Reading



Mathematics



* Significantly different ($p < .05$) from 2012.

Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed

Original assessment format using the same assessment procedures established for the first assessment year

Revised assessment format introducing more current assessment procedures and content

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading and Mathematics Assessments.

Racial/ethnic and gender gaps narrow

Closing achievement gaps is a goal of both national and state education policy. The results from the 2012 NAEP long-term trend assessments show some progress toward meeting that goal. The narrowing of the White – Black and White – Hispanic score gaps in reading and mathematics from the 1970s is the result of larger gains by Black and Hispanic students than White students. Only the White – Hispanic gap in mathematics at age 9 has not shown a significant change from the early 1970s.

Female students scored higher in reading than male students at all three ages. The 2012 results show 9-year-old males making larger score gains than females. This has led to a narrowing of the gender gap at age 9 as compared to 1971.

In mathematics, male 17-year-old students scored higher than female students. The gender gap at age 17 narrowed because female students made gains from 1971 to 2012, but 17-year-old male students did not.

Reading

Characteristic	Score changes from 1971			Score changes from 2008		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
All students	⬆ 13	⬆ 8	⬌	⬌	⬆ 3	⬌
Race/ethnicity						
White	⬆ 15	⬆ 9	⬆ 4	⬌	⬌	⬌
Black	⬆ 36	⬆ 24	⬆ 30	⬌	⬌	⬌
Hispanic[1]	⬆ 25	⬆ 17	⬆ 21	⬌	⬆ 7	⬌
Gender						
Male	⬆ 17	⬆ 9	⬆ 4	⬌	⬌	⬌
Female	⬆ 10	⬆ 6	⬌	⬌	⬆ 3	⬌
Score gaps						
White – Black	Narrowed	Narrowed	Narrowed	⬌	⬌	⬌
White – Hispanic	Narrowed	Narrowed	Narrowed	⬌	Narrowed	⬌
Female – Male	Narrowed	⬌	⬌	⬌	⬌	⬌

Mathematics

Characteristic	Score changes from 1973			Score changes from 2008		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
All students	⬆ 25	⬆ 19	⬌	⬌	⬆ 4	⬌
Race/ethnicity						
White	⬆ 27	⬆ 19	⬆ 4	⬌	⬌	⬌
Black	⬆ 36	⬆ 36	⬆ 18	⬌	⬌	⬌
Hispanic	⬆ 32	⬆ 32	⬆ 17	⬌	⬌	⬌
Gender						
Male	⬆ 26	⬆ 21	⬌	⬌	⬌	⬌
Female	⬆ 24	⬆ 17	⬆ 3	⬌	⬆ 5	⬌
Score gaps						
White – Black	Narrowed	Narrowed	Narrowed	⬌	⬌	⬌
White – Hispanic	⬌	Narrowed	Narrowed	⬌	⬌	⬌
Male – Female[2]	⬌	⬌	Narrowed	⬌	⬌	⬌

[1] Reading results for Hispanic students were first available in 1975. Therefore, the results shown in the 1971 section for Hispanic students are from the 1975 assessment.

[2] Score differences between male and female students in mathematics were not found to be statistically significant ($p < .05$) at age 9 in 1973, 2008, or 2012, and at age 13 in 1973 and 2012.

NOTE: Black includes African American, and Hispanic includes Latino. Race categories exclude Hispanic origin.

⬆ Indicates score was higher in 2012

⬌ Indicates no significant change in 2012

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading and Mathematics Assessments.

Introduction

The National Assessment of Educational Progress (NAEP) long-term trend assessments provide the most extended retrospective picture of student achievement in the United States. Results span four decades of student performance by 9-, 13-, and 17-year-olds in two major subject areas. Reading results are available for 12 assessments dating back to 1971, and mathematics results are available for 11 assessments dating back to 1973.

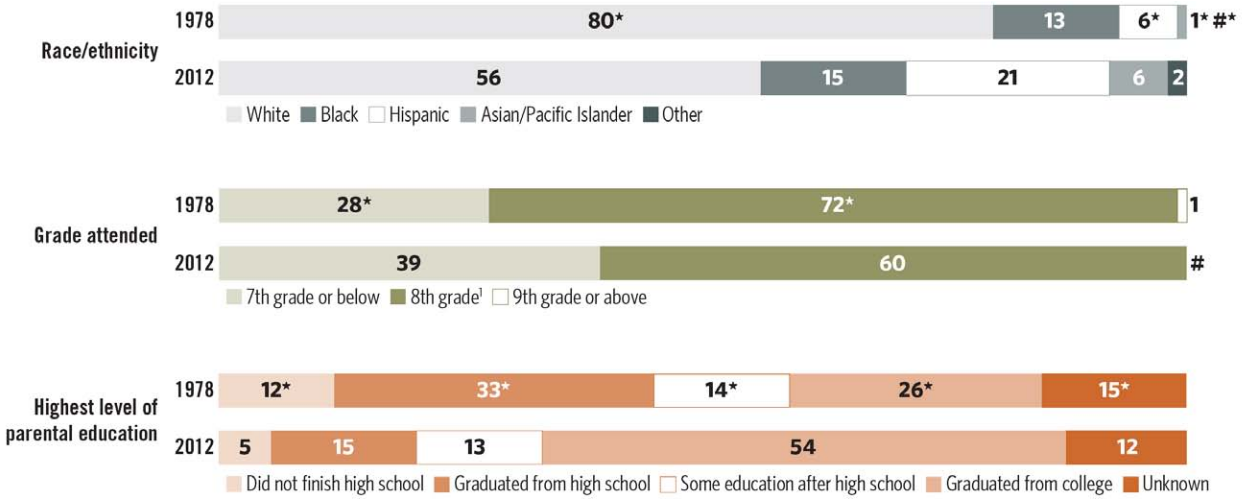
There are two separate components of NAEP—long-term trend assessments and main assessments. Results from the long-term trend assessments are not directly comparable to those from the main assessments because the long-term trend assessments use different questions and because students are sampled by age rather than by grade. Learn more about the differences between the two NAEP assessments at http://nces.ed.gov/nationsreportcard/about/ltt_main_diff.asp.

Changes in the Student Population

Over the past four decades, the demographic makeup of American students has changed considerably. Notably, Hispanic students now account for a larger proportion of students, and White students account for a lower proportion, than in the 1970s. At age 13, for example, the proportion of Hispanic students more than tripled between 1978 and 2012, while the proportion of White students decreased from 80 percent to 56 percent (**figure 1**). These changes were similar at ages 9 and 17 (see appendix **tables A-1** and **A-2**).

Another notable change is that students at all three ages tend to be in lower grades now than they were in the past. For example, 72 percent of 13-year-olds were in 8th grade in 1978 compared with 60 percent in 2012. The proportion of 13-year-olds in 7th grade or below has increased from 28 percent to 39 percent over the same period. Similar patterns in grade enrollment were observed for 9- and 17-year-olds.

Figure 1. Percentage distribution of 13-year-old students assessed in NAEP mathematics, by selected characteristics: 1978 and 2012



Rounds to zero.
* Significantly different ($p < .05$) from 2012.
† Typical grade for age group.
NOTE: Results for 1978 are from the original assessment format, and results for 2012 are from the revised assessment format. Black includes African American, Hispanic includes Latino, Pacific Islander includes Native Hawaiian, and "other" includes American Indian/Alaska Native, two or more races, and unclassified. Race categories exclude Hispanic origin. Detail may not sum to totals because of rounding.

Accommodations and Exclusions in NAEP

NAEP aims to include all students sampled for the assessments including students with disabilities (SD) and English language learners (ELL). This goal is accomplished by allowing many of the same accommodations that students use on other tests such as extra testing time or individual administration. Some accommodations such as bilingual books and reading the test aloud to students are offered for the mathematics assessment but not for the reading assessment. Accommodations were first made available in the long-term trend assessments in 2004.

Information on exclusion rates of SD and/or ELL students was first collected in 1990. At that time, 4 to 6 percent of all students at each age group were excluded from the long-term trend assessments. By 2012, only 1 to 2 percent of all students at each age group were excluded (see appendix **table A-3**).

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1978 and 2012 Mathematics Assessments.

Reporting NAEP Results

The results in this report are based on nationally representative samples of students at ages 9, 13, and 17 from both public and private schools. The long-term trend assessments are not designed to provide results for individual states or large urban districts. More information on NAEP samples and participation of schools and students is provided in the Technical Notes.

This report summarizes students' performance on the NAEP long-term trend assessments in several different ways: average scores, percentiles, and performance levels. **Average scores** in reading and mathematics are reported on 0–500 scales for each subject. Although the scale range is the same for both reading and mathematics, scores cannot be compared across subjects because the scales are developed independently of one another.

Scores for students at five selected **percentiles** indicate whether or not changes in the overall average scores are reflected in the performance of lower performing students (at the 10th and 25th percentiles), middle performing students (at the 50th percentile), or higher performing students (at the 75th and 90th percentiles).

Percentages of students attaining **performance levels** that correspond to five points on the scale (150, 200, 250, 300, and 350) provide information about changes in what students know and can do. The knowledge and skills associated with each level are described in the reading and mathematics sections of this report. In each subject, the performance of 9-year-olds tends to concentrate within the lower three levels, 13-year-olds within the middle three levels, and 17-year-olds within the top three levels. Therefore, this report contains only results for the three performance levels most relevant for each age group.

Interpreting NAEP Results

The long-term trend assessments have undergone some changes over the past four decades. The potential effects of these changes were examined prior to implementation and the actual effects were monitored afterward to ensure that comparability of results was maintained across assessments. When changes in content and administration procedures were last implemented in 2004, NAEP administered the original and the revised versions of the assessment to ensure comparability of the results. Results from both versions of the 2004 assessment are presented in some of the tables and figures in this report.

An asterisk (*) is used in figures and tables to indicate that an earlier year's score or percentage is significantly different from the 2012 results. Changes in students' performance over time are summarized in the text by comparing 2012 results to those from the last assessment in 2008 and to results from the first year each subject was assessed. Only statistically significant differences are discussed as higher or lower. Statistical significance is set at a level of .05 with appropriate adjustments for multiple comparisons. More information on NAEP statistical standards is provided in the Technical Notes of this report.

Score gaps between student groups presented in the figures in this report are based on the difference between unrounded scores. Score point changes over time cited in the text are based on the differences between the rounded estimates used in the figures. The word "about" precedes the score point change if it would have rounded one point higher or lower when calculated using the unrounded estimates.

NAEP reports changes in performance, but is not designed to identify the causes of these changes. Trends in student performance based on demographic characteristics and educational experiences are reported but do not establish or imply a causal relationship. Many factors may influence student achievement, including educational practices and policies, availability of resources, and the demographic makeup of the student body. Such factors may change over time and vary among student groups.

The Long-Term Trend Assessment in Reading

What does the assessment measure?

The long-term trend reading assessment measures students' reading comprehension skills using an array of passages that vary by text types and length. These passages include expository texts, narrative pieces, poems, advertisements, and schedules. Locating specific information, identifying main ideas, and making inferences across a passage to provide an explanation are typical of the skills measured by assessment questions.

What did students do?

Students participating in the assessment read passages and responded to questions in three 15-minute sections. Each section contained three or four short passages and approximately 10 questions. The majority of the questions were presented in a multiple-choice format. Some questions and their corresponding materials were administered to more than one age group.

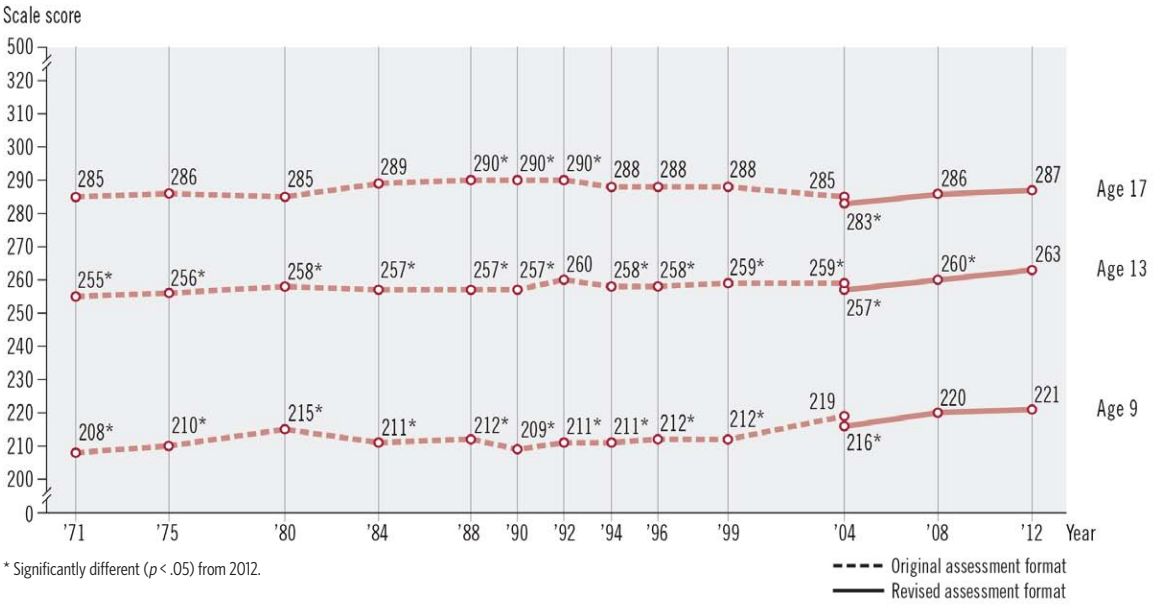
How did students perform?

Results from the 2012 NAEP long-term trend assessment show improvement in the reading skills of 9- and 13-year-olds compared to students their age in 1971, but no significant change in the performance of 17-year-olds. There is a pattern across all three age groups of long-term gains for lower performing students.

Nine- and 13-year-olds make long-term gains

The national trend in reading shows improvement at ages 9 and 13. Students in both age groups scored higher in 2012 than did students their age in 1971 (**figure 2**). Seventeen-year-olds did not show improvement. The average reading score in 2012 for 17-year-olds was not significantly different from the score in 1971.

Figure 2. Trend in NAEP reading average scores for 9-, 13-, and 17-year-old students



* Significantly different ($p < .05$) from 2012.

Thirteen-year-olds were the only age group to make score gains from 2008 to 2012.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

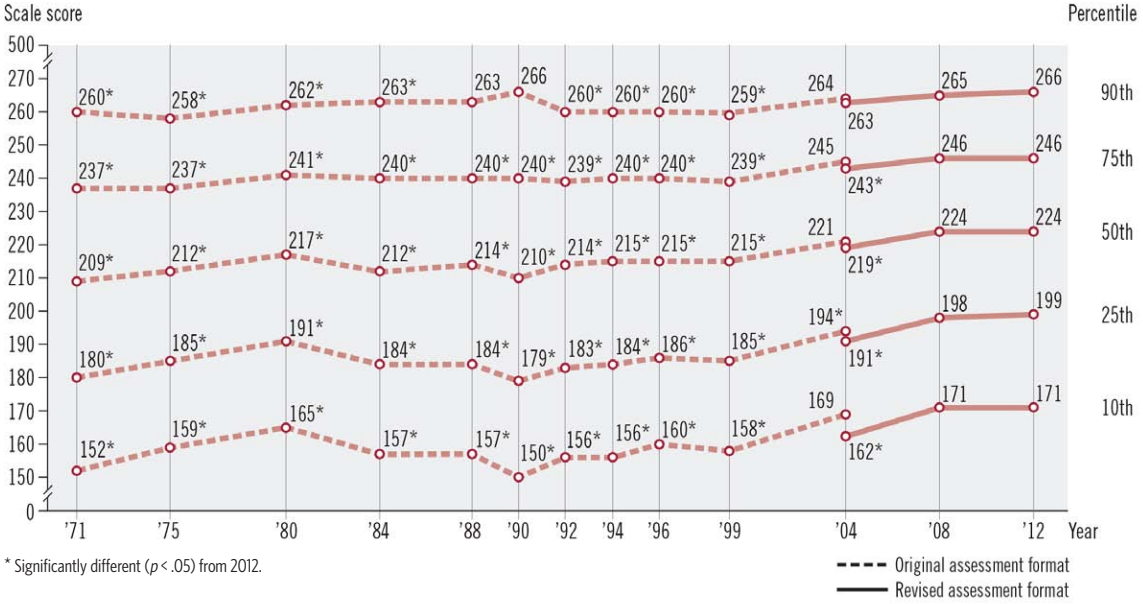
Lower, middle, and higher performing 9-year-olds make long-term gains

Percentile results provide information on which students are making progress. For example, changes in the scores of students performing at different percentiles indicate if overall trends are being driven by lower or higher performing students.

In 2012, the score increase for 9-year-olds in comparison to 1971 was evident at all five percentiles reported (**figure 3**). Larger gains were made by lower and middle performing students at the 10th, 25th, and 50th percentiles than by those at higher percentiles.

Scores for students at the 10th and 25th percentiles were **19** points higher than in 1971.

Figure 3. Trend in NAEP reading percentile scores for 9-year-old students



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

What 9-year-olds know and can do in reading

The item map below illustrates a range of reading behaviors associated with scores on the long-term trend reading scale. The cut scores for the three performance levels reported at age 9 are highlighted in boxes on the scale. The descriptions of selected assessment questions indicate what students need to do to receive credit for a correct answer. For example, 9-year-olds with a score of 201 were likely to be able to connect explicit details to recognize the main idea of an expository passage.

Age 9 NAEP Reading Item Map

Scale score	Question description
500	
//	
296	Infer the meaning of a supporting idea in a biographical sketch (MC - ages 13 and 17)
289	Generalize from details to recognize the meaning of a description (MC - ages 13 and 17)
278	Recognize a sequence of supporting details in a story excerpt (MC - age 13)
271	Interpret story details to recognize what happened (MC - age 13)
266	Recognize the main purpose of an expository passage (MC)
255	Recognize the main idea of instructions (MC - ages 13 and 17)
253	Retrieve and provide relevant information about the subject of a biographical sketch (CR - ages 13 and 17)
250	
244	Locate and recognize a fact in an expository passage (MC - age 13)
240	Recognize the similarity between two story characters (MC - ages 13 and 17)
237	Infer the characters' feelings based on the story dialogue (MC - age 13)
231	Make an inference to recognize generalization of the main topic (MC)
228	Recognize the main topic of a short paragraph (MC)
221	Make an inference based on explicit information in a biographical sketch (MC - ages 13 and 17)
214	Recognize the meaning of a figure of speech in a short poem (MC)
209	Recognize a supporting detail in a short document (MC - age 13)
209	Recognize an explicitly stated fact from a short expository passage (MC)
202	Retrieve and provide a relevant fact related to the main idea (CR - ages 13 and 17)
201	Connect explicit details to recognize the main idea (MC)
200	
198	Recognize an explicitly stated sequence from an expository passage (MC)
183	Use details and prior knowledge to infer a speaker (MC)
177	Recognize explicit information in an expository passage (MC)
161	Choose the best description of a text feature (MC)
153	Recognize an explicit detail from a poem (MC)
150	
//	
0	

CR Constructed-response question MC Multiple-choice question

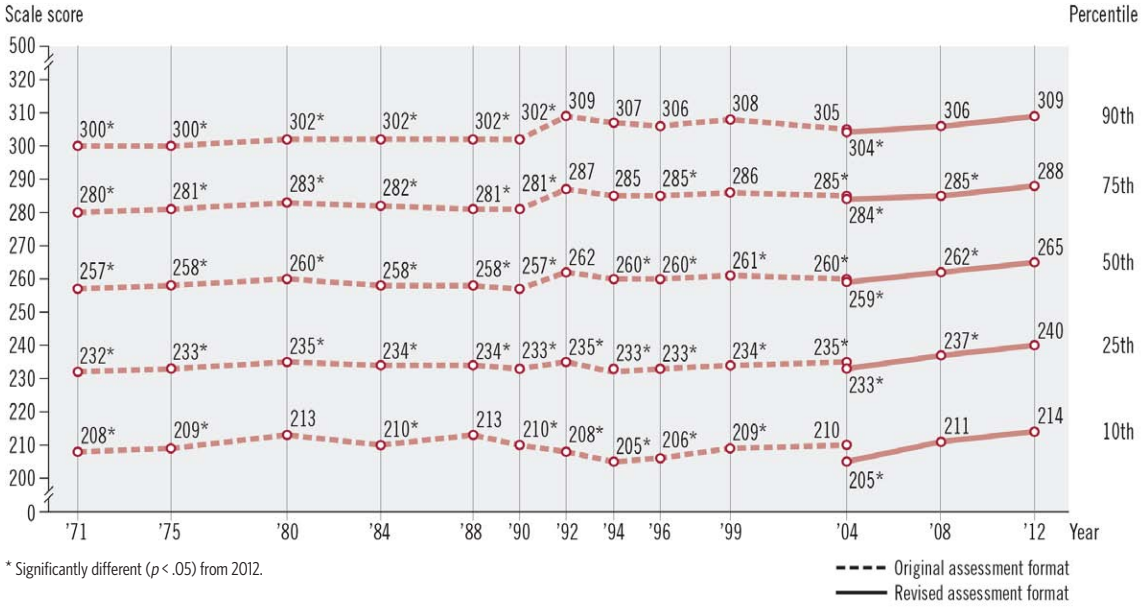
NOTE: Ages in parentheses indicate a cross-age question. The position of a question on the scale represents the scale score attained by students who had a 65 percent probability of successfully answering a constructed-response question, or a 74 percent probability of correctly answering a four-option multiple-choice question. For constructed-response questions, the question description represents students' performance rated as completely correct. Scores associated with the three performance levels reported for age 9 are boxed.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading Assessment.

Thirteen-year-olds make long- and short-term gains

The increase from 1971 to 2012 in the overall average score for 13-year-olds is reflected at all five percentiles—an indication that students across the performance distribution made gains (**figure 4**). The short-term gains since 2008 were not as broad. The overall score increase is reflected only at the 25th, 50th, and 75th percentiles.

Figure 4. Trend in NAEP reading percentile scores for 13-year-old students



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

What 13-year-olds know and can do in reading

As shown in the item map below, 13-year-olds with a score of 262 were likely to demonstrate the ability to summarize main ideas in an expository passage in order to provide a text-based description. Students with a score of 301 on the scale were likely to successfully provide an example to illustrate how the author of the story created a mood.

Age 13 NAEP Reading Item Map

Scale score	Question description
500	
//	
345	Provide an example of language and explain the effect on the reader (CR - age 17)
315	Provide relevant information about the subject of a biographical sketch and explain why it is important (CR - ages 9 and 17)
306	Support an opinion about a story using details (CR - ages 9 and 17)
301	Provide an example to illustrate the author's device for creating a mood (CR - age 17)
300	
291	Provide a description that reflects the main idea of a short science passage (CR - ages 9 and 17)
284	Recognize the meaning of a word as used in a document (MC - age 17)
284	Infer the meaning of a supporting idea in a biographical sketch (MC - ages 9 and 17)
282	Recognize an explicitly stated purpose in a process description (MC - age 17)
274	Recognize the sequence of a supporting detail in a story excerpt (MC - age 9)
266	Generalize from details to recognize the meaning of a description (MC - ages 9 and 17)
264	Recognize the main purpose of a description of a process (MC - ages 9 and 17)
262	Summarize the main ideas to provide a description (CR - age 17)
253	Connect explicit information to recognize the main idea in an expository passage (MC)
250	
248	Locate and recognize a relevant detail in a document (MC)
241	Locate and recognize a fact in an expository passage (MC - age 9)
229	Recognize the main idea of a short expository passage (MC)
223	Recognize a character's feeling in a short narrative passage (MC - age 17)
208	Provide a key fact related to the main topic of an expository passage (CR - ages 9 and 17)
200	Recognize a supporting detail in a short document (MC - age 9)
200	
184	Recognize an explicit detail from a poem (MC - age 9)
172	Infer the type of information based on a short paragraph (MC - age 17)
163	Provide a fact relevant to a then-now comparison (CR - ages 9 and 17)
//	
0	

CR Constructed-response question MC Multiple-choice question

NOTE: Ages in parentheses indicate a cross-age question. The position of a question on the scale represents the scale score attained by students who had a 65 percent probability of successfully answering a constructed-response question, or a 74 percent probability of correctly answering a four-option multiple-choice question. For constructed-response questions, the question description represents students' performance rated as completely correct. Scores associated with the three performance levels reported for age 13 are boxed.

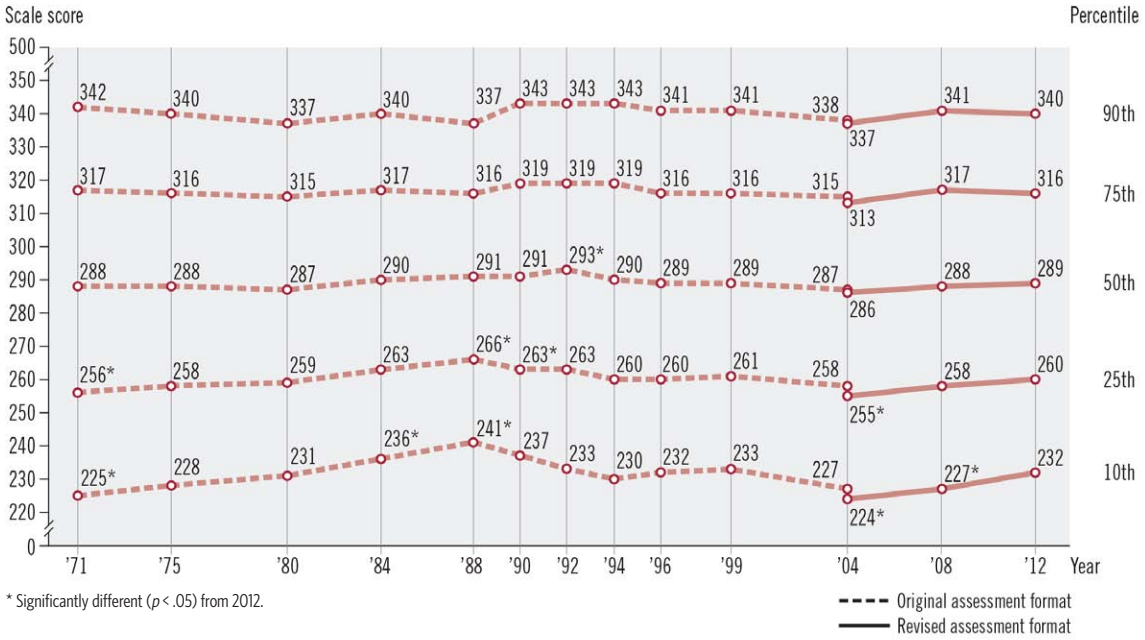
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading Assessment.

Lower performing 17-year-olds make gains

Lower performing 17-year-olds made gains since the early 1970s even though the overall average reading score for this age group did not change significantly (figure 5). Scores for students at the 10th and 25th percentiles were higher in 2012 than in 1971. Short-term gains since 2008 were made only by 17-year-olds performing at the 10th percentile.

The score at the 10th percentile was **7** points higher than in 1971 and about **5** points higher than in 2008.

Figure 5. Trend in NAEP reading percentile scores for 17-year-old students



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

What 17-year-olds know and can do in reading

As shown in the item map below, 17-year-olds with a score of 276 were likely to recognize the main point of a scientific passage. Seventeen-year-olds with a score of 316 were likely to be able to find specific information in a highly detailed schedule. Students at age 17 with a score of 387 were likely to provide text-based descriptions of the key steps in a process.

Age 17 NAEP Reading Item Map

Scale score	Question description
500	
//	
399	Extend the information in a short historical passage to provide comparisons (CR - ages 9 and 13)
387	Provide a text-based description of the key steps in a process (CR)
356	Make an inference to recognize a non-explicit cause in an expository passage (MC - age 13)
354	Provide a description that includes the key aspects of a passage topic (CR - ages 9 and 13)
350	
348	Infer and provide a moral based on a short tale (CR - ages 9 and 13)
341	Provide an example of language and explain its effect on the reader (CR - age 13)
337	Provide relevant information about the subject of a biographical sketch and explain why it is important (CR - ages 9 and 13)
329	Recognize a supporting detail from a scientific description (MC)
319	Provide an example to illustrate the author's device for creating a mood (CR - age 13)
316	Read a highly detailed schedule to locate specific information (MC - age 13)
300	
292	Provide a description that reflects the main idea of a science passage (CR - ages 9 and 13)
281	Infer the meaning of a supporting idea in a biographical sketch (MC - ages 9 and 13)
281	Use understanding of a poem to recognize the best description of the poem's speaker (MC)
276	Recognize the main point of a scientific passage (MC - age 13)
273	Recognize an explicitly stated purpose in a process description (MC - age 13)
269	Recognize the meaning of a word as used in a document (MC - age 13)
265	Recognize a causal relation in a historical description (MC - age 13)
258	Generalize from details to recognize the meaning of a description (MC - ages 9 and 13)
250	Recognize the main purpose of a description of a process (MC - ages 9 and 13)
250	
248	Summarize the main ideas in an expository passage to provide a description (CR - ages 9 and 13)
230	Support an opinion about a story using details (CR - ages 9 and 13)
224	Recognize an explicitly stated reason in a highly detailed description (MC)
216	Recognize a character's feeling in a short narrative passage (MC - age 13)
//	
0	

CR Constructed-response question MC Multiple-choice question

NOTE: Ages in parentheses indicate a cross-age question. The position of a question on the scale represents the scale score attained by students who had a 65 percent probability of successfully answering a constructed-response question, or a 74 percent probability of correctly answering a four-option multiple-choice question. For constructed-response questions, the question description represents students' performance rated as completely correct. Scores associated with the three performance levels reported for age 17 are boxed.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading Assessment.

Two-thirds or more of 13- and 17-year-olds are able to make text-based generalizations

Performance levels provide another perspective for interpreting long-term trend results. Changes in the percentages at or above each performance level reflect changes in the proportion of students who demonstrated the knowledge and skills associated with that level in responding to assessment questions.

Sixty-six percent of 13-year-olds and 82 percent of 17-year-olds performed at a level of 250 or above on the reading scale in 2012 (**figure 6**). Students at this level demonstrated the ability to search for specific information, interrelate ideas, and make generalizations based on what they read. Twenty-two percent of 9-year-olds demonstrated similar abilities in 2012. At all three ages, the percentages of students performing at or above level 250 were higher in 2012 than in 1971.

Reading Performance-Level Descriptions

The skills demonstrated by students at each reading performance level are described below. The five performance levels are applicable at all three age groups; however, the likelihood of attaining higher performance levels is related to a student's age. The performance level results presented for each age are those that are most likely to show significant change across the assessment years. For this reason, only three performance levels are discussed for each age. See the Technical Notes for information about how the levels were set.

Reported for age

LEVEL 350: Learn From Specialized Reading Materials — 17

Readers at this level can extend and restructure the ideas presented in specialized and complex texts. Examples include scientific materials, literary essays, and historical documents. Readers are also able to understand the links between ideas, even when those links are not explicitly stated, and to make appropriate generalizations. Performance at this level suggests the ability to synthesize and learn from specialized reading materials.

LEVEL 300: Understand Complicated Information — 17, 13

Readers at this level can understand complicated literary and informational passages, including material about topics they study at school. They can also analyze and integrate less familiar material about topics they study at school as well as provide reactions to and explanations of the text as a whole. Performance at this level suggests the ability to find, understand, summarize, and explain relatively complicated information.

LEVEL 250: Interrelate Ideas and Make Generalizations — 17, 13, 9

Readers at this level use intermediate skills and strategies to search for, locate, and organize the information they find in relatively lengthy passages and can recognize paraphrases of what they have read. They can also make inferences and reach generalizations about main ideas and the author's purpose from passages dealing with literature, science, and social studies. Performance at this level suggests the ability to search for specific information, interrelate ideas, and make generalizations.

LEVEL 200: Demonstrate Partially Developed Skills and Understanding — 13, 9

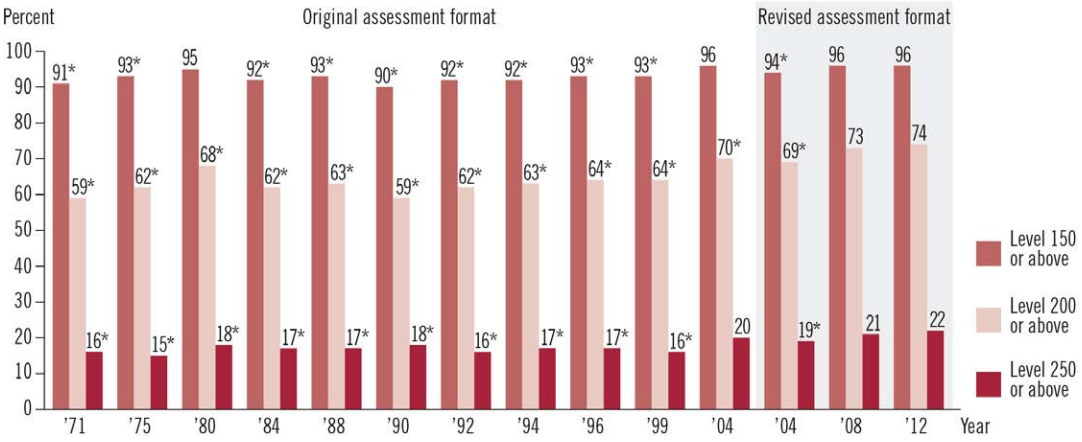
Readers at this level can locate and identify facts from simple informational paragraphs, stories, and news articles. In addition, they can combine ideas and make inferences based on short, uncomplicated passages. Performance at this level suggests the ability to understand specific or sequentially related information.

LEVEL 150: Carry Out Simple, Discrete Reading Tasks — 9

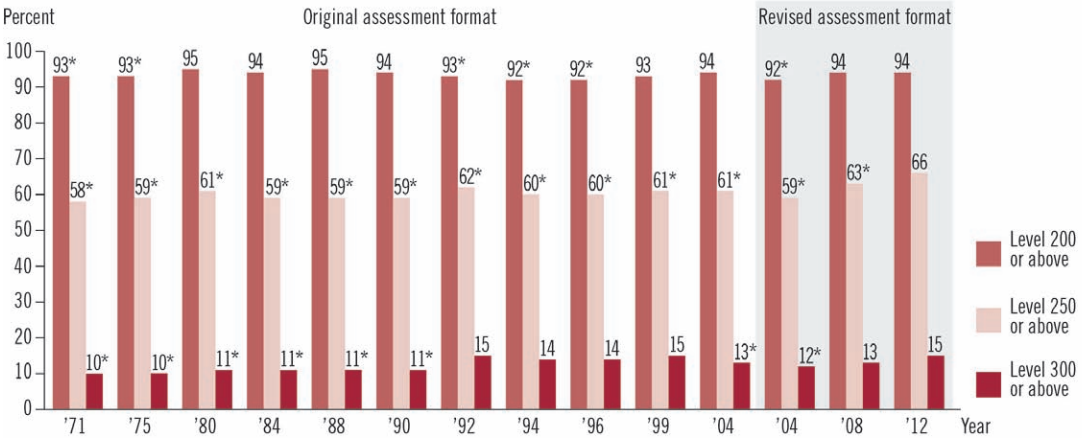
Readers at this level can follow brief written directions. They can also select words, phrases, or sentences to describe a simple picture and can interpret simple written clues to identify a common object. Performance at this level suggests the ability to carry out simple, discrete reading tasks.

Figure 6. Trend in NAEP reading performance-level results for 9-, 13-, and 17-year-old students

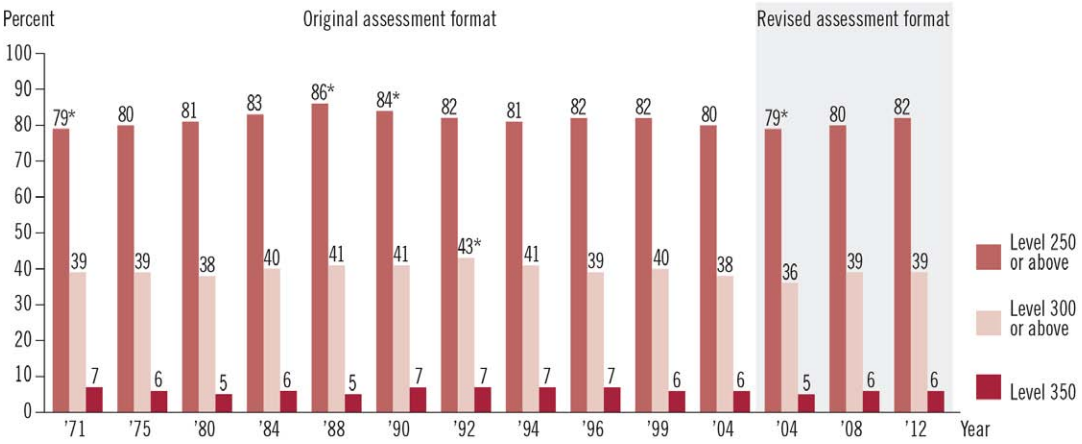
Age 9



Age 13



Age 17



* Significantly different ($p < .05$) from 2012.
NOTE: The revised assessment format introduced more current assessment procedures and content.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

Racial/ethnic score gaps narrow at all three ages

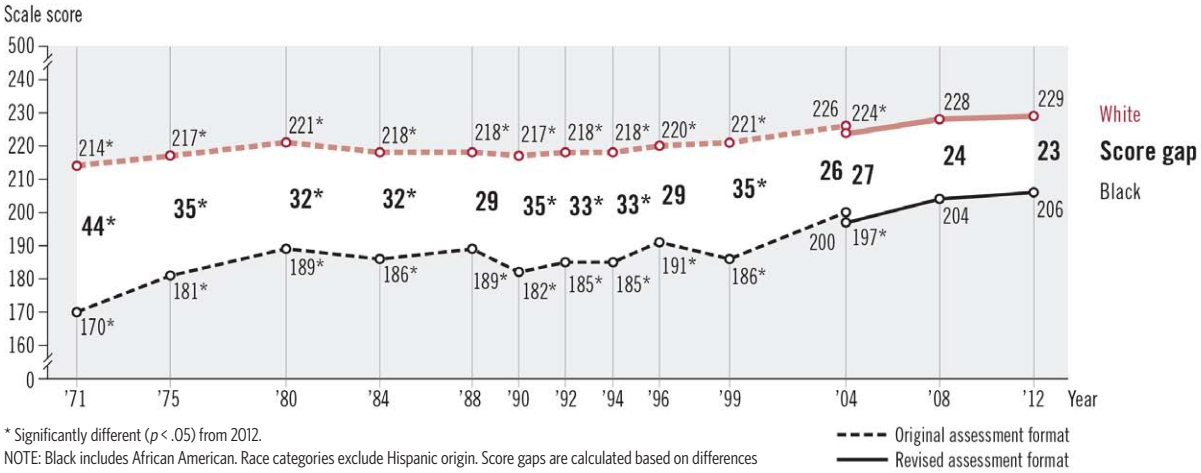
Even though White students continued to score 21 or more points higher on average than Black and Hispanic students in 2012, the White – Black and White – Hispanic gaps narrowed in comparison to the gaps in the 1970s at all three ages. The White – Black score gaps for 9- and 17-year-olds in 2012 were nearly half the size of the gaps in 1971.

Black and Hispanic 9-year-olds make larger gains than White students

The score gaps between White and Black students and between White and Hispanic students at age 9 narrowed from the 1970s because Black and Hispanic students made larger gains than did White students (**figures 7** and **8**). The average score for Black students was 36 points higher in 2012 than in 1971 (206 – 170) and the score for White students was 15 points higher (229 – 214). The average score for Hispanic students increased 25 points from 1975, and the score for White students increased 12 points.

Figure 7. Trend in NAEP reading average scores and score gaps for White and Black 9-year-old students

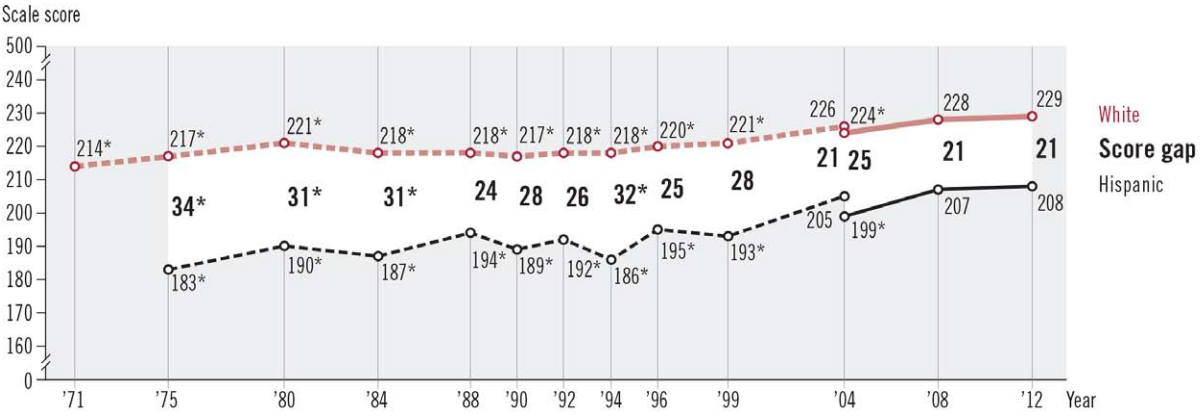
The White – Black score gap narrowed **21** points since 1971.



* Significantly different ($p < .05$) from 2012.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

Figure 8. Trend in NAEP reading average scores and score gaps for White and Hispanic 9-year-old students

The White – Hispanic score gap narrowed about **13** points since 1975.



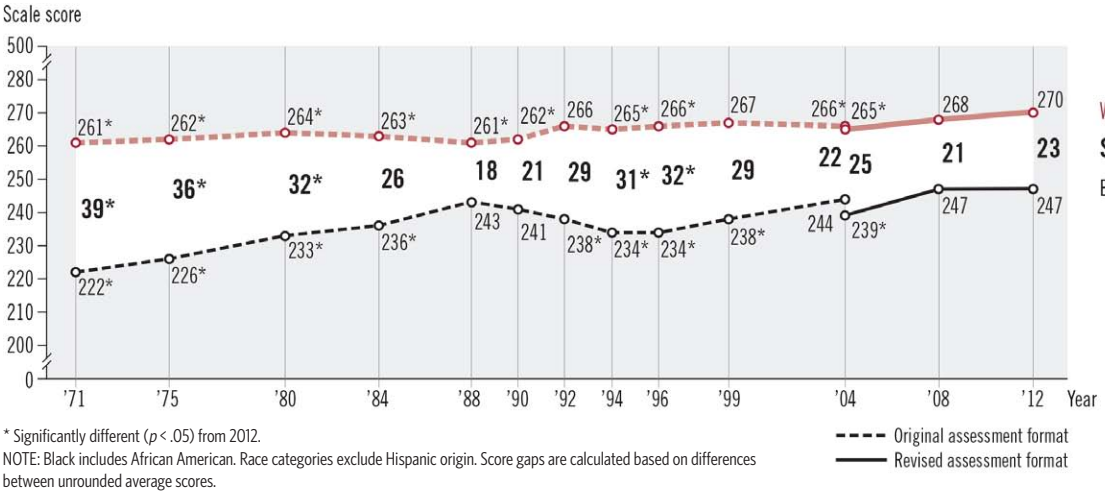
* Significantly different ($p < .05$) from 2012.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Results are not available for Hispanic students in 1971 because Hispanic was not reported as a separate category at that time. Score gaps are calculated based on differences between unrounded average scores.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

Thirteen-year-old Hispanic students make long- and short-term gains

The racial/ethnic score gap trends at age 13 are similar to those at age 9. Black and Hispanic students both made larger gains from the 1970s than White students, leading to a narrowing of the score gaps in 2012 (**figures 9** and **10**). Hispanic 13-year-olds are the only racial/ethnic group to make short-term reading score gains. The White – Hispanic gap narrowed 5 points since 2008.

Figure 9. Trend in NAEP reading average scores and score gaps for White and Black 13-year-old students



* Significantly different ($p < .05$) from 2012.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

The White – Black score gap narrowed **16** points since 1971.

Figure 10. Trend in NAEP reading average scores and score gaps for White and Hispanic 13-year-old students

* Significantly different ($p < .05$) from 2012.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Results are not available for Hispanic students in 1971 because Hispanic was not reported as a separate category at that time. Score gaps are calculated based on differences between unrounded average scores.

The White – Hispanic score gap narrowed **9** points since 1975.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

White, Black, and Hispanic 17-year-olds show improvement since the 1970s

Average reading scores for 17-year-olds increased 4 points from the first assessment year for White students, 30 points for Black students, and 21 points for Hispanic students (**figures 11** and **12**). Larger gains for Black and Hispanic students than for White students narrowed the White – Black and White – Hispanic gaps to about half of what they were in the 1970s.

The changing makeup of the student population is one reason why the overall average score for 17-year-olds has not changed significantly, even though student groups within the overall population are making gains. When an increase in the proportion of typically lower performing students is accompanied by a decrease in the proportion of higher performing students, the overall average score can remain unchanged even though the average scores for both higher and lower performing groups increase. This phenomenon is known as Simpson's paradox.

Figure 11. Trend in NAEP reading average scores and score gaps for White and Black 17-year-old students

The White – Black score gap narrowed **27** points since 1971.

* Significantly different ($p < .05$) from 2012.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

Figure 12. Trend in NAEP reading average scores and score gaps for White and Hispanic 17-year-old students

The White – Hispanic score gap narrowed about **20** points since 1975.

* Significantly different ($p < .05$) from 2012.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Results are not available for Hispanic students in 1971 because Hispanic was not reported as a separate category at that time. Score gaps are calculated based on differences between unrounded average scores.

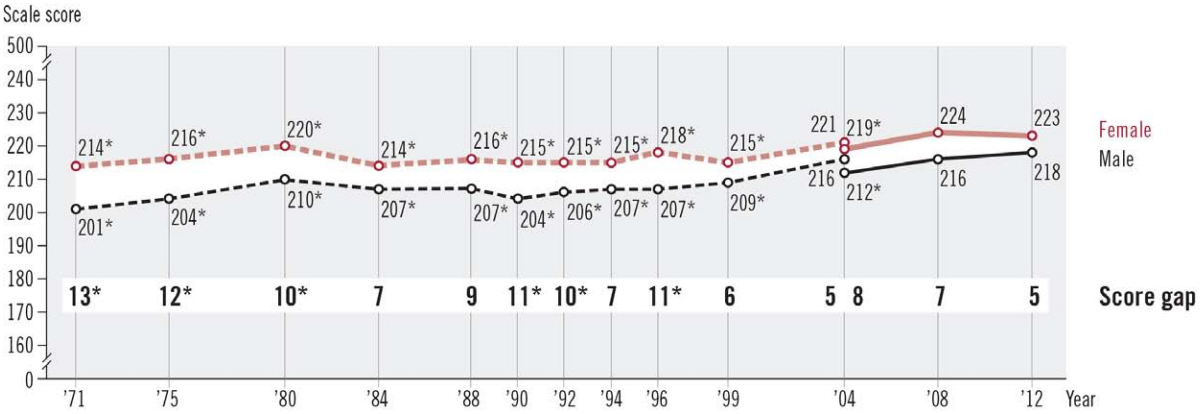
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

Gender gap narrows from 1971 only at age 9

Female students continue to score higher on average in reading than male students at all three ages in 2012 (**figure 13**). A larger gain from 1971 to 2012 for male students than for female students narrowed the score gap at age 9. Male students also made gains from 1971 to 2012 at ages 13 and 17; however, the score gaps did not change significantly.

Figure 13. Trend in NAEP reading average scores and score gaps for 9-, 13-, and 17-year-old students, by gender

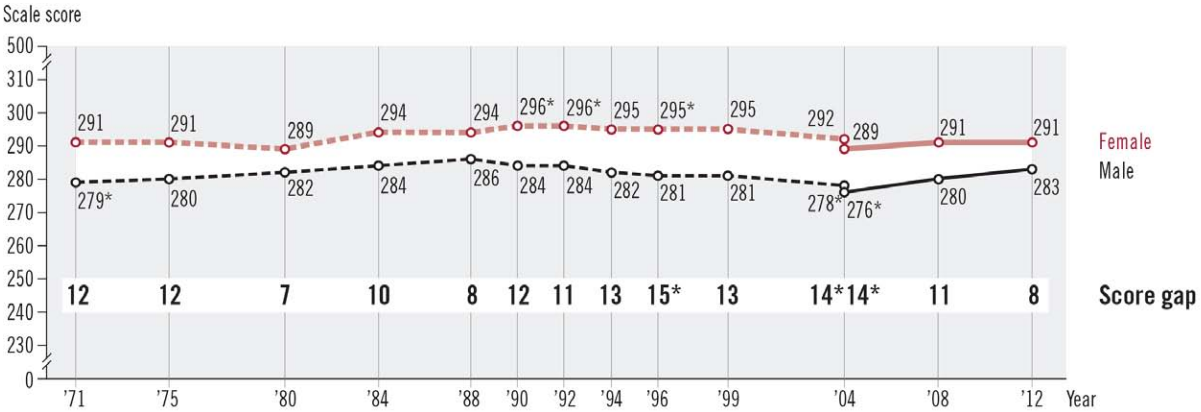
Age 9



The gender gap narrowed about **8** points since 1971.

Age 13

Age 17



* Significantly different ($p < .05$) from 2012.
NOTE: Score gaps are calculated based on differences between unrounded average scores.

Original assessment format
Revised assessment format

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

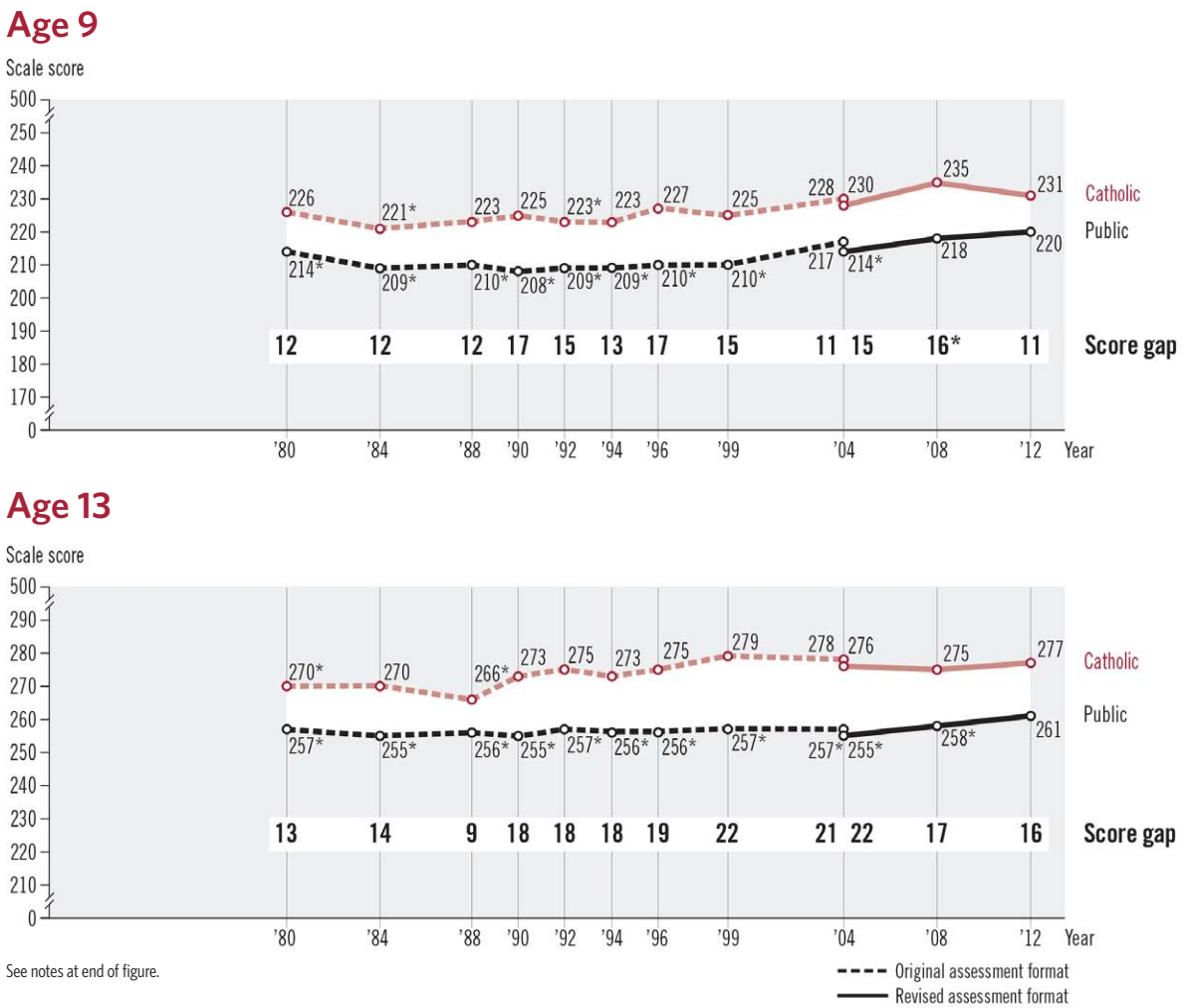
Thirteen-year-old public school students score higher than in 2008

Information about the type of school students were attending was first collected for the long-term trend reading assessment in 1980. Results for private schools overall are not presented in this report because participation rates fell below the required standard for reporting results in 2012. (See the Technical Notes for more information.)

Catholic school students have consistently had higher average scores than public school students since that time. In 2012, Catholic school students scored 11 to 23 points higher on average than public school students across the three age groups (**figure 14**). The score gaps in 2012 did not differ significantly from 1980.

As with overall average reading score results, the only age group to show improvement since 2008 was 13-year-olds. In this case, only public school 13-year-olds made significant gains.

Figure 14. Trend in NAEP reading average scores and score gaps for 9-, 13-, and 17-year-old students, by type of school



See notes at end of figure.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1980–2012 Long-Term Trend Reading Assessments.

Figure 14. Trend in NAEP reading average scores and score gaps for 9-, 13-, and 17-year-old students, by type of school—Continued

Age 17

* Significantly different ($p < .05$) from 2012.

NOTE: Score gaps are calculated based on differences between unrounded average scores. Results are not shown for private schools because the participation rate for private schools did not meet the minimum participation guidelines for reporting in 2012. At age 17, results are not shown for Catholic schools in 1996 and 2004 (original and revised assessment formats) because the participation rates for Catholic schools did not meet the minimum participation guidelines for reporting.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1980–2012 Long-Term Trend Reading Assessments.

Percentages of students in a grade below the one typical for their age increase

The long-term trend assessments are administered to samples of students defined by age rather than by grade. Nine-year-olds are typically in fourth grade, 13-year-olds are typically in eighth grade, and 17-year-olds are typically in eleventh grade. Some students in each age group, however, are in a grade that is below or above the grade that is typical for their age. For example, some 17-year-olds are in the tenth or twelfth grade rather than the eleventh grade. Different factors may contribute to why students are in a lower or higher grade than is typical for their age. Such factors could include students having started school a year earlier or later than usual, having been held back a grade, or having skipped a grade.

For each of the three age groups, the percentage of students below the grade typical for their age was larger in 2012 than in 1971 (**table 1**). At age 17, the percentage of students in twelfth grade was smaller in 2012 than in 1971.

Table 1. Percentage of students assessed in NAEP reading, by age group and grade attended: Various years, 1971–2012

Age group and grade attended	1971	1975	1980	1984	1988	1990	1992	1994	1996	1999	2004	2008	2012
Age 9													
3rd grade or below	24*	23*	28*	34*	37	42*	43*	40*	33*	30*	36	38	37
4th grade[1]	75*	76*	72*	66*	63	58*	57*	60*	67*	69*	63	62	63
5th grade or above	1*	1*	#*	#*	1	#	#	#	#	#	#	#	#
Age 13													
7th grade or below	28*	28*	28*	35*	39	39	43*	44*	38	38	38	41	39
8th grade[1]	71*	72*	71*	64*	61	60	56*	56*	61	62	62	59	60
9th grade or above	1	1	1	#	1	#	1	#	#	#	#	#	1
Age 17													
10th grade or below	14*	15*	14*	21	24	26*	28*	29*	32*	33*	25	26*	23
11th grade[1]	73	73	77*	70*	65*	65*	64*	63*	61*	63*	71	70*	73
12th grade	13*	12*	9*	9*	12*	9*	8*	7*	7*	4	4	4	4

Rounds to zero.
* Significantly different ($p < .05$) from 2012.
[1] Typical grade for age group.
NOTE: Results for 1971–99 are from the original assessment format, and results for 2004–12 are from the revised assessment format. Detail may not sum to totals because of rounding.

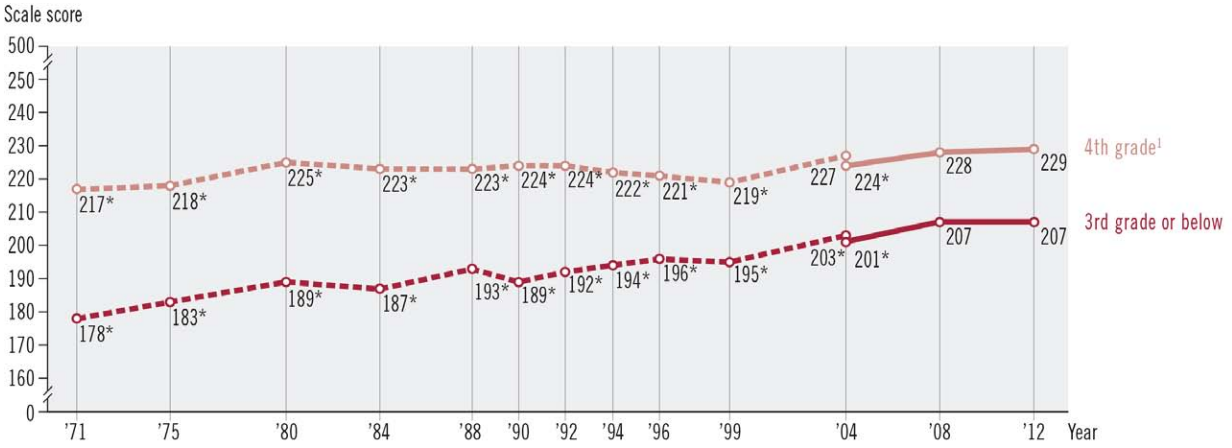
Nine-, 13-, and 17-year-olds who were in the grade typical for their age scored higher on average in 2012 than students who were in a lower grade (**figure 15**). The sample sizes in 2012 for 9- and 13-year-olds in grades higher than the grade typical for their age were too small to allow reporting on their performance.

Scores were higher in 2012 than in 1971 for 9- and 13-year-olds at or below their typical grade. The trend results at age 17 were mixed. Seventeen-year-olds who were in 10th grade or below had a higher average score in 2012 than in 1971, whereas 17-year-olds in the twelfth grade had a lower score.

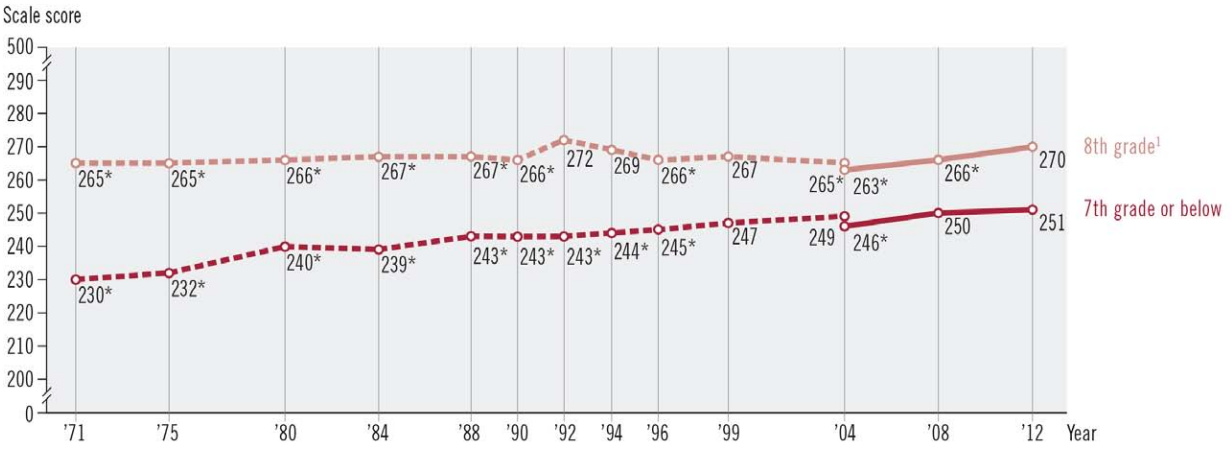
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

Figure 15. Trend in NAEP reading average scores for 9-, 13-, and 17-year-old students, by grade attended

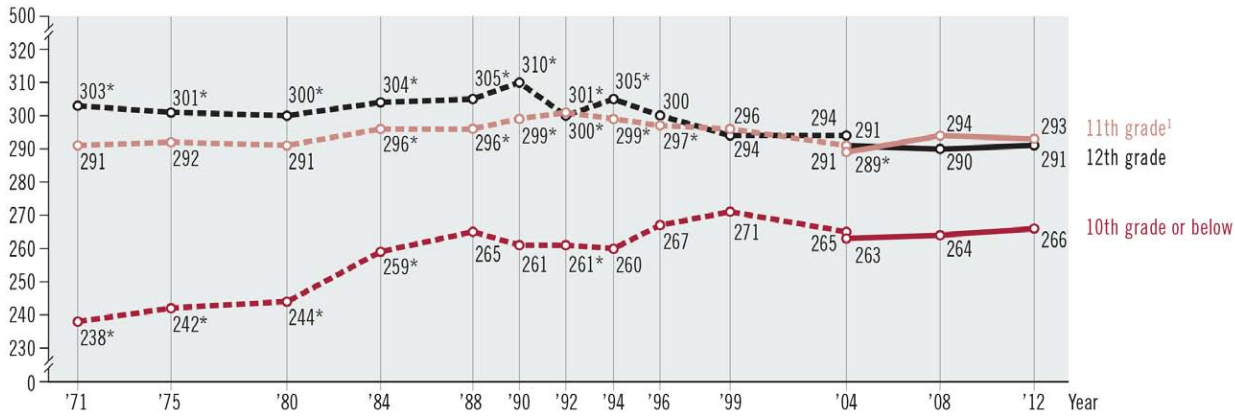
Age 9



Age 13



Age 17



Seventeen-year olds in twelfth grade scored **12** points lower than in 1971.

* Significantly different ($p < .05$) from 2012.
[1] Typical grade for age group.
NOTE: Trend results are not shown for 9-year-olds in 5th grade or above, or for 13-year-olds in 9th grade or above, because reporting standards were not met for all of the assessment years.

Original assessment format
Revised assessment format

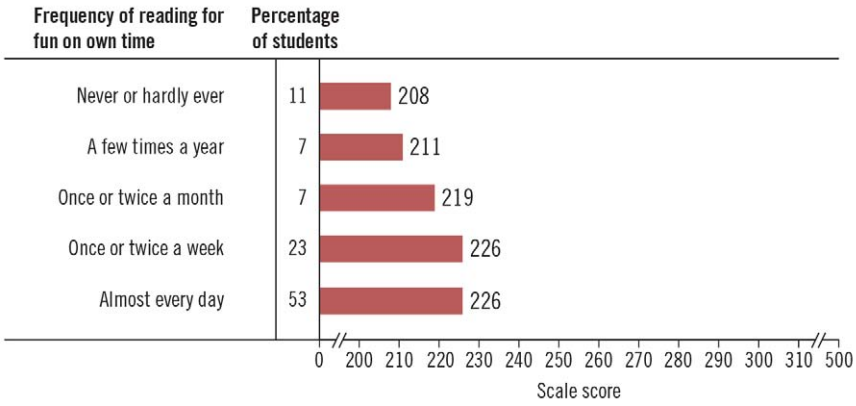
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

Students who frequently read for fun score higher

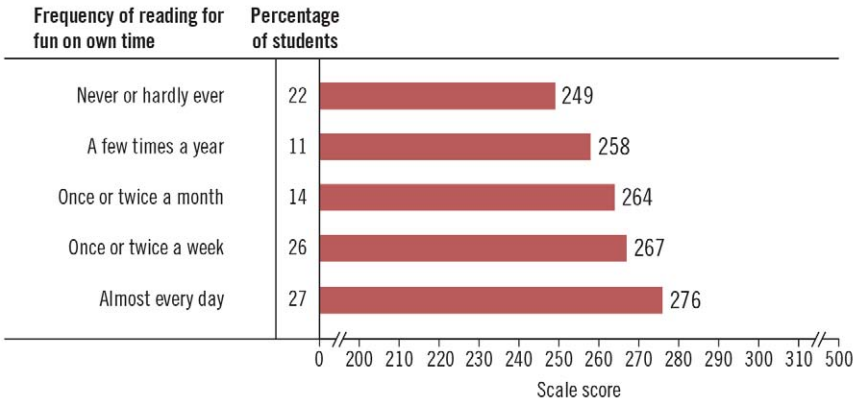
Results from previous NAEP reading assessments show students who read for fun more frequently had higher average scores. Results from the 2012 long-term trend assessment also reflect this pattern. At all three ages, students who reported reading for fun almost daily or once or twice a week scored higher than did students who reported reading for fun a few times a year or less (**figure 16**).

Figure 16. Percentage of students and average scores in NAEP reading for 9-, 13-, and 17-year-olds, by how often they read for fun on their own time: 2012

Age 9



Age 13

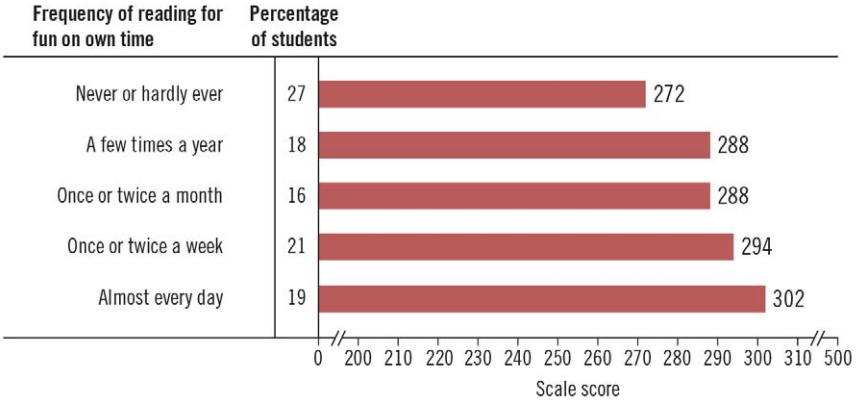


See note at end of figure.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading Assessment.

Figure 16. Percentage of students and average scores in NAEP reading for 9-, 13-, and 17-year-olds, by how often they read for fun on their own time: 2012—Continued

Age 17



NOTE: Detail may not sum to totals because of rounding.

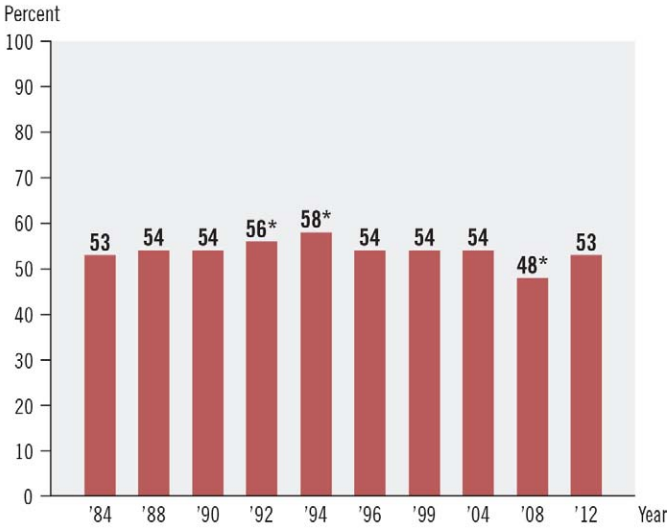
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading Assessment.

Smaller percentages of 13- and 17-year-olds read for fun

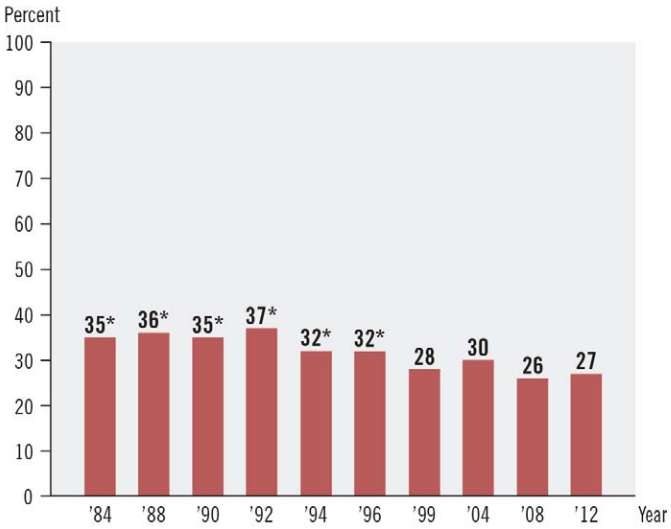
About the same percentage of 9-year-olds reported reading for fun daily in 2012 as in 1984 when this question was first asked (**figure 17**). For 13- and 17-year-old students, however, the percentages have decreased.

Figure 17. Trend in percentage of 9-, 13-, and 17-year-old students assessed in NAEP reading who reported that they read for fun on their own time almost every day

Age 9



Age 13

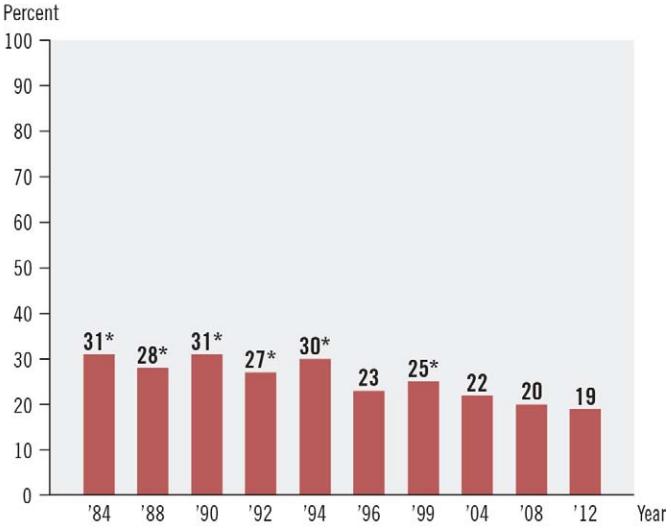


See notes at end of figure.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1984–2012 Long-Term Trend Reading Assessments.

Figure 17. Trend in percentage of 9-, 13-, and 17-year-old students assessed in NAEP reading who reported that they read for fun on their own time almost every day—Continued

Age 17



* Significantly different ($p < .05$) from 2012.
NOTE: Results for 1984–2004 are from the original assessment format, and results for 2008 and 2012 are from the revised assessment format (2004 revised assessment results are not available).

In general, higher percentages of White students than Black and Hispanic students reported in 2012 that they read for fun almost daily (**table 2**). The one exception was at age 9 where there was no significant difference in the percentages of White and Hispanic students reading for fun almost daily.

At ages 13 and 17, smaller percentages of White, Black, and Hispanic students reported reading for fun almost daily in 2012 as compared to 1984. At age 9, only the percentage of Black students was smaller.

Table 2. Percentage of students assessed in NAEP reading who reported that they read for fun on their own time almost every day, by age group and selected race/ethnicity categories: Various years, 1984–2012

Age group and race/ethnicity	1984	1988	1990	1992	1994	1996	1999	2004	2008	2012
Age 9										
White	53	54	54	57	57	54	52	53	48*	53
Black	55*	58	54	55	59*	53	57	51	43	47
Hispanic	51	47	51	51	59	52	56	57	46*	52
Age 13										
White	35*	37*	38*	36	37*	32	29	31	28	30
Black	34*	37*	31	36	17	31	33	26	23	23
Hispanic	32*	‡	21	‡	18	29	19	26	19	18
Age 17										
White	31*	28*	35*	29*	33*	24	25	25	22	22
Black	31*	35*	20	15	16	21	22	14	19	17
Hispanic	26*	‡	‡	‡	13	20	‡	17	15	15

‡ Reporting standards not met.
* Significantly different ($p < .05$) from 2012.
NOTE: Results for 1984–2004 are from the original assessment format, and results for 2008 and 2012 are from the revised assessment format (2004 revised assessment format results are not available). Black includes African American, and Hispanic includes Latino. Race categories exclude Hispanic origin.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1984–2012 Long-Term Trend Reading Assessments.

The Long-Term Trend Assessment in Mathematics

What does the assessment measure?

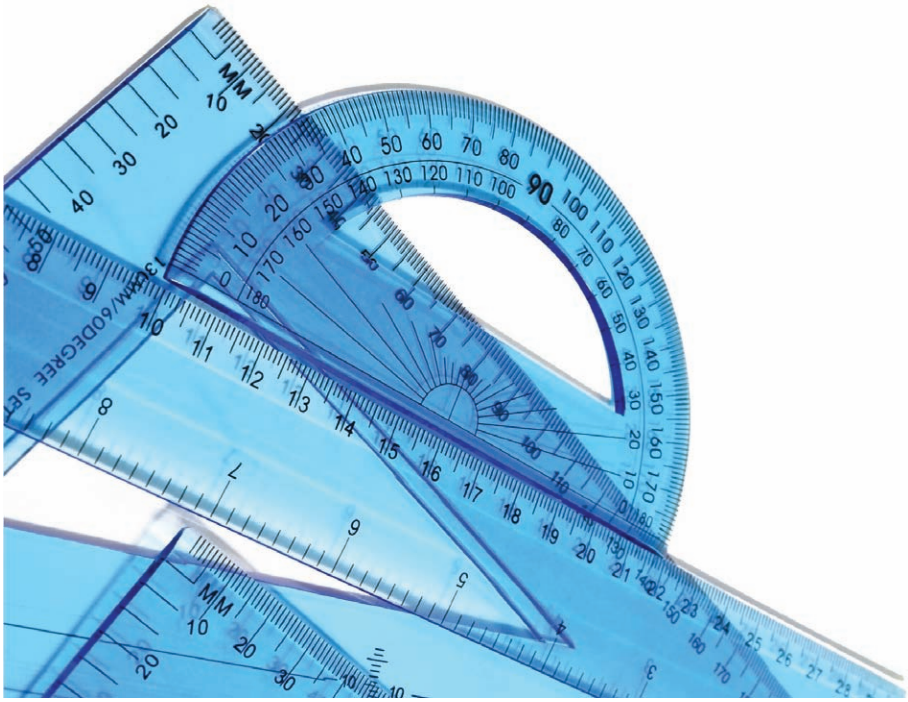
The long-term trend mathematics assessment is designed to measure students' knowledge of mathematical facts, their understanding of basic measurement formulas as applied in geometric settings, and their ability to carry out computations using pencil and paper. Questions also assess students' ability to apply mathematics to daily living skills, such as those involving time and money. Students were not allowed to use a calculator because a large portion of the assessment measured their ability to perform computations.

What did students do?

Students participating in the assessment responded to questions in three 15-minute sections. Each section contained approximately 21 to 37 questions. The majority of questions students answered were presented in a multiple-choice format. Some questions were administered at more than one age. See more detailed information about the composition of the assessment in the Technical Notes.

How did students perform?

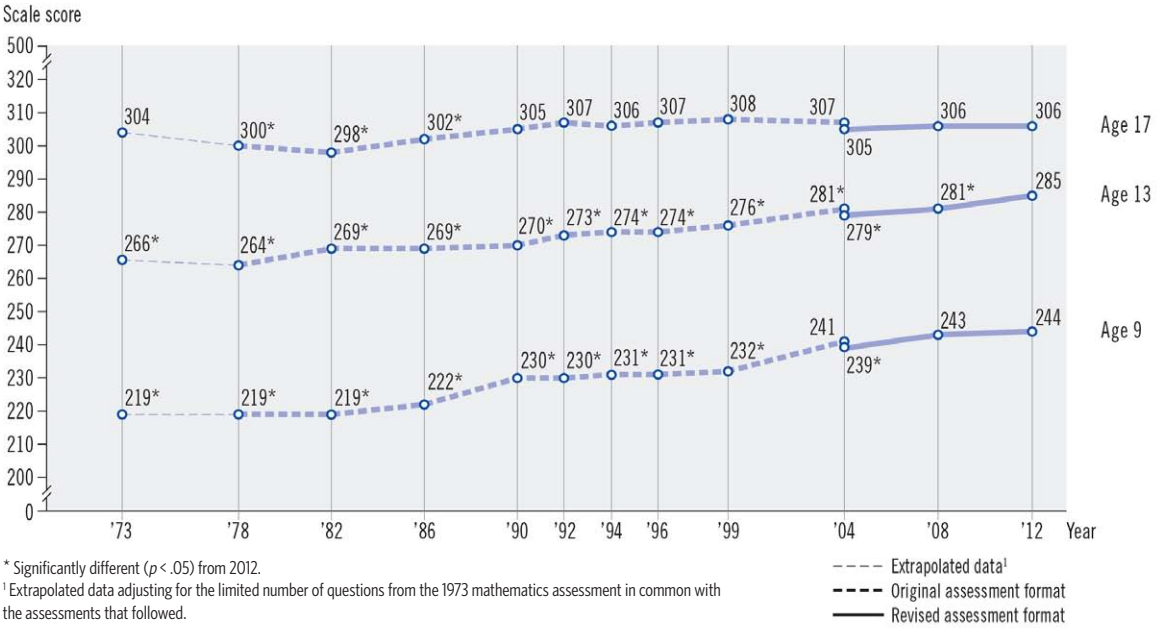
Results from the 2012 NAEP long-term trend assessment show improvement in the mathematics knowledge and skills demonstrated by 9- and 13-year-olds in comparison to students their age in 1973, but no significant change in the overall performance of 17-year-olds. Although results differ by age group, there is a common pattern of improvement for lower performing students. In some cases, these improvements have led to a narrowing of the racial/ethnic score gaps.



Thirteen-year-olds score higher than in all previous assessment years

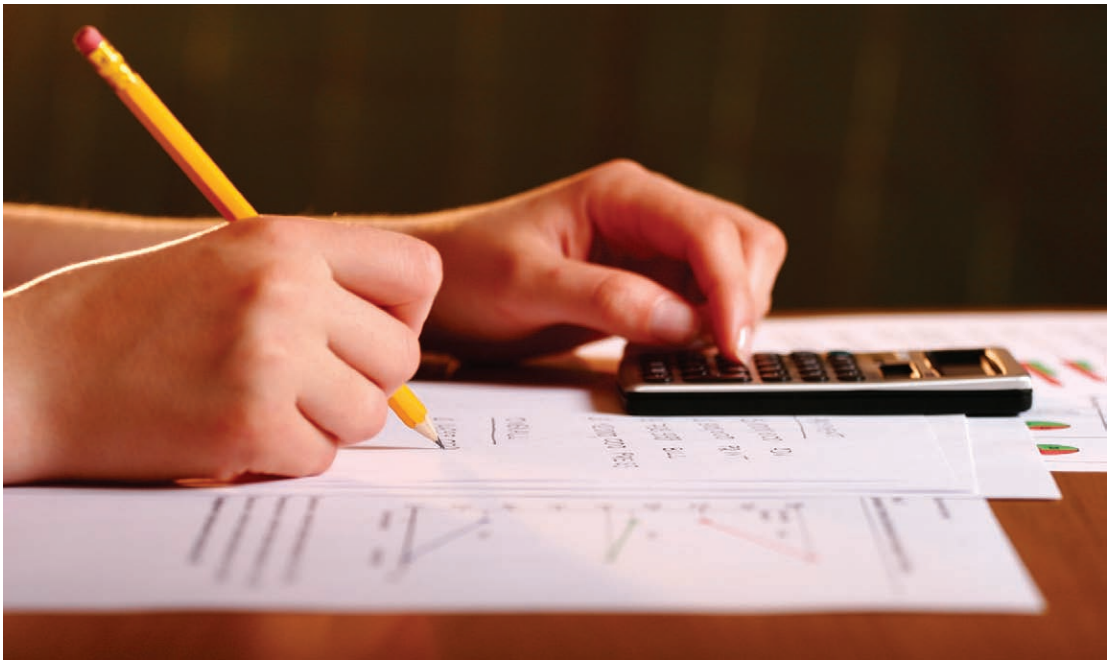
The overall national trend in mathematics shows improvement at ages 9 and 13, but not at age 17 (**figure 18**). The average score for 9-year-olds was 25 points higher in 2012 than in 1973. Thirteen-year-olds scored higher in 2012 than in all the previous assessment years, with a 19-point gain from 1973 and a 4-point gain from 2008. The average score in 2012 for 17-year-olds was not significantly different from the score in 1973.

Figure 18. Trend in NAEP mathematics average scores for 9-, 13-, and 17-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.

Thirteen-year-olds were the only age group to make score gains from 2008 to 2012.

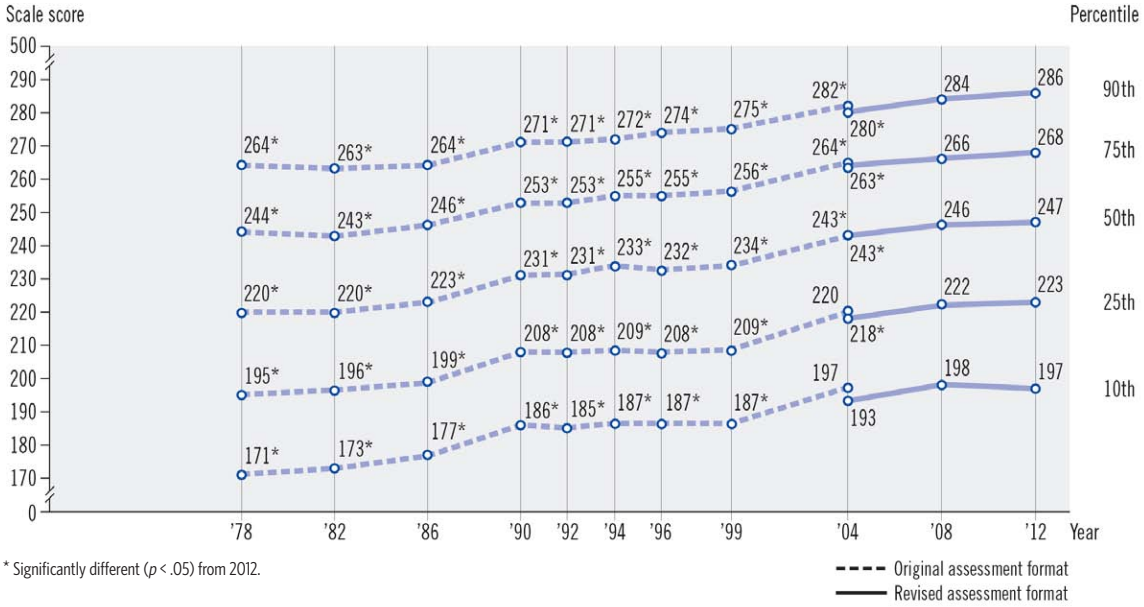


SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.

Lower, middle, and higher performing 9-year-olds make long-term gains

Changes in the scores of students performing at different percentiles indicate if overall trends are being driven by lower or higher performing students. The overall gain made by 9-year-olds since the late 1970s is evident at all five percentiles (**figure 19**). Gains of 22 to about 28 points can be seen across the percentiles reported.

Figure 19. Trend in NAEP mathematics percentile scores for 9-year-old students



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

What 9-year-olds know and can do in mathematics

The item map below illustrates a range of mathematical skills associated with scores on the long-term trend mathematics scale. Cut scores for the three performance levels reported at age 9 are highlighted in boxes on the scale. The descriptions of selected assessment questions indicate what students need to do to receive credit for a correct answer. For example, 9-year-olds with a score of 182 were likely to be able to identify a symmetric shape. Nine-year-olds with a score of 259 were likely to be able to solve an application problem involving multiple operations.

Age 9 NAEP Mathematics Item Map

Scale score	Question description
500	
//	
298	Multiply two fractions (MC)
291	Add two fractions with like denominators (MC - ages 13 and 17)
284	Identify a relationship shown on a number line (MC)
280	Divide a three-digit number by a two-digit number (CR)
273	Use and interpret number models (CR - age 13)
271	Use the transitive property (MC - ages 13 and 17)
262	Identify a figure based on relationship to other figures (MC - age 13)
259	Solve an application problem involving multiple operations (MC)
254	Multiply a three-digit number by a single-digit number (MC - age 13)
250	
248	Determine a simple probability from a context (MC)
244	Compute the perimeter of a square (MC - age 13)
241	Model a relationship using a number sentence (MC)
237	Convert units of length (CR)
232	Calculate elapsed time (MC)
228	Solve a problem involving conversion between units of volume (MC)
226	Divide a two-digit number by a one-digit number (CR)
222	Subtract a two-digit number from a two-digit number (CR)
211	Solve a story problem involving subtraction (CR)
209	Identify congruent triangles (MC)
206	Identify the true inequality (MC)
200	Identify whole number place value (MC)
200	
190	Read and interpret a circle graph (MC - age 13)
184	Solve a story problem involving multiplication (MC)
182	Identify a symmetric shape (MC - age 13)
165	Translate number words to numerals (MC)
158	Find the value of an unknown quantity in a number sentence (CR)
150	
106	Identify a polygon (MC)
//	
0	

CR Constructed-response question MC Multiple-choice question

NOTE: Ages in parentheses indicate a cross-age question. The position of a question on the scale represents the scale score attained by students who had a 65 percent probability of successfully answering a constructed-response question, a 77 percent probability of correctly answering a three-option multiple-choice question, a 74 percent probability of correctly answering a four-option multiple-choice question, a 72 percent probability of correctly answering a five-option multiple-choice question, or a 71 percent probability of correctly answering a six-option multiple-choice question. For constructed-response questions, the question description represents students' performance rated as completely correct. Scores associated with the three performance levels reported for age 9 are boxed.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Mathematics Assessment.

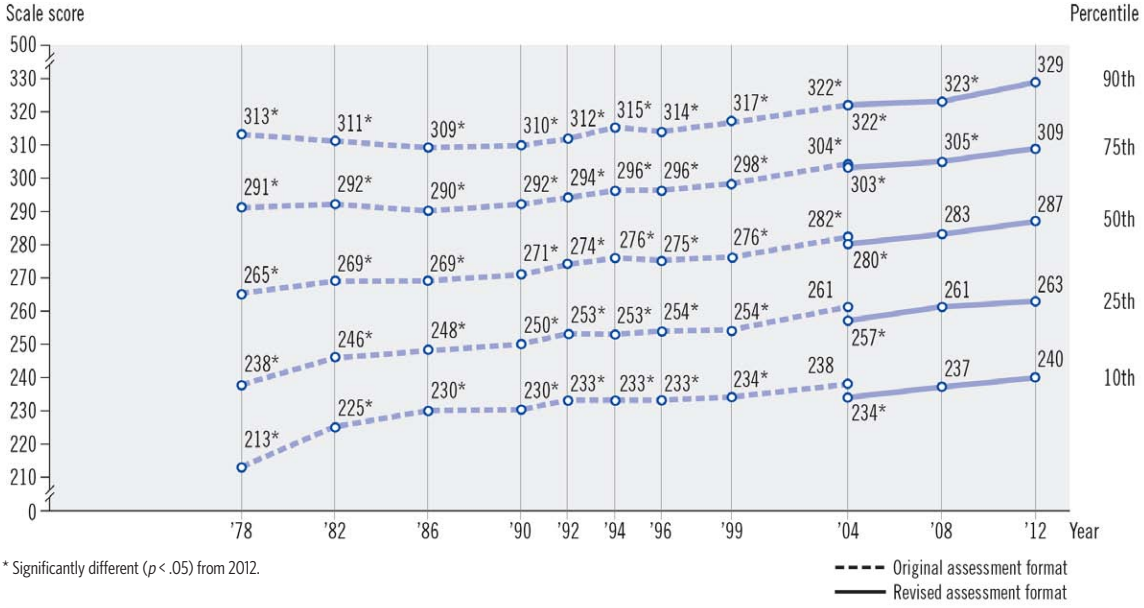
Higher performing 13-year-olds make short-term gains

The increase in the overall average score for 13-year-olds from the 1970s to 2012 is reflected at all five percentiles (**figure 20**). The long-term gains made by lower performing students at the 10th and 25th percentiles were larger than the gains for higher performing students at the 75th and 90th percentiles.

Short-term gains since 2008 were not as broad. The overall score increase is reflected only for higher performing students at the 75th and 90th percentiles.

The **27**-point gain since 1978 at the 10th percentile was larger than the gains at the 75th and 90th percentiles.

Figure 20. Trend in NAEP mathematics percentile scores for 13-year-old students



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978-2012 Long-Term Trend Mathematics Assessments.

What 13-year-olds know and can do in mathematics

As shown in the item map below, 13-year-olds with a score of 236 were likely to be able to use geometric properties to determine the measure of an angle in a set of intersecting lines. Students with a score of 307 were likely to be able to successfully write an improper fraction as a decimal.

Age 13 NAEP Mathematics Item Map

Scale score	Question description
500 //	
340	Compare units of length (MC)
337	Identify fractional models (MC)
320	Determine the percent given the part and the whole (MC - age 17)
310	Rewrite an algebraic expression (MC - age 17)
307	Write an improper fraction as a decimal (CR)
302	Compute the area of a square (CR)
300	Add two fractions with unlike denominators (MC - age 17)
300	
296	Use place value to identify a decimal number (MC)
291	Identify a relationship between two unknown values (MC)
287	Estimate length (MC - age 17)
285	Use and interpret number models (CR - age 9)
277	Read and interpret data from a table (CR - age 17)
271	Use the transitive property (MC - ages 9 and 17)
268	Find factors of numbers (MC)
260	Identify a figure based on relationship to other figures (MC - age 9)
257	Identify a particular three-dimensional figure (MC - age 17)
255	Add two fractions with like denominators (MC - ages 9 and 17)
254	Find the value of a variable that makes an equation true (CR)
250	
248	Determine probability (MC)
240	Compute the perimeter of a square (MC - age 9)
236	Use geometric properties to determine angle measure (MC)
231	Read and interpret data from a bar graph (MC)
224	Evaluate an algebraic expression for a given value (CR - age 17)
216	Multiply a three-digit number by a single-digit number (MC - age 9)
206	Subtract a two-digit number from a two-digit number (CR)
200	
186	Identify a symmetric shape (MC - age 9)
165	Read and interpret a circle graph (MC - age 9)
158	Solve a problem in context (MC)
// 0	

CR Constructed-response question MC Multiple-choice question

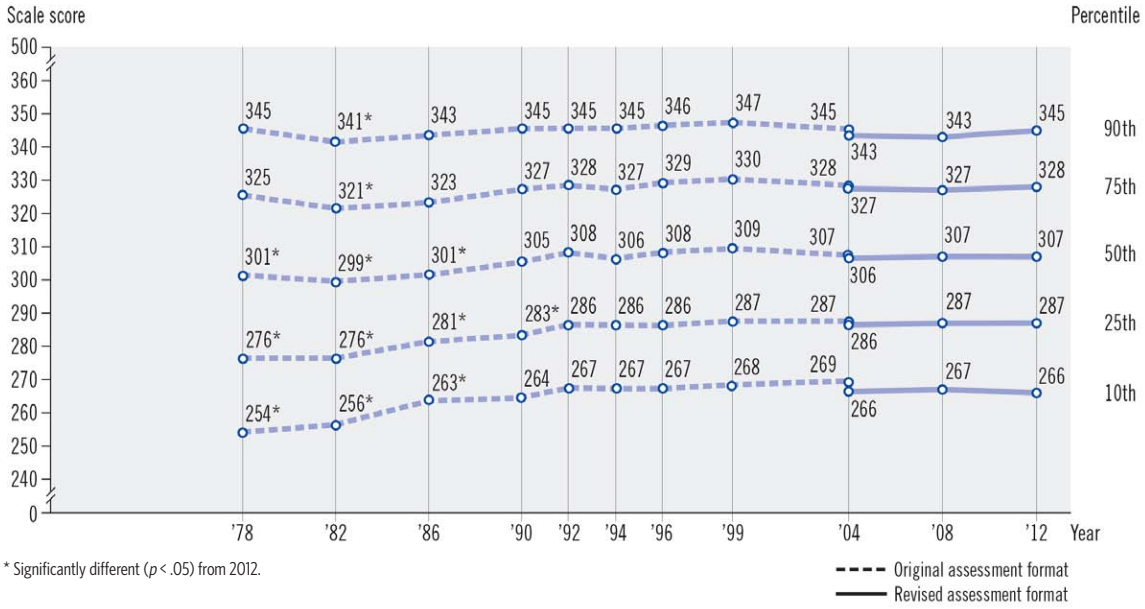
NOTE: Ages in parentheses indicate a cross-age question. The position of a question on the scale represents the scale score attained by students who had a 65 percent probability of successfully answering a constructed-response question, a 77 percent probability of correctly answering a three-option multiple-choice question, a 74 percent probability of correctly answering a four-option multiple-choice question, a 72 percent probability of correctly answering a five-option multiple-choice question, or a 71 percent probability of correctly answering a six-option multiple-choice question. For constructed-response questions, the question description represents students' performance rated as completely correct. Scores associated with the three performance levels reported for age 13 are boxed.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Mathematics Assessment.

Score gains for lower and middle performing 17-year-olds

Lower and middle performing 17-year-olds made gains since the 1970s even though the overall average mathematics score for this age group did not change significantly (**figure 21**). Scores for students at the 10th, 25th, and 50th percentiles were higher in 2012 than in 1978.

Figure 21. Trend in NAEP mathematics percentile scores for 17-year-old students



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

What 17-year-olds know and can do in mathematics

As shown in the item map below, 17-year-olds with a score of 286 were likely to be able to add two fractions with like denominators. Students with a score of 320 were likely to be able to successfully estimate an integer value for the square root of a number that is not a perfect square. Seventeen-year-olds with a score of 341 were likely to be able to analyze a proportional relationship.

Age 17 NAEP Mathematics Item Map

Scale score	Question description
500	
//	
394	Identify a construction using a compass (MC)
365	Rewrite an expression involving exponents and radicals (CR)
360	Read and interpret data from tables, charts, and graphs (MC)
357	Determine a logical result from a statement (MC)
352	Compute the area of a circle (CR)
350	
341	Analyze a proportional relationship (MC)
338	Identify an inequality from its graph (MC)
331	Find the median (MC)
325	Determine the percent given the part and the whole (MC - age 13)
320	Estimate a square root (CR)
317	Compute the area of a square given its perimeter (MC)
312	Add two fractions with unlike denominators (MC - age 13)
308	Convert between units of weight (MC)
304	Estimate length (MC - age 13)
301	Estimate an outcome in a probability context (MC)
300	
290	Use the transitive property (MC - ages 9 and 13)
289	Rewrite an algebraic expression (MC - age 13)
286	Add two fractions with like denominators (MC - ages 9 and 13)
280	Find the quotient of two negative integers (MC)
278	Identify a particular three-dimensional figure (MC - age 13)
273	Determine a square root (MC)
260	Convert between decimals and percents (MC)
252	Evaluate an algebraic expression for a given value (CR - age 13)
250	
239	Use congruence properties (CR)
224	Identify parallel lines (MC)
//	
0	

CR Constructed-response question MC Multiple-choice question

NOTE: Ages in parentheses indicate cross-age questions. The position of a question on the scale represents the scale score attained by students who had a 65 percent probability of successfully answering a constructed-response question, a 77 percent probability of correctly answering a three-option multiple-choice question, a 74 percent probability of correctly answering a four-option multiple-choice question, a 72 percent probability of correctly answering a five-option multiple-choice question, or a 71 percent probability of correctly answering a six-option multiple-choice question. For constructed-response questions, the question description represents students' performance rated as completely correct. Scores associated with the three performance levels reported for age 17 are boxed.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Mathematics Assessment.

Almost one-half of 9-year-olds and the majority of 13- and 17-year-olds understand basic mathematical operations

Performance levels provide another perspective for interpreting long-term trend results. Changes in the percentages at or above each performance level reflect changes in the proportion of students who demonstrated the knowledge and skills associated with that level in responding to assessment questions.

Forty-seven percent of 9-year-olds, 85 percent of 13-year-olds, and 96 percent of 17-year-olds performed at the level of 250 or higher in 2012 (**figure 22**). Students at this level demonstrated an understanding of at least basic numerical operations. At all three ages, the percentages of students performing at or above level 250 were higher in 2012 than in 1978.

Mathematics Performance-Level Descriptions

The skills demonstrated by students at each mathematics performance level are described below. The five performance levels are applicable at all three age groups; however, the likelihood of attaining higher performance levels is related to a student's age. The performance-level results presented for each age are those that are most likely to show significant change across the assessment years. For this reason, only three performance levels are discussed for each age. See the Technical Notes for information about how the levels were set.

Reported for age

LEVEL 350: Multistep Problem Solving and Algebra

Students at this level can apply a range of reasoning skills to solve multistep problems. They can solve routine problems involving fractions and percents, recognize properties of basic geometric figures, and work with exponents and square roots. They can solve a variety of two-step problems using variables, identify equivalent algebraic expressions, and solve linear equations and inequalities. They are developing an understanding of functions and coordinate systems.

17

LEVEL 300: Moderately Complex Procedures and Reasoning

Students at this level are developing an understanding of number systems. They can compute with decimals, simple fractions, and commonly encountered percents. They can identify geometric figures, measure lengths and angles, and calculate areas of rectangles. These students are also able to interpret simple inequalities, evaluate formulas, and solve simple linear equations. They can find averages, make decisions based on information drawn from graphs, and use logical reasoning to solve problems. They are developing the skills to operate with signed numbers, exponents, and square roots.

17
13

LEVEL 250: Numerical Operations and Beginning Problem Solving

Students at this level have an initial understanding of the four basic operations. They are able to apply whole number addition and subtraction skills to one-step word problems and money situations. In multiplication, they can find the product of a two-digit and a one-digit number. They can also compare information from graphs and charts and are developing an ability to analyze simple logical relations.

17
13
9

LEVEL 200: Beginning Skills and Understandings

Students at this level have considerable understanding of two-digit numbers. They can add two-digit numbers but are still developing an ability to regroup in subtraction. They know some basic multiplication and division facts, recognize relations among coins, can read information from charts and graphs, and use simple measurement instruments. They are developing some reasoning skills.

13
9

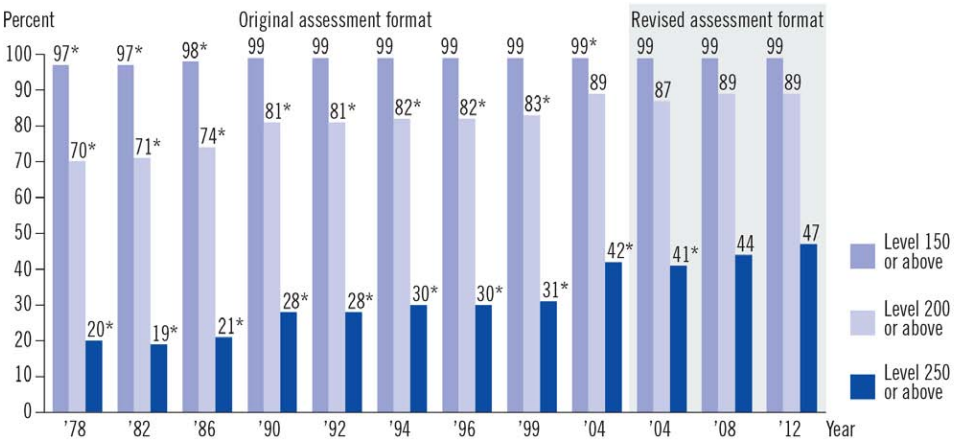
LEVEL 150: Simple Arithmetic Facts

Students at this level know some basic addition and subtraction facts, and most can add two-digit numbers without regrouping. They recognize simple situations in which addition and subtraction apply. They also are developing rudimentary classification skills.

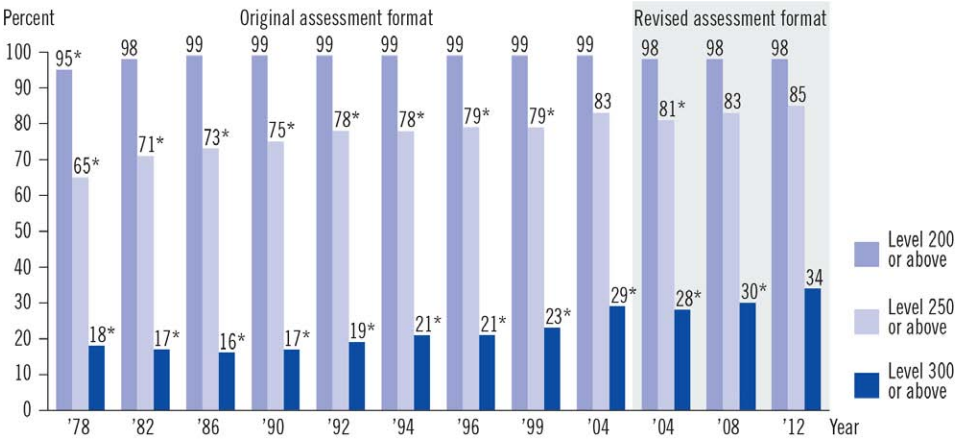
9

Figure 22. Trend in NAEP mathematics performance-level results for 9-, 13-, and 17-year-old students

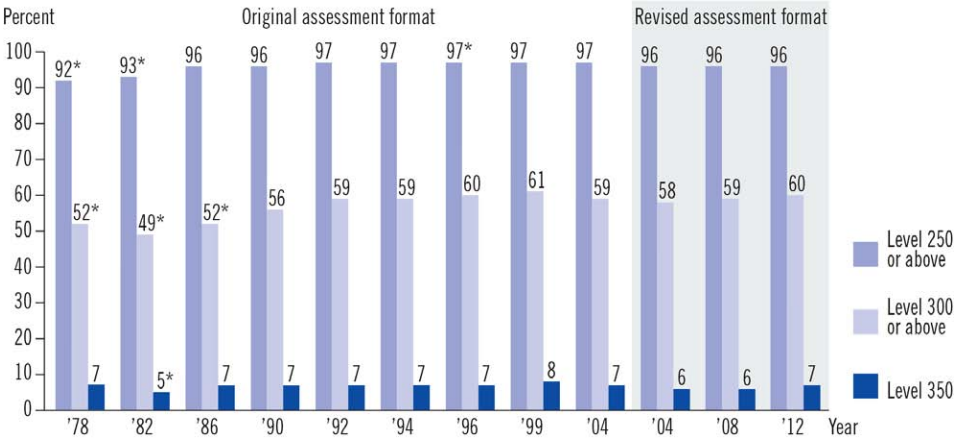
Age 9



Age 13



Age 17



* Significantly different ($p < .05$) from 2012.
NOTE: The revised assessment format introduced more current assessment procedures and content.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

White – Black score gap narrows at all three ages

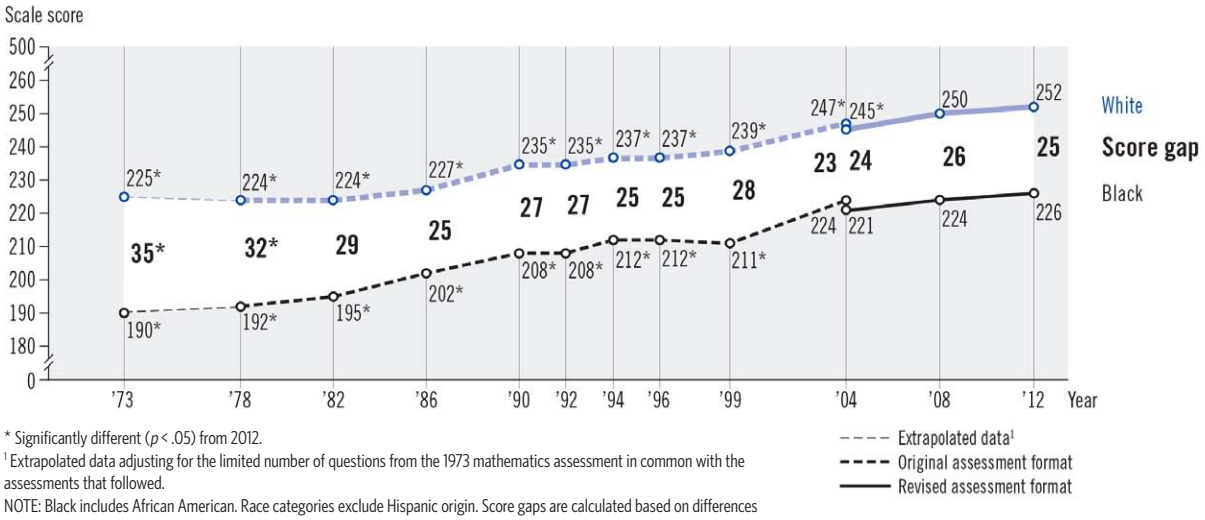
Even though White students continued to score 25 or more points higher on average than Black students in 2012, the White – Black gap narrowed in comparison to the 1970s at all three ages. The White – Hispanic gap also narrowed from 1973 at ages 13 and 17, but did not change significantly at age 9.

Black 9-year-olds make larger gains than White students

The 36-point gain made by Black 9-year-olds from 1973 was larger than the gain made by White students, leading to a narrowing of the White – Black score gap in 2012 (**figure 23**). Hispanic students made a 32-point gain, but this was not significantly different from the gain for White students (**figure 24**). Consequently, the White – Hispanic gap did not narrow significantly even though it was numerically smaller.

The White – Black score gap narrowed **10** points since 1973.

Figure 23. Trend in NAEP mathematics average scores and score gaps for White and Black 9-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

Figure 24. Trend in NAEP mathematics average scores and score gaps for White and Hispanic 9-year-old students

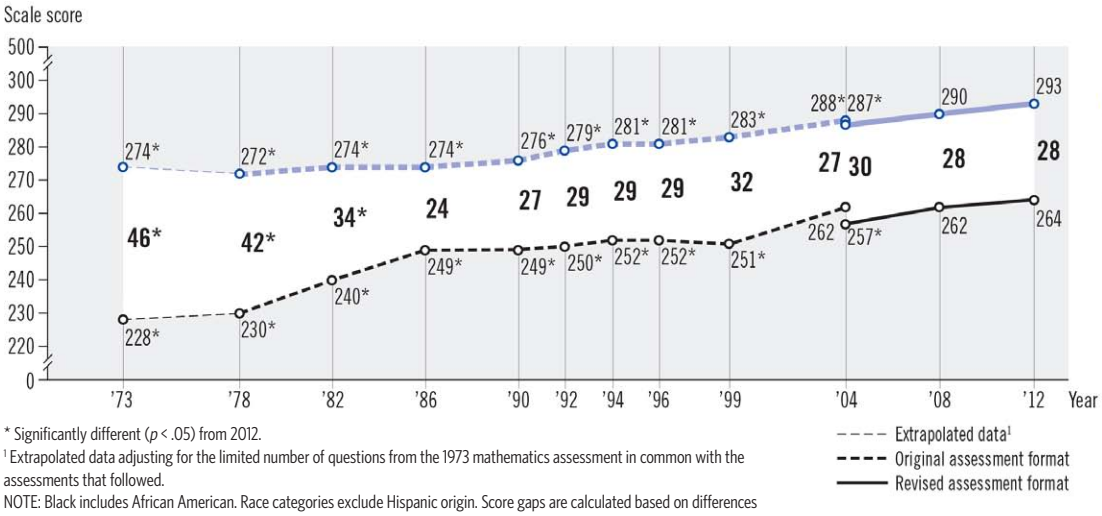
* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Score gaps are calculated based on differences between unrounded average scores.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.

Racial/ethnic score gaps narrow at age 13

Both the White – Black and White – Hispanic gaps narrowed from 1973 at age 13 (**figures 25** and **26**). Black and Hispanic students both made larger gains from the 1970s than White students, leading to a narrowing of the score gaps in 2012.

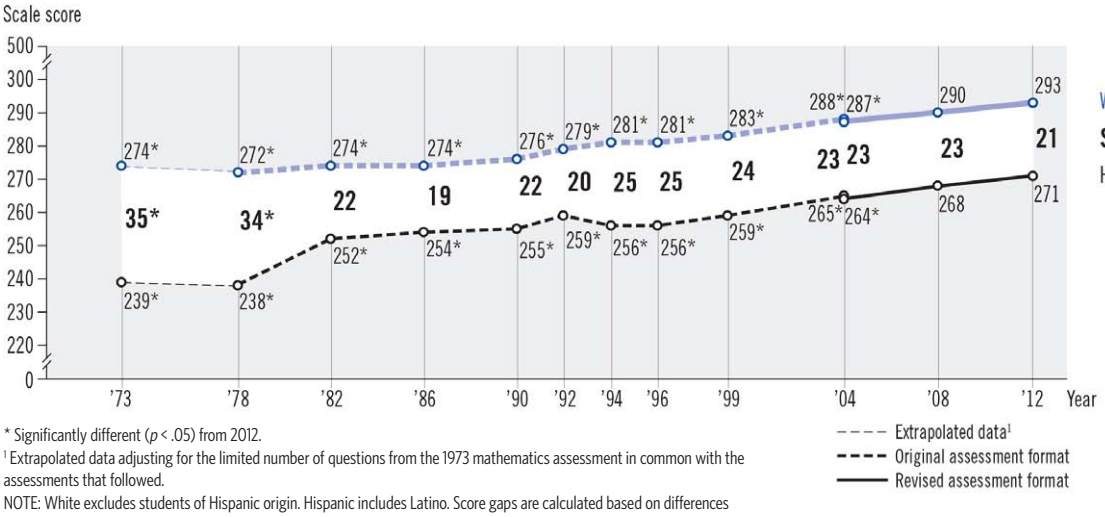
Figure 25. Trend in NAEP mathematics average scores and score gaps for White and Black 13-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

The White – Black score gap narrowed **18** points since 1973.

Figure 26. Trend in NAEP mathematics average scores and score gaps for White and Hispanic 13-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Score gaps are calculated based on differences between unrounded average scores.

The White – Hispanic score gap narrowed **14** points since 1973.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.

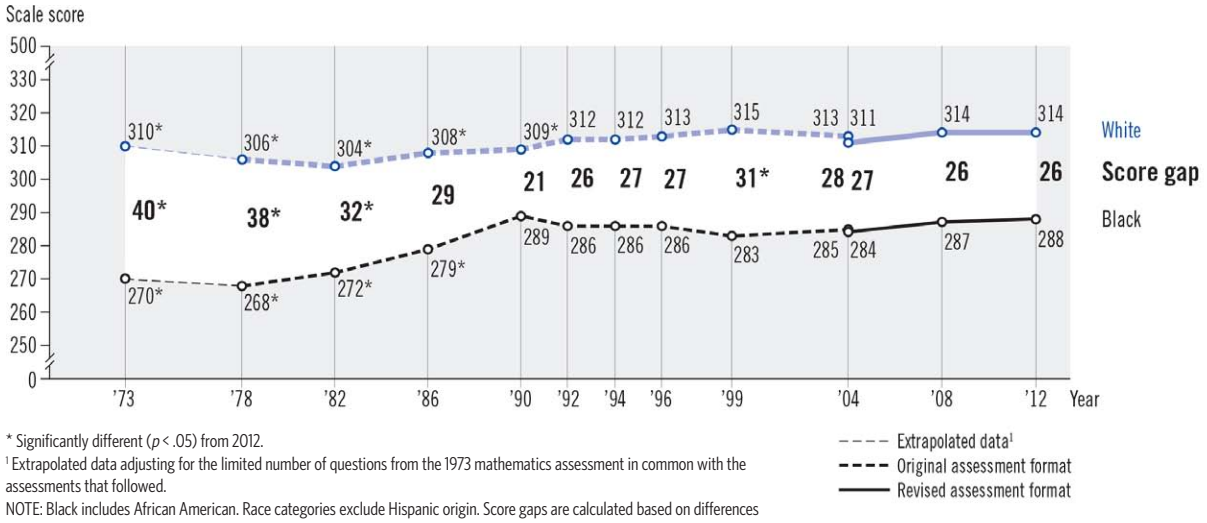
White, Black, and Hispanic 17-year-olds show improvement since the 1970s

White – Black and White – Hispanic gaps narrowed at age 17 because Black and Hispanic students made larger gains from 1973 than White students (figures 27 and 28). Average mathematics scores for 17-year-olds increased 4 points from the first assessment year for White students, 18 points for Black students, and 17 points for Hispanic students.

The changing makeup of the student population is one reason why the overall average score for 17-year-olds has not changed significantly even though student groups within the overall population are making gains. When an increase in the proportion of typically lower performing students is accompanied by a decrease in the proportion of higher performing students, the overall average score can remain unchanged even though the average scores for both higher and lower performing groups increase. This phenomenon is known as Simpson's paradox.

The White – Black score gap narrowed **14** points since 1973.

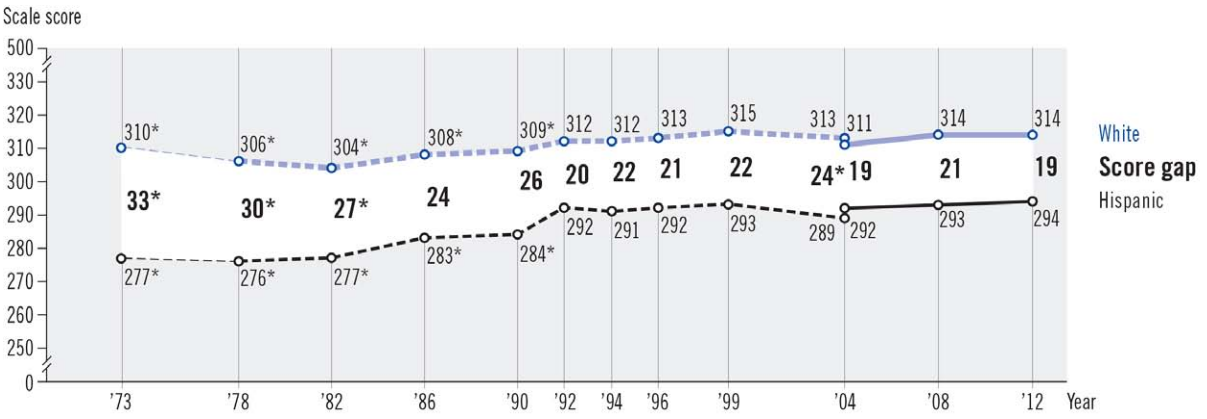
Figure 27. Trend in NAEP mathematics average scores and score gaps for White and Black 17-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

The White – Hispanic score gap narrowed **14** points since 1973.

Figure 28. Trend in NAEP mathematics average scores and score gaps for White and Hispanic 17-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Score gaps are calculated based on differences between unrounded average scores.

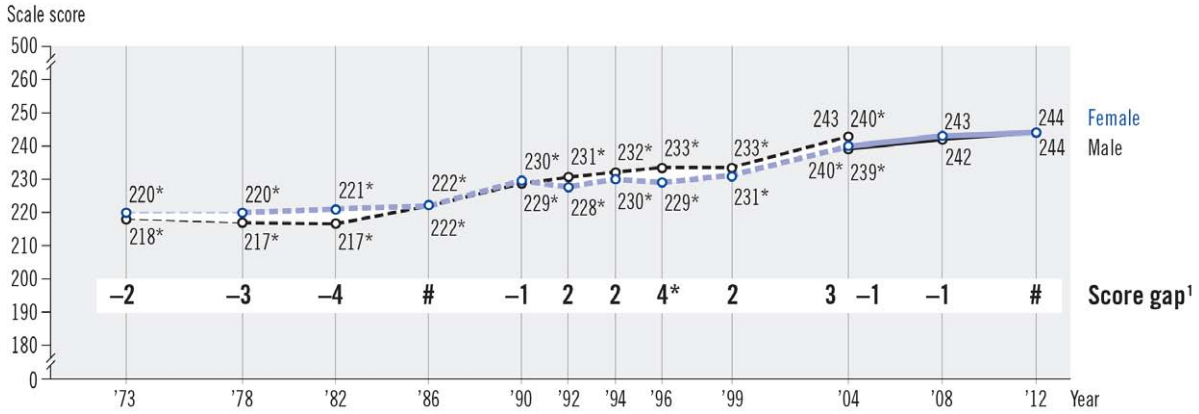
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.

Gender gap for 17-year-olds narrows from 1973

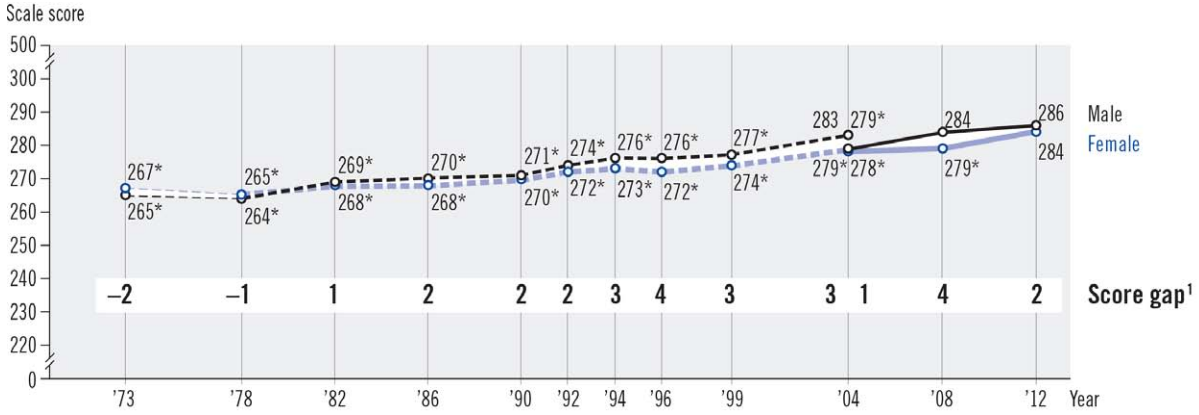
The 2012 reading results show female students scoring higher on average than male students at all three ages, but this is not the case in mathematics. In 2012, there were no significant gender gaps in mathematics at ages 9 and 13 (**figure 29**). At age 17, male students scored higher in mathematics than female students. The gender gap in 2012 at age 17, however, was narrower than in 1973 due to the increase in the average score for female students.

Figure 29. Trend in NAEP mathematics average scores and score gaps for 9-, 13-, and 17-year-old students, by gender

Age 9



Age 13



Age 17

The gender gap narrowed **4** points since 1973.

Rounds to zero.
* Significantly different ($p < .05$) from 2012.
[1] Negative numbers indicate that the average score for male students was lower than the score for female students.
[2] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: Score gaps are calculated based on differences between unrounded average scores. Score differences were not found to be statistically significant at age 9 in 1973, 1986, 1990, 1992, 1994, 1999, 2004, 2008, and 2012; at age 13 in 1973, 1978, 1982, 1986, 1990, 1992, 1999, 2004 (revised assessment format), and 2012; and at age 17 in 1999.

– – – – Extrapolated data[2]
– – – Original assessment format
——— Revised assessment format

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.

Score gap between public and Catholic school students widens at age 17

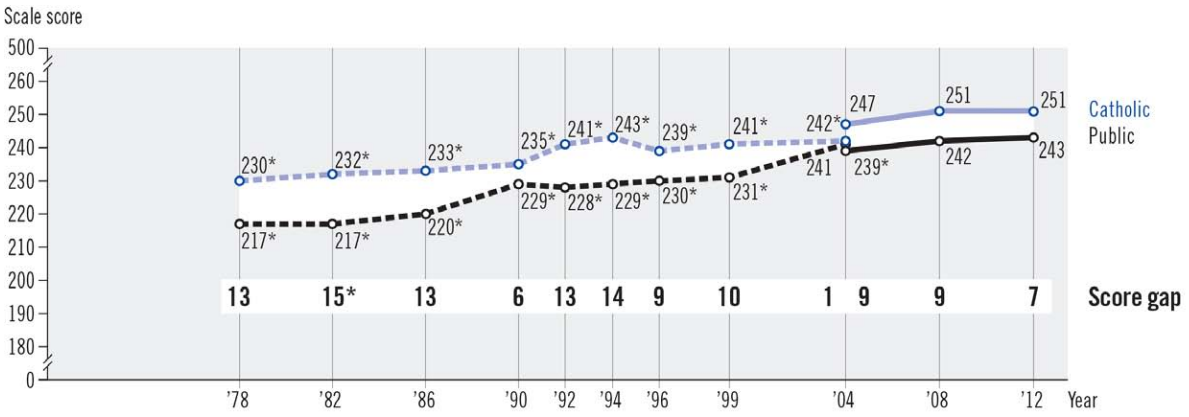
Information about the type of school students attend was first collected for the long-term trend mathematics assessment in 1978. In most assessment years since then, Catholic school students have had higher average scores than public school students. In 2012, Catholic school students scored 7 to 20 points higher on average than public school students across the three age groups (**figure 30**).

Both public and Catholic school students scored higher in 2012 than in 1978 at all three ages. Short-term gains from 2008 were only seen for 13-year-old students in public schools and 17-year-old students in Catholic schools. In the case of 17-year-olds, the increase for Catholic school students led to a widening of the score gap.

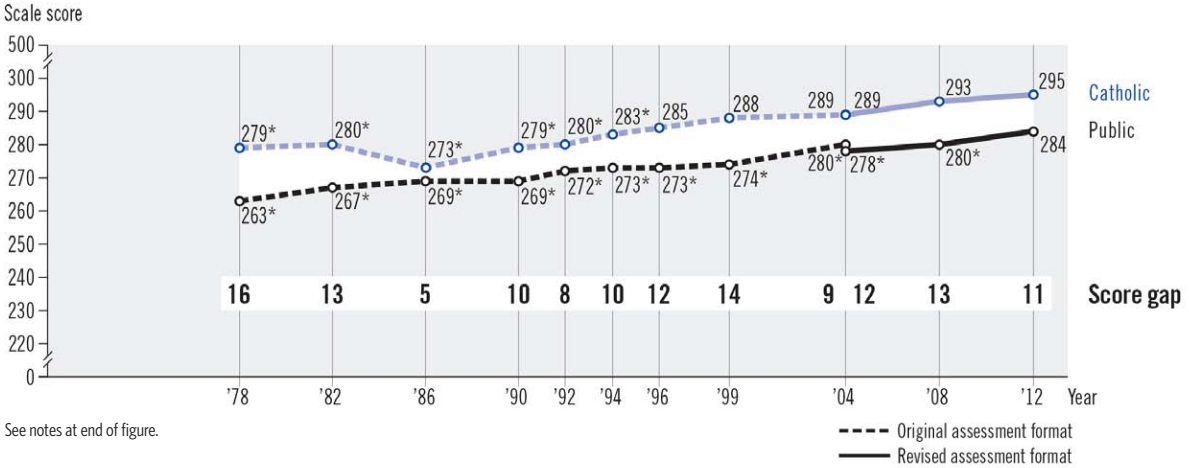
This report presents results only for public and Catholic school students because private school participation rates overall fell below the required standard for reporting results in 2012. (See the Technical Notes for more information.)

Figure 30. Trend in NAEP mathematics average scores and score gaps for 9-, 13-, and 17-year-old students, by type of school

Age 9



Age 13

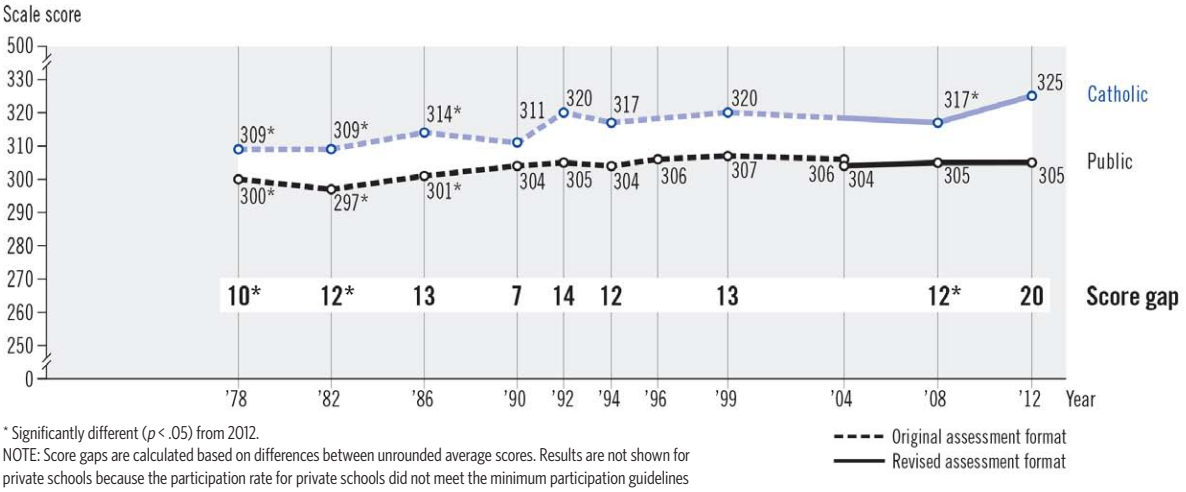


See notes at end of figure.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

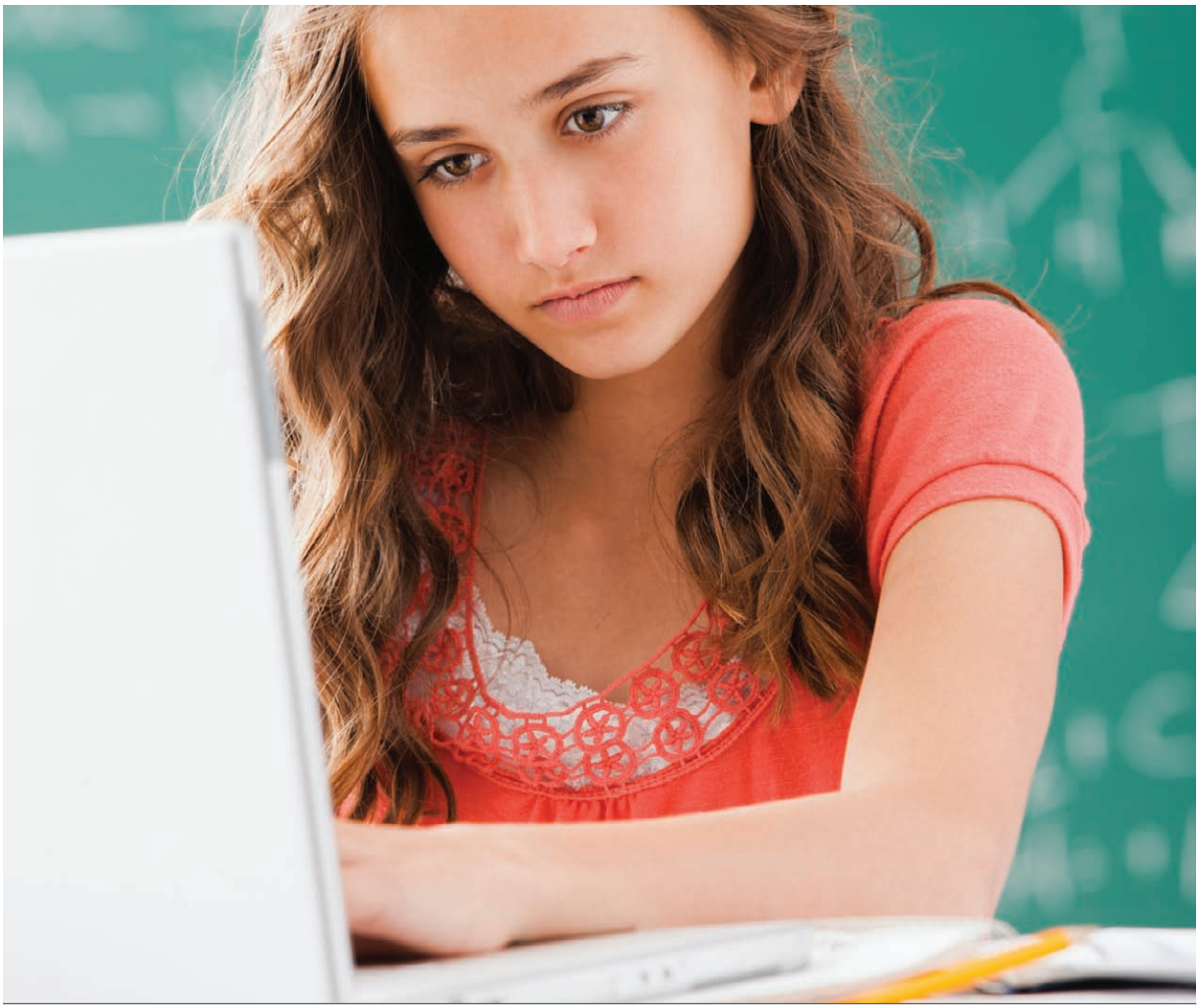
Figure 30. Trend in NAEP mathematics average scores and score gaps for 9-, 13-, and 17-year-old students, by type of school—Continued

Age 17



The score gap between 17 year-old Catholic and public school students widened **10** points since 1978.

* Significantly different ($p < .05$) from 2012.
NOTE: Score gaps are calculated based on differences between unrounded average scores. Results are not shown for private schools because the participation rate for private schools did not meet the minimum participation guidelines for reporting in 2012. At age 17, results are not shown for Catholic schools in 1996 and 2004 (original and revised assessment formats) because the participation rates for Catholic schools did not meet the minimum participation guidelines for reporting. Score differences were not found to be statistically significant at age 9 in 1990 and 2004 (original assessment format), at age 13 in 1986, and at age 17 in 1990 and 1999.



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

Thirteen- and 17-year-olds whose parents did not finish high school score higher than in 1978

Students participating in the long-term trend assessment responded to a short section of background questions that included questions about the highest level of education completed by their parents. Students selected one of five response options for each parent:

- Did not finish high school
- Graduated from high school
- Some education after high school
- Graduated from college
- Don't know

Results are presented for the highest level of education for either parent. Nine-year-olds were not asked the question because they are often unsure about their parents' education level.

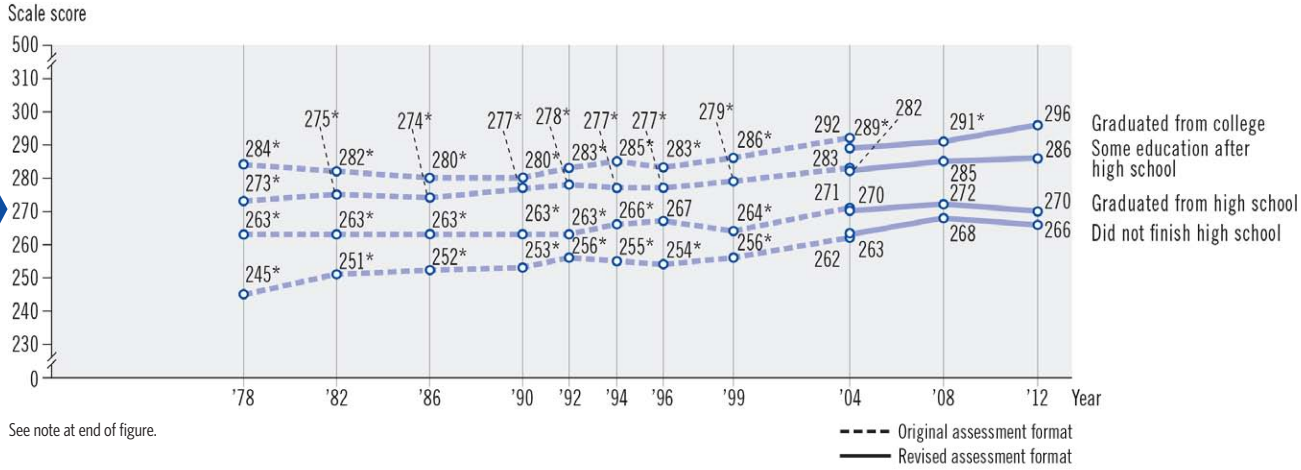
Students whose parents have completed higher levels of education generally score higher than those whose parents completed lower levels. In 2012, both 13- and 17-year-olds who reported their parents either did not finish high school or graduated from high school scored lower on average than students reporting higher levels of parental education. Furthermore, students whose parents graduated from college scored higher than those reporting lower levels of parental education.

Thirteen-year-olds made long-term gains from 1978 regardless of the highest level of education they reported for their parents (**figure 31**). The only short-term gain from 2008 was made by 13-year-olds who indicated that at least one parent graduated from college. At age 17, the average score decreased from 2008 to 2012 for students who reported that high school graduation was the highest level of education completed by either parent.

Figure 31. Trend in NAEP mathematics average scores for 13- and 17-year-old students, by highest level of parental education

Age 13

Thirteen-year olds whose parents did not finish high school scored **21** points higher than in 1978.

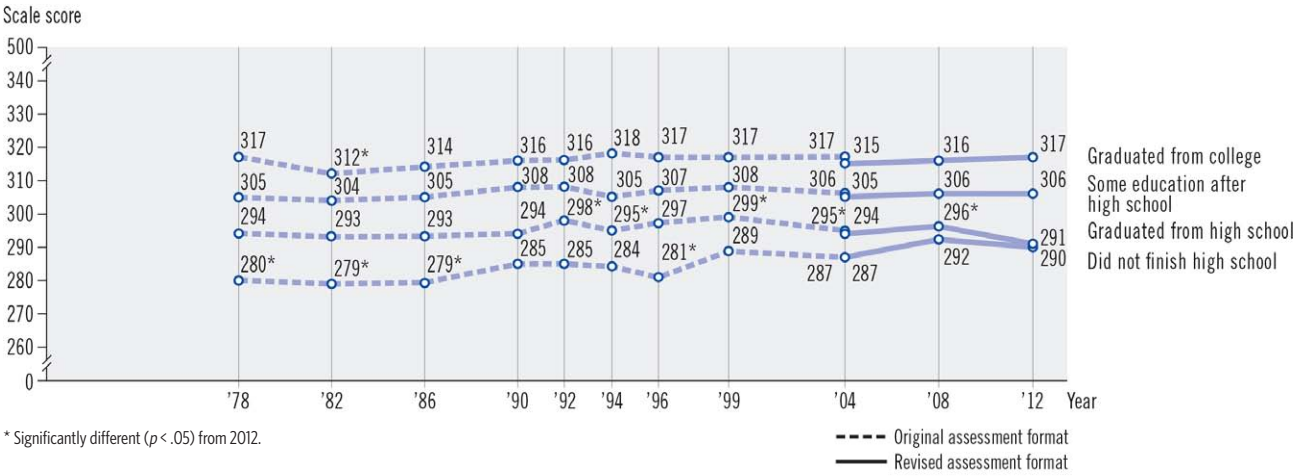


See note at end of figure.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

Figure 31. Trend in NAEP mathematics average scores for 13- and 17-year-old students, by highest level of parental education—Continued

Age 17



* Significantly different ($p < .05$) from 2012.

Seventeen-year olds whose parents did not finish high school scored **10** points higher than in 1978.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

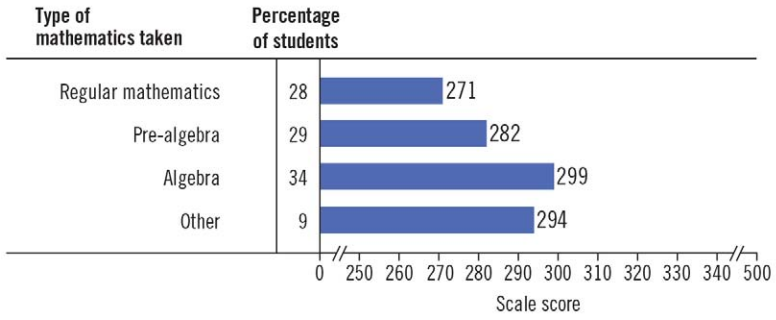
Thirteen-year-olds taking a regular mathematics course score lower than those taking algebra

Implicit in the recent push for higher academic standards is the hope that more challenging coursework will prepare students for their future education and careers. Information about coursetaking collected as part of the long-term trend mathematics assessment reflects some movement in that direction. Thirteen-year-olds were asked, "What kind of mathematics are you taking this year?" and were given the following five response options:

- I am not taking mathematics this year
- Regular mathematics
- Pre-algebra
- Algebra
- Other

As might be expected, students engaging in more challenging mathematics coursework tend to perform higher than those taking lower level courses. In 2012, students taking a regular mathematics course scored lower on average than those who reported taking pre-algebra or algebra (**figure 32**). Students taking algebra also scored higher than those taking pre-algebra.

Figure 32. Percentage of students and average scores in NAEP mathematics for 13-year-olds, by type of mathematics taken during the school year: 2012



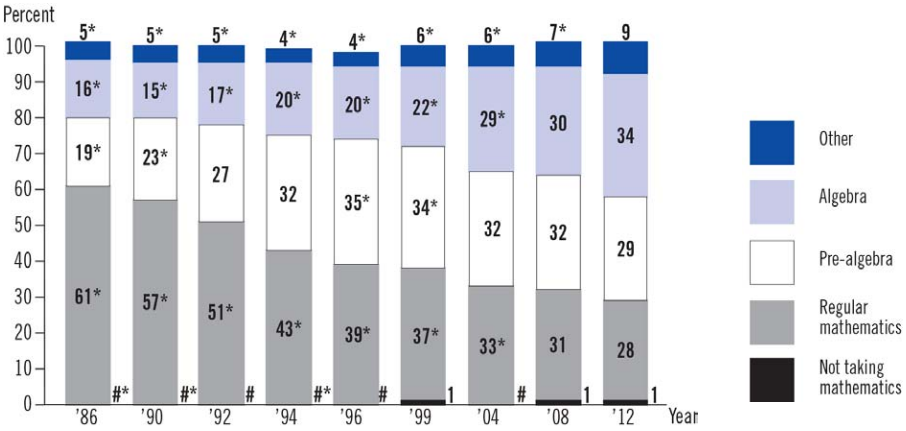
NOTE: An average score is not shown for students who selected the "not taking mathematics" response because the sample size was insufficient to permit a reliable estimate. Detail may not sum to totals because results are not shown for students who reported not taking mathematics.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Mathematics Assessment.

Percentage of 13-year-olds taking algebra increasing

NAEP first collected information on mathematics coursetaking at age 13 in 1986. Since that time, the percentage of 13-year-olds taking algebra has doubled and the percentage taking pre-algebra has also increased (**figure 33**). NCES recently released *Algebra I and Geometry Curricula: Results From the 2005 High School Transcript Mathematics Curriculum Study*. This study explored differences in the content of algebra I and geometry courses. The study also examined the accuracy of school course titles and descriptions in relation to the rigor of what is taught in algebra I and geometry. The results of the study are available at http://nces.ed.gov/nationsreportcard/hsts/math_curriculum/.

Figure 33. Trend in percentage of 13-year-old students assessed in NAEP mathematics, by type of mathematics taken during the school year



Rounds to zero.
* Significantly different ($p < .05$) from 2012.
NOTE: Results for 1986–2004 are from the original assessment format, and results for 2008 and 2012 are from the revised assessment format (2004 revised assessment format results are not available). Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1986–2012 Long-Term Trend Mathematics Assessments.

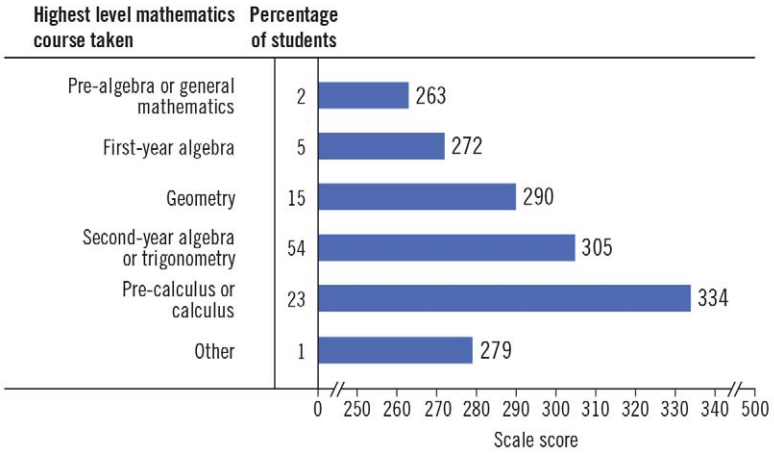
Seventeen-year-olds taking calculus score higher

Seventeen-year-olds were asked, "Counting what you are taking now, have you ever taken any of the following mathematics courses?" The highest level mathematics course was determined based on students' selections from the following responses:

- General, business, or consumer mathematics
- Pre-algebra or introduction to algebra
- First-year algebra
- Second-year algebra
- Geometry
- Trigonometry
- Pre-calculus or calculus

As with the pattern at age 13, the more rigorous the coursework, the higher the average mathematics score for 17-year-olds (**figure 34**). In 2012, students who had taken pre-calculus or calculus scored higher on average than students who selected any of the other options as the highest level course taken. Second-year algebra or trigonometry was the highest mathematics course reported by over one-half of 17-year-olds; the average score for these students was higher than the scores for students who reported taking other courses, with the exception of pre-calculus or calculus. The average score for students whose highest level course was pre-algebra or general mathematics was lower than the scores for students taking any of the other courses.

Figure 34. Percentage of students and average scores in NAEP mathematics for 17-year-olds, by highest level mathematics course ever taken: 2012



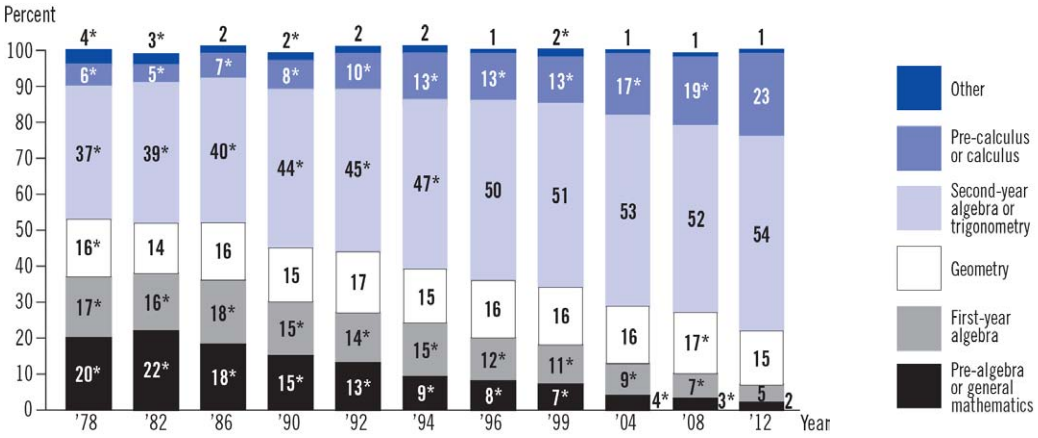
NOTE: The "pre-algebra or general mathematics" response category includes "pre-algebra or introduction to algebra," "general, business, or consumer mathematics," and students who did not take any of the listed courses. The "other" response category includes students for whom the highest level mathematics course could not be determined due to missing or inconsistent responses. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Mathematics Assessment.

Percentage of 17-year-olds taking calculus increasing

The percentage of 17-year-olds taking pre-calculus or calculus more than tripled from 1978 to 2012 (**figure 35**). The percentage of students whose highest level mathematics course was second-year algebra or trigonometry also increased in comparison to 1978.

Figure 35. Trend in percentage of 17-year-old students assessed in NAEP mathematics, by highest level mathematics course ever taken



* Significantly different ($p < .05$) from 2012.

NOTE: The "pre-algebra or general mathematics" response category includes "pre-algebra or introduction to algebra," "general, business, or consumer mathematics," and students who did not take any of the listed courses. The "other" response category includes students for whom the highest level mathematics course could not be determined due to missing or inconsistent responses. Results for 1978–2004 are from the original assessment format, and results for 2008 and 2012 are from the revised assessment format (2004 revised assessment format results are not available). Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

Technical Notes

Sampling and Weighting

The target population for the 2012 NAEP long-term trend assessments consisted of 9-, 13-, and 17-year-old students enrolled in public and private schools nationwide. Eligibility for the age 9 and age 13 samples was based on the calendar year. Students in the age 9 sample were 9 years old on January 1, 2012, with birth months January 2002 through December 2002. Students in the age 13 sample were 13 years old on January 1, 2012, with birth months January 1998 through December 1998. Students eligible for the age 17 sample had to be 17 years old on October 1, 2012, with birth months October 1994 through September 1995.

The national samples for students at ages 9, 13, and 17 were chosen using a multistage design that involved drawing students from the sampled public and private schools across the country (**table TN-1**). Within each age group, the results from the assessed students were combined to provide accurate estimates of the overall performance of students in the nation.

Table TN-1. Number of participating schools and students in NAEP reading and mathematics assessments, by student age group: 2012

	Reading		Mathematics	
Age group	Schools	Students	Schools	Students
Age 9	380	8,700	380	8,800
Age 13	380	8,800	380	8,900
Age 17	370	8,800	360	8,500

NOTE: The number of schools is rounded to the nearest ten. The number of students is rounded to the nearest hundred.

Because each school that participated in the assessment, and each student assessed, represents only a portion of the population of interest, disproportionate representation of subgroups in the selected sample may occur. Results must be weighted to account for any such disproportionate representation. This includes oversampling of schools with high concentrations of students from certain racial/ethnic groups and the lower sampling rates of students who attend small schools.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading and Mathematics Assessments.

School and Student Participation

The weighted national school participation rates for the 2012 long-term trend assessments are presented in table TN-2. Although not shown in the table, national student participation rates for 9-, 13-, and 17-year-old students were 95 percent, 93 percent, and 88 percent, respectively.

Table TN-2. School participation rates in NAEP reading and mathematics assessments, by student age group and type of school: 2012

Type of school	Age 9	Age 13	Age 17
Nation	87	88	84
Public	89	90	86
Private	61	69	63
Catholic	95	92	88

NOTE: Private schools include Catholic, other religious, and nonsectarian private schools.

To ensure unbiased samples, NAEP statistical standards require that participation rates for original school samples be 70 percent or higher to report national results separately for public and private school students. At all three ages, the school participation rates met the standards for reporting results separately for public schools in 2012 but not for private schools. Catholic school participation rates, however, did meet the standards in 2012 for reporting results separately; therefore, results for Catholic schools are included in this report.

The Composition of the 2012 Long-Term Trend Reading and Mathematics Assessments

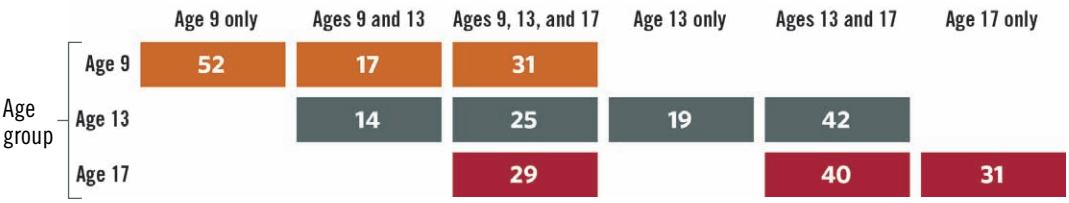
The 2012 reading assessment was composed of between 88 and 106 questions at each age (table TN-3). The majority of these questions were multiple choice. One constructed-response question was included in some, but not all, of the 10 sections administered at each age.

Table TN-3. Number of reading passages and questions in NAEP reading assessment, by student age group: 2012

Age group	Reading passages	Multiple-choice questions	Constructed-response questions
Age 9	36	84	4
Age 13	39	99	7
Age 17	36	95	8

Some of the reading assessment questions were administered to students at more than one age (figure TN-1). For example, of the 88 questions that made up the reading assessment for 9-year-olds, 17 percent were also administered at age 13, and 31 percent were administered across all three age groups.

Figure TN-1. Percentage distribution of NAEP reading assessment questions administered at and across student age groups: 2012



NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading and Mathematics Assessments.

The 2012 mathematics assessment included between 137 and 157 questions at each age (**table TN-4**). The majority of these questions were multiple choice. Some constructed-response questions were included in each of the sections administered at each age.

Table TN-4. Number of multiple-choice and constructed-response questions in NAEP mathematics assessment, by student age group: 2012

Age group	Multiple-choice questions	Constructed-response questions
Age 9	101	36
Age 13	120	37
Age 17	126	31

Some of the mathematics assessment questions were administered across more than one age group (**figure TN-2**). For example, of the 157 questions that made up the mathematics assessment for 13-year-olds, 13 percent were also administered at age 9 and 23 percent were also administered at age 17. Three percent of the mathematics assessment at age 13 was also administered to both 9- and 17-year-old students.

Figure TN-2. Percentage distribution of NAEP mathematics assessment questions administered at and across student age groups: 2012

NOTE: Detail may not sum to totals because of rounding.

The 1973 Mathematics Results

The mathematics trend scale was developed in 1986 for all the assessment years up to that point. Because the 1973 mathematics assessment had too few questions in common with the 1978, 1982, and 1986 assessments, results from the 1973 assessment were placed on the same 0 to 500 mathematics scale using mean proportion correct extrapolation. Estimates were extrapolated from the data so that average mathematics scores could be reported for the nation and by race/ethnicity and gender at all three ages.

The extrapolated estimates for each age level were obtained by assuming a linear relationship between a student group's average scale score and the logit transformation of the group's average percentage of correct responses. The same linear relationship was assumed to hold across assessment years and student groups within an age level. For more information, see the Mathematics Data Analysis chapter in *Expanding the New Design: The NAEP 1985-86 Technical Report*. Because of the need to extrapolate the average scale scores, caution should be used in interpreting the pattern of trends across those assessment years.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Mathematics Assessment.

Interpreting Statistical Significance

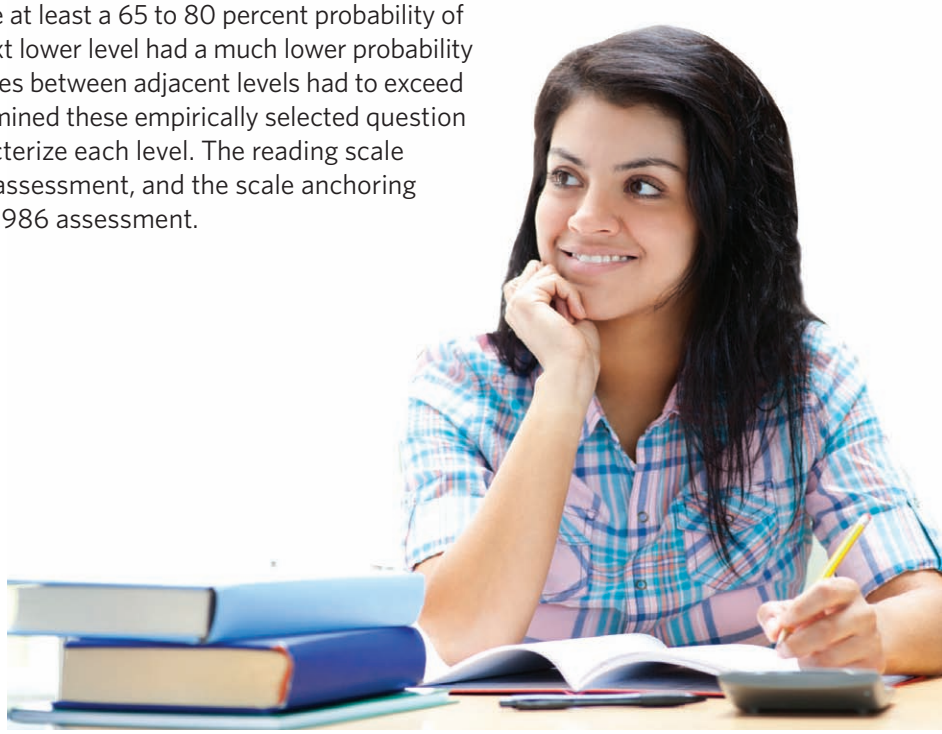
NAEP reports results using widely accepted statistical standards. Significance tests in the form of *t*-tests are conducted to determine if estimates are significantly different from each other. Findings are reported based on a statistical significance level set at .05 with appropriate adjustments for multiple comparisons. Comparisons over time or between groups are based on statistical tests that consider both the size of the differences and the standard errors of the two statistics being compared. Standard errors are margins of error, and estimates based on smaller groups are likely to have larger margins of error. The size of the standard errors may also be influenced by other factors, such as how representative the assessed students are of the entire population.

When an estimate has a large standard error, a numerical difference that seems large may not be statistically significant. Differences of the same magnitude may or may not be statistically significant depending upon the size of the standard errors of the estimates. Standard errors for the estimates presented in this report are available at http://nces.ed.gov/nationsreportcard/lttdata/.

When making multiple simultaneous comparisons, error rates are controlled to ensure that significant differences in NAEP data reflect actual differences and not mere chance. In NAEP, the Benjamini-Hochberg False Discovery Rate (FDR) procedure is used to control the expected proportion of falsely rejected hypotheses relative to the number of comparisons that are conducted. A detailed explanation of this procedure can be found at http://nces.ed.gov/nationsreportcard/tdw/analysis/infer.asp. NAEP employs a number of rules to determine the number of comparisons conducted, which in most cases is simply the number of possible statistical tests. When comparing multiple years, however, the number of years does not count toward the number of comparisons.

Setting Performance Levels

Performance levels are distinct from the achievement levels that have been set for main NAEP assessments. To help interpret NAEP long-term trend results, the reading and mathematics scales were each divided into five successive levels of performance (150, 200, 250, 300, and 350). A "scale anchoring" process was used to define what it meant to score at each of these levels. Questions were identified that were more likely to be answered correctly by students performing at each level on the scale and less likely to be answered correctly by students performing at the next lower level. Students at a given level had to have at least a 65 to 80 percent probability of answering the question correctly; students at the next lower level had a much lower probability of answering it correctly. The difference in probabilities between adjacent levels had to exceed 30 percent. Content specialists for each subject examined these empirically selected question sets and used their professional judgment to characterize each level. The reading scale anchoring was conducted on the basis of the 1984 assessment, and the scale anchoring for mathematics trend reporting was based on the 1986 assessment.



Race/Ethnicity

Results are presented for students in three mutually exclusive racial/ethnic groups: White, Black, and Hispanic. (Note that reading results for Hispanic students were not available prior to 1975.) Performance results for Asian/Pacific Islander students have not been included in long-term trend reports because reporting standards were not met in some of the earlier assessment years. Results for those years in which they could be reported are available in the NAEP Data Explorer at http://nces.ed.gov/nationsreportcard/lttdata/. Results for American Indian (including Alaska Native) students are not reported separately because there were too few students sampled in this group for the results to be statistically reliable. Data for all students, regardless of whether their racial/ethnic group was reported separately, were included in computing the overall national results.

Results by students' race/ethnicity are presented in this report based on information collected from two different sources:

Observed Race/Ethnicity. Prior to 2004, students participating in the long-term trend assessment were assigned to a racial/ethnic category based on the assessment administrator's observation. The results for the 2004 original assessment format and all previous assessment years are based on observed race/ethnicity.

School-Reported Race/Ethnicity. Data about students' race/ethnicity from school records were collected in 2004, but were not collected for any of the previous NAEP long-term trend assessments. The results presented in this report for the 2004 revised assessment format and for 2008 and 2012 are based on school-reported race/ethnicity.

Appendix Tables

Table A-1. Percentage of students assessed in NAEP reading, by age group and selected characteristics: Various years, 1971–2012

Age group and characteristics	1971	1975	1980	1984	1988	1990	1992	1994	1996	1999	2004	2008	2012
Age 9													
Race/ethnicity													
White	84*	80*	79*	75*	75*	74*	74*	76*	71*	69*	59*	56	53
Black	14	13	14	16	16	16	16	15	17*	18*	16	16	14
Hispanic	—	5*	6*	7*	6*	6*	7*	6*	8*	9*	17*	20	25
Other	2*	2*	1*	2*	3*	4*	3*	4*	4*	4*	7	7	9
Asian/Pacific Islander	—	—	1*	2*	2*	3*	2*	3*	3	3*	5	5	6
Type of school													
Public	—	—	89*	88*	88	92	88*	89	86*	88	89*	90*	92
Catholic	—	—	9*	9*	8	5	9*	6	7*	6	6*	5	3
Age 13													
Race/ethnicity													
White	84*	81*	80*	77*	76*	73*	73*	74*	71*	70*	63*	57	55
Black	15	13	13	14	15	15	16	15	15	16	16	16	14
Hispanic	—	5*	6*	7*	6*	8*	7*	8*	9*	10*	16*	21	22
Other	1*	2*	1*	2*	2*	3*	3*	3*	5	3*	5*	7	9
Asian/Pacific Islander	—	—	1*	1*	2*	3*	3*	3*	4	2*	4	5	6
Type of school													
Public	—	—	88	89*	89	88	86*	89	89	87	90	90	91
Catholic	—	—	9*	9*	9	7	7	9*	6	7	5	5	4
Age 17													
Race/ethnicity													
White	87*	84*	83*	77*	77*	74*	75*	73*	72*	72*	70*	59	56
Black	11	11	12	14	15	16	15	15	15	14	12	15	14
Hispanic	—	3*	4*	7*	6*	7*	8*	8*	9*	9*	13*	18	22
Other	1*	1*	1*	2*	2*	4*	3*	3*	4*	4*	6*	7	8
Asian/Pacific Islander	—	—	1*	2*	2*	3*	3*	3*	3*	4*	4*	5	6
Type of school													
Public	—	—	93	90	88	93	92	89	92	90	90	92	93
Catholic	—	—	6	6	11	3	6	7	5	7	‡	4	3

— Not available.
‡ Reporting standards not met.
* Significantly different ($p < .05$) from 2012.
NOTE: Results for 1971–99 are from the original assessment format, and results for 2004–12 are from the revised assessment format. Black includes African American, Hispanic includes Latino, and "other" includes Asian, Native Hawaiian or Other Pacific Islander, American Indian/Alaska Native, two or more races, and unclassified. Race categories exclude Hispanic origin. Results are not shown for private schools under the type of school category because the participation rate for private schools did not meet the minimum participation guidelines for reporting in 2012. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

Table A-2. Percentage of students assessed in NAEP mathematics, by age group and selected characteristics: Various years, 1978–2012

Age group and characteristics	1978	1982	1986	1990	1992	1994	1996	1999	2004	2008	2012
Age 9[1]											
Race/ethnicity											
White	79*	79*	77*	74*	75*	75*	72*	70*	59*	54	52
Black	14	14	15	16*	16	15	16	18*	16	16	13
Hispanic	5*	5*	6*	5*	6*	6*	8*	8*	18*	23	26
Other	1*	2*	2*	4*	3*	4*	5*	4*	7	7	9
Asian/Pacific Islander	1*	1*	1*	3	2*	3*	3	3*	5	4	6
Type of school											
Public	89	86*	85*	89	87*	88	87*	88*	90	90	92
Catholic	10*	9*	12*	7	9*	7*	9*	8*	5	5	3
Grade attended											
3rd grade or below	26*	31*	34	35	38	33	33	35	36	39	37
4th grade[2]	73*	69*	66	65	62	66	66	65	64	61	63
5th grade or above	1*	1*	#	#	#	#	#	#	#	#	#
Age 13											
Race/ethnicity											
White	80*	79*	77*	73*	74*	73*	71*	71*	62	58	56
Black	13	14	14	16	16	15	15	15	16	15	15
Hispanic	6*	5*	7*	7*	7*	8*	9*	10*	17	21	21
Other	1*	2*	2*	4*	3*	4*	4*	4*	5	6	8
Asian/Pacific Islander	1*	1*	2*	3	2*	3*	4	3*	4	4	6
Parents' highest education level											
Did not finish high school	12*	11*	8	8*	6	6	6	6	7*	7*	5
Graduated from high school	33*	34*	31*	27*	23*	23*	23*	21*	18*	17	15
Some education after high school	14*	14	16*	17*	18*	17*	17*	17*	15*	14	13
Graduated from college	26*	32*	38*	41*	44*	46*	45*	48*	47*	48*	54
Unknown	15*	9*	8*	8*	8*	8*	10*	9*	13	14	12
Type of school											
Public	91	89	96	90	88	88	89	88	92	90	91
Catholic	9*	8*	3	7	8	9*	7	7	4	5	4
Grade attended											
7th grade or below	28*	28*	33*	36	37	38	36	39	38	40	39
8th grade[2]	72*	70*	67*	63	62	62	63	61	62	60	60
9th grade or above	1	1	#	1	#	1	1	#	#	#	#
Age 17											
Race/ethnicity											
White	83*	81*	78*	73*	75*	73*	71*	72*	69*	59	56
Black	12	13	14	16	15	15	15	15	12	14	13
Hispanic	4*	5*	5*	7*	7*	9*	9*	10*	14*	19	22
Other	1*	2*	3*	4*	3*	3*	4*	4*	5*	7	8
Asian/Pacific Islander	1*	2*	2*	3*	3*	2*	3*	4*	4*	5	6
Parents' highest education level											
Did not finish high school	13*	14*	8	8	8	7*	6*	7*	8	9	9
Graduated from high school	33*	33*	28*	26*	21*	22*	21*	20*	19*	19*	16
Some education after high school	16*	18*	24*	24*	25*	24*	24*	23*	22*	22*	19
Graduated from college	32*	32*	37*	39*	43*	44*	46*	48	47*	46*	51
Unknown	5	4	3*	3*	2*	3*	2*	3*	4	5	4
Type of school											
Public	94	92	96	93	91	88*	91	89	91	92	93
Catholic	4	6	2	3	6	8*	5	6	‡	4	4
Grade attended											
10th grade or below	15*	16*	17*	22	24	21	24	23	24	25	23
11th grade[2]	75*	75	75	70*	70*	73	71	74	72	71	73
12th grade	10*	9*	8*	8*	6*	6*	6	3	4	4	4

Rounds to zero.

‡ Reporting standards not met.

* Significantly different ($p < .05$) from 2012.

[1] For students at age 9, results are not shown for the parental education level category because research indicates that these students are less likely to report this information accurately.

[2] Typical grade for age group.

NOTE: Results for 1978–99 are from the original assessment format, and results for 2004–12 are from the revised assessment format. Black includes African American, Hispanic includes Latino, and "other" includes Asian, Native Hawaiian or Other Pacific Islander, American Indian/Alaska Native, two or more races, and unclassified. Race categories exclude Hispanic origin. Results are not shown for private schools under the type of school category because the participation rate for private schools did not meet the minimum participation guidelines for reporting in 2012. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1978–2012 Long-Term Trend Mathematics Assessments.

Table A-3. Percentage of students identified as students with disabilities and/or English language learners excluded in NAEP reading and mathematics, as a percentage of all students, by subject and age group: Various years, 1990–2012

Subject and age group	1990[1]	1992[1]	1994[1]	1996[1]	1999[1]	2004[1]	2004[2]	2008[2]	2012[2]
Reading									
Age 9	6	7	7	8	8	8	5	4	2
Age 13	5	6	6	7	6	8	5	4	2
Age 17	4	5	5	7	6	7	4	4	2
Mathematics									
Age 9	5	7	8	8	7	7	3	3	1
Age 13	5	6	6	7	6	8	3	3	1
Age 17	4	5	5	7	6	7	3	4	2

[1] Original assessment format.
[2] Revised assessment format.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1990–2012 Long-Term Trend Reading and Mathematics Assessments.

Table A-4. Percentage of 9-, 13-, and 17-year-old students with disabilities (SD) and/or English language learners (ELL) identified, excluded, and assessed in NAEP reading and mathematics, as a percentage of all students, by SD/ELL category: 2012

	Reading			Mathematics		
SD/ELL category	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
SD and/or ELL						
Identified	22	16	15	22	15	15
Excluded	2	2	2	1	1	2
Assessed	20	14	13	21	14	13
Without accommodations	10	4	4	10	4	3
With accommodations	10	10	9	11	11	10
SD						
Identified	11	12	11	11	12	11
Excluded	1	2	2	1	1	2
Assessed	10	10	9	10	11	10
Without accommodations	2	1	1	3	1	1
With accommodations	8	9	8	7	9	9
ELL						
Identified	12	5	4	12	4	4
Excluded	1	#	#	#	#	#
Assessed	11	4	4	12	4	4
Without accommodations	8	3	3	7	2	2
With accommodations	4	2	1	5	2	2

Rounds to zero.
NOTE: Students identified as both SD and ELL were counted only once under the combined SD and/or ELL category, but were counted separately under the SD and ELL categories. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2012 Long-Term Trend Reading and Mathematics Assessments.

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JUNE 2013

SUGGESTED CITATION

National Center for Education Statistics (2013). *The Nation's Report Card: Trends in Academic Progress 2012* (NCES 2013 456). Institute of Education Sciences, U.S. Department of Education, Washington, D.C.

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