3 Subgroup Results for the Nation and the States

This chapter presents the 2000 mathematics results for various subgroups of students. Subgroup results are given for the nation and for the jurisdictions that participated in the assessment. The 2000 results for the nation are reported for grades 4, 8, and 12 by gender, race/ethnicity, parents' education level, type of school, type of location, and eligibility for the free/reduced-price lunch program, and are compared to results in 1990, 1992, and 1996. For jurisdictions, results are reported for grades 4 and 8 by gender, race/ethnicity and eligibility for the free/reduced-price lunch program. State results for 2000 at grade 4 are compared to those from 1992 and 1996, while grade 8 results are compared to those from 1990, 1992, and 1996. Complete information on subgroups for each jurisdiction that participated in the 2000 assessment is available on the NAEP web site at http://nces.ed.gov/nationsreportcard/tables/.

Chapter Focus

Are selected subgroups of students making progress in mathematics?

The differences that are reported in this chapter for demographic subgroups for the 2000 assessment and previous assessments are based on statistical tests that consider both the magnitude of the difference between group average scores or percentages and the standard error of those statistics. Differences between groups and between assessment years are discussed only if they have been determined to be statistically significant. Furthermore, the reader should bear in mind that differences in mathematics performance most likely reflect a range of socioeconomic and educational factors not addressed in this report or by NAEP.

Chapter Contents

Gender

Race/Ethnicity

Trends in Scale Score Differences

Parents' Education

Type of School

Type of Location

Eligibility for the Free/Reduced-Price Lunch Program

The results are most useful when they are considered in combination with other information about the student population and the educational system, such as trends in instruction, changes in school-age population, funding levels, and societal demands and expectations. Examples of related data by state that are not collected by NAEP are given in appendix C.

National Results: Performance of Selected Subgroups

Gender

Figure 3.1 presents average mathematics scores across assessment years for male and female students at grades 4, 8, and 12. As shown in this figure, both male and female students at each grade had higher scores in 2000 than in 1990.

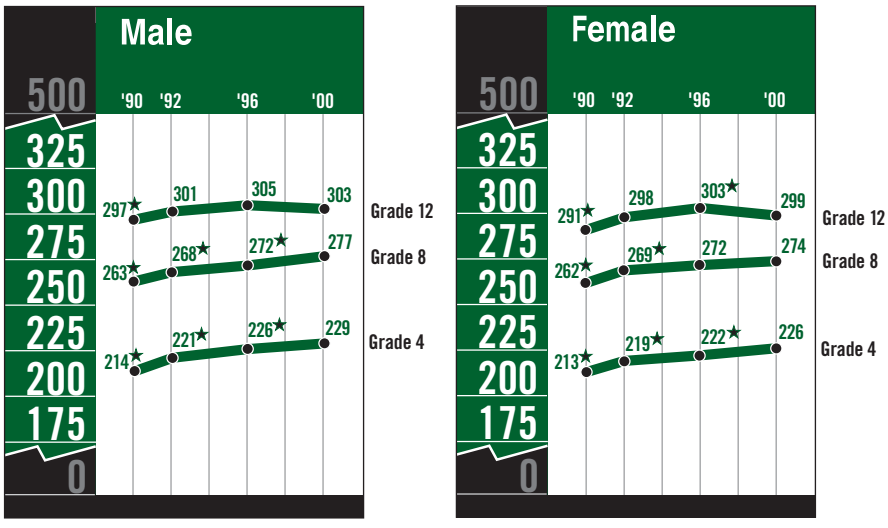
Among fourth-graders, progress has been relatively steady for both males and females throughout the decade, with each year's average score being higher than the previous year. Steady gains are also evident across this ten-year period for male eighth-graders. The average score for female eighth-graders increased from 1990 to 1996, but the apparent increase since 1996 was not statistically significant.

Consistent with the national overall results, the gains made by twelfth-grade male and female students between 1990 and 1996 did not continue through the 2000 assessment. Although the average score for both groups of students remained higher in 2000 than in 1990, there is evidence of a decline since 1996. The

Figure 3.1

National Scale Score Results by Gender

Average mathematics scale scores by gender, grades 4, 8, and 12: 1990–2000



★ Significantly different from 2000.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

apparent decline for male students, however, was not statistically significant.

In 2000, male students outperformed their female peers in grades 8 and 12. However, the apparent score difference between males and females in the fourth grade was not statistically significant.

The percentages of male and female students at or above the mathematics achievement levels and within each achievement level range are presented in figure 3.2. At grade 4, the percentages of both male and female students who performed at or above the *Basic* achievement level increased each assessment year since 1990. Overall gains are also evident in the percentages of students at or above the *Proficient* level, the achievement level identified by the National Assessment Governing Board (NAGB) as the goal for all students. The percentages of male and female fourth-graders performing at this level have at least doubled since 1990—from 13 to 28 percent for male students, and from 12 to 24 percent for female students. Despite some gains since 1990, the percentages of male and female fourth-graders attaining the *Advanced* level remained small in 2000—3 and 2 percent, respectively.

At grade 8, the percentage of male eighth-graders performing at or above the *Basic* level increased each assessment year since 1990. The comparable percentage for female students also increased each year; however, the apparent increase between 1996 and 2000 was not statistically significant. The percentages of students at or above *Proficient* increased between 1990 and 2000—from 17 to 29 percent for males and from 14 to 25 percent for females. Between 1996 and 2000, gains were made by male students at this level, but the apparent increase for female students was not statistically significant. Although the percentages of males and females at the *Advanced* level remained small in 2000 (6 and 4 percent, respectively), for both groups of students these percentages represent an increase from 1990.

At grade 12, the percentages of male and female students at or above *Basic* increased from 1990 through 1996. Although both groups show a decline between 1996 and 2000, the percentages of males and females performing at this level in 2000 remained higher than those in 1990. Performance at or above the *Proficient* level was demonstrated by 20 percent of males and 14 percent of females in 2000. Since 1990 the percentages of male and female twelfth-graders reaching the *Advanced* level have remained mostly stable. In 2000, only 3 percent of males and 1 percent of females demonstrated performance at this highest achievement level.

Comparing the performance of male and female students in 2000 by scale scores revealed a difference favoring male students at grades 8 and 12. A comparison of achievement level results shows that a greater percentage of male students at all three grades performed at or above *Proficient* and at the *Advanced* level in 2000 than did female students. Apparent differences in the percentages of males and females at or above *Basic* in 2000 were not statistically significant at any of the three grades.

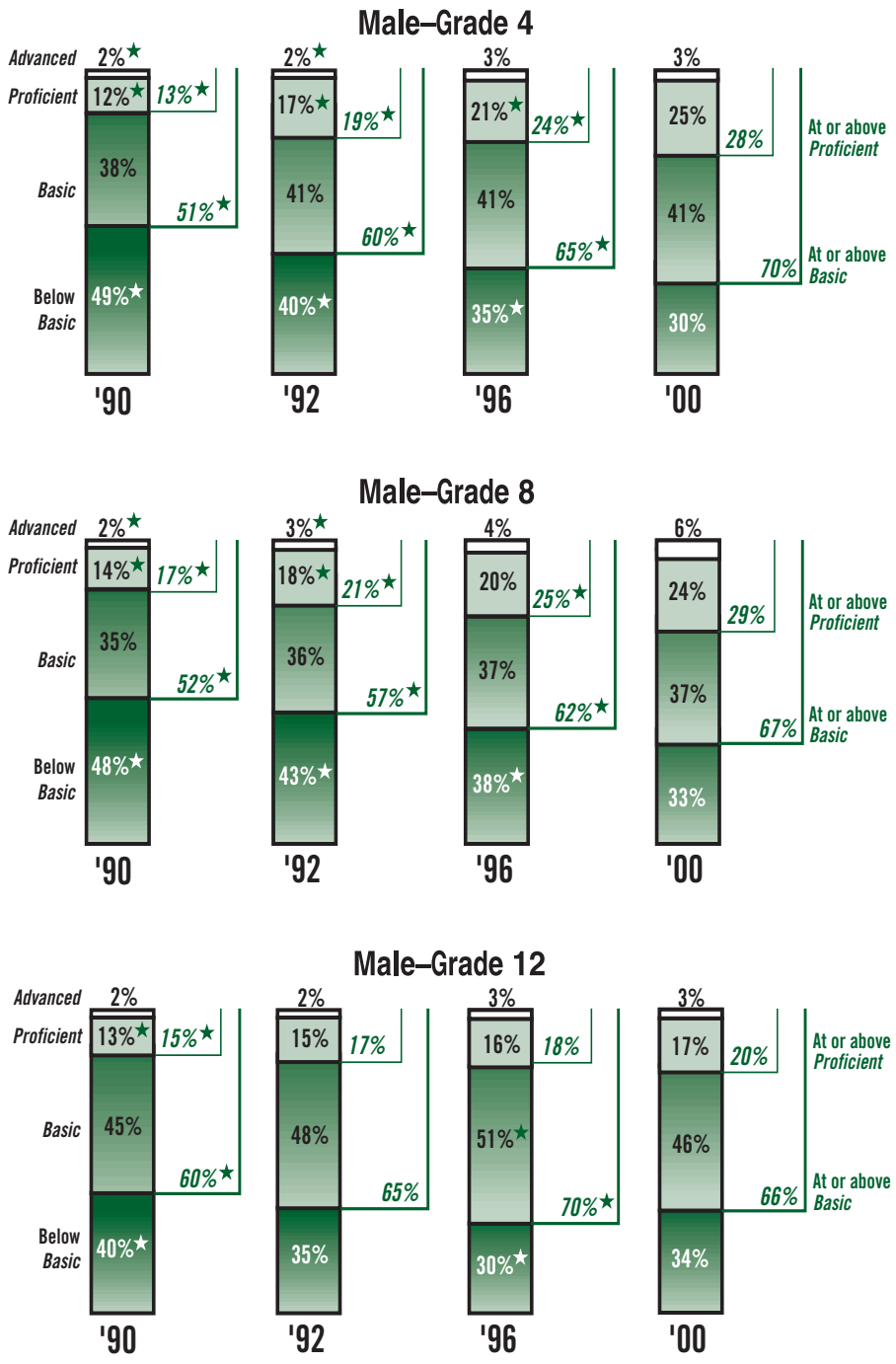
Figure 3.2

National Achievement Level Results by Gender

Percentages of students within each mathematics achievement level range and at or above achievement levels by gender, grades 4, 8, and 12: 1990–2000

How to read these figures:

- The italicized percentages to the right of the shaded bars represent the percentages of students at or above *Basic* and *Proficient*.
- The percentages in the shaded bars represent the percentages of students within each achievement level.

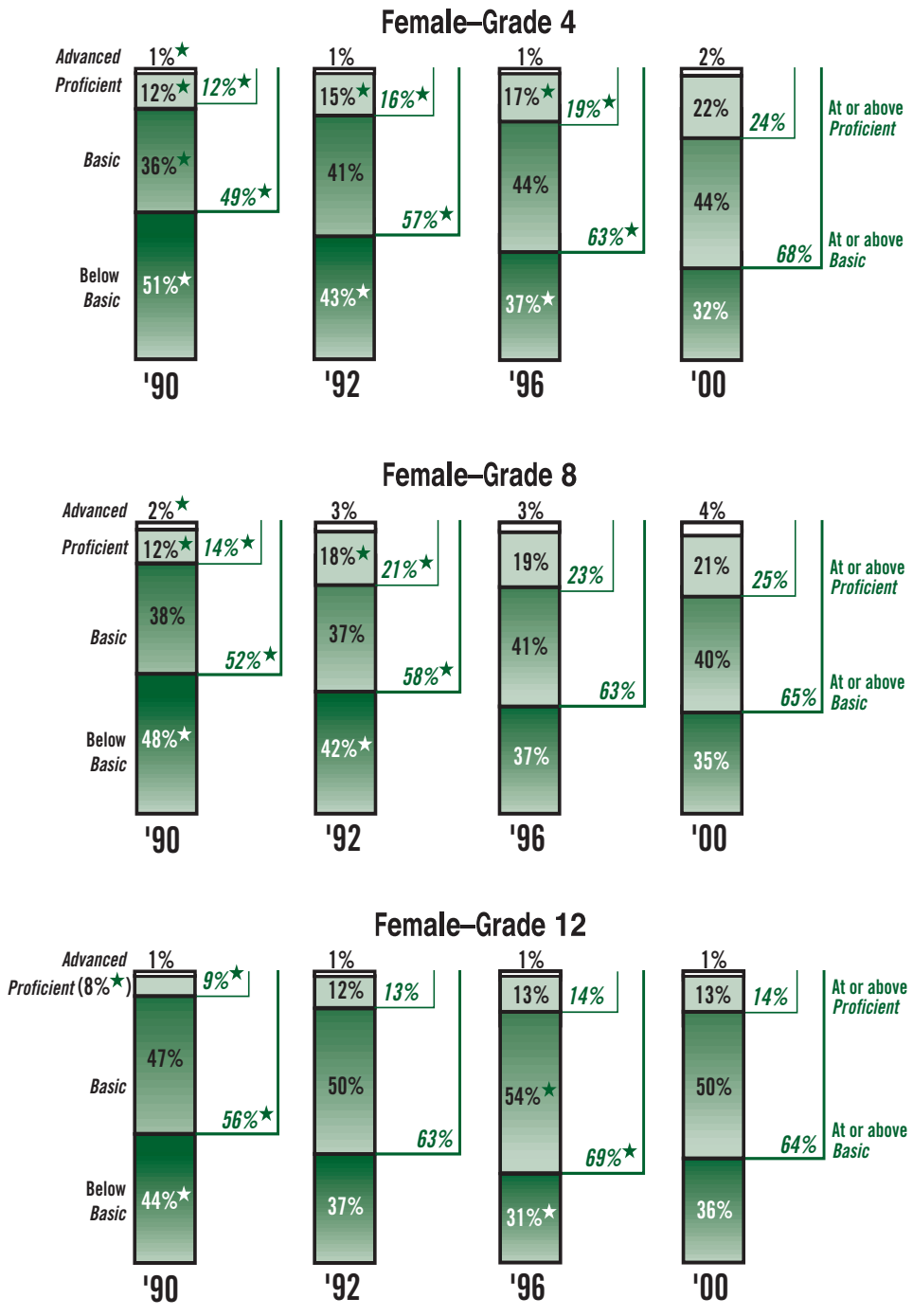


See footnotes at end of figure. ▶

Figure 3.2

National Achievement Level Results by Gender (continued)

Percentages of students within each mathematics achievement level range and at or above achievement levels by gender, grades 4, 8, and 12: 1990–2000



★ Significantly different from 2000.

NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Race/Ethnicity

Students participating in the assessment were asked to indicate which of the following racial/ethnic subgroups best describes them—white, black, Hispanic, Asian/Pacific Islander, or American Indian (including Alaskan native). Figure 3.3 presents average scale scores for students by these subgroups at grades 4, 8, and 12. Overall, while some groups of students have made progress over the past decade, results are mixed.

At grade 4, white, black, and Hispanic students attained a higher score in 2000 than in either 1990 or 1992, while the apparent increase since 1990 for American Indian students was not statistically significant. Data for Asian/Pacific Islander students were not available for 2000 because special analyses raised concerns about the accuracy and precision of these results (see appendix A for a full discussion of this).

At grade 8, scores for white students were higher in 2000 than in any of the previous three assessment years: 1990, 1992, or 1996. Scores for black and Hispanic eighth-graders also were up in 2000 over both 1990 and 1992. However, the apparent increases from 1990 for Asian/Pacific Islander and American Indian eighth-graders were not statistically significant.

Of the three grades assessed, grade 12 saw the fewest increases in students' mathematics performance over the past decade. Despite increases in the mathematics scores of black and Hispanic students from 1990 to 1992, the average scores for both these groups of students in 2000 was similar to that in 1990. White students showed a 7-point increase in scores between 1990 and 2000.

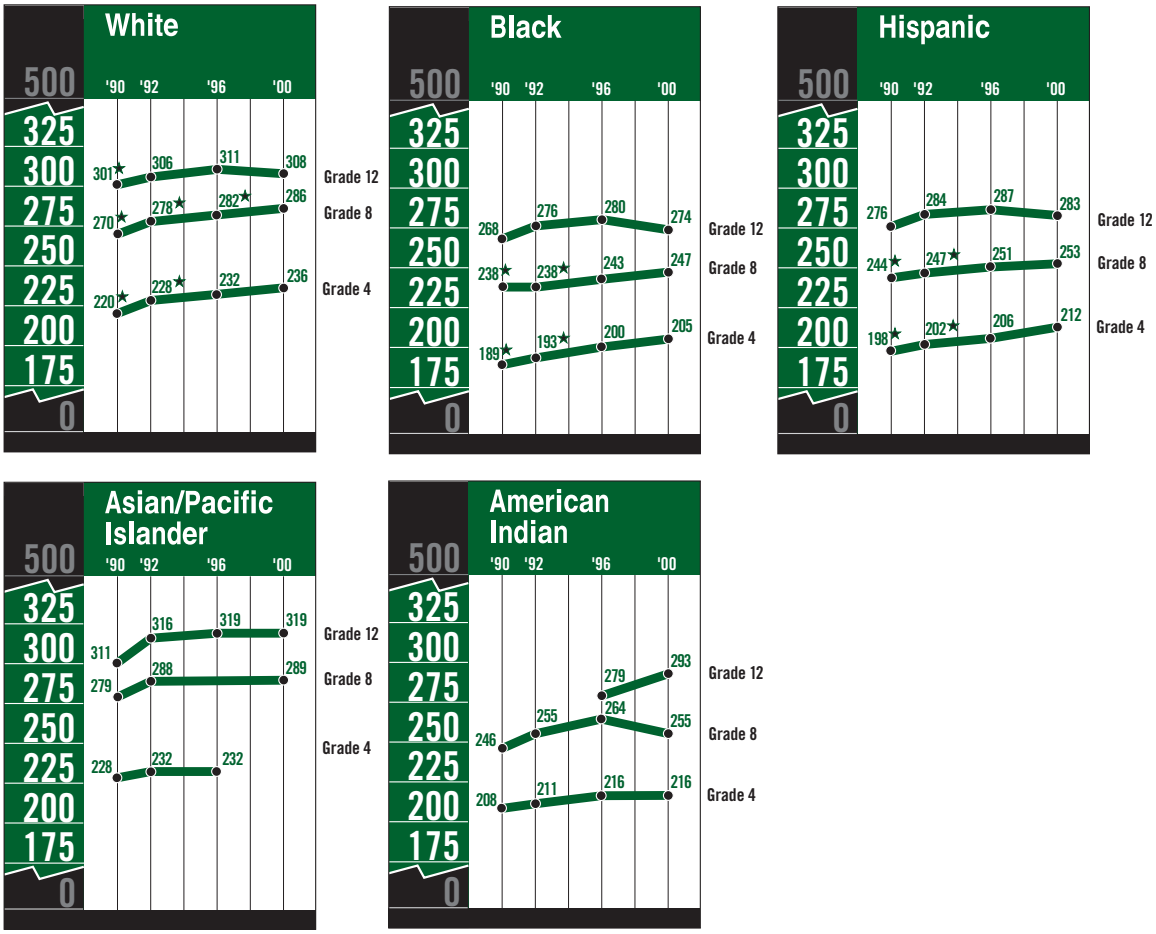
As in previous NAEP mathematics assessments, differences by racial/ethnic subgroup can be seen in students' 2000 mathematics performance at all three grade levels.[1] White and Asian/Pacific Islander students scored higher, on average, than their black, Hispanic and American Indian counterparts at all three grades. Asian/Pacific Islander students scored higher than white students at grade 12.

[1] Reese, C.M., Miller, K.E., Mazzeo, J., & Dossey, J.A. (1997). *NAEP 1996 mathematics report card for the nation and states*. Washington, DC: National Center for Education Statistics.

Figure 3.3

National Scale Score Results by Race/ Ethnicity

Average mathematics scale scores by race/ethnicity, grades 4, 8, and 12: 1990–2000



★Significantly different from 2000.

NOTE: Sample size was insufficient to permit a reliable estimate for American Indian students in grade 12 in 1990 and 1992.

Special analyses raised concerns about the accuracy and precision of national grade 8 Asian/Pacific Islander results in 1996, and grade 4 Asian/Pacific Islander results in 2000. As a result, they are omitted from the body of this report. See appendix A for a more detailed discussion.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

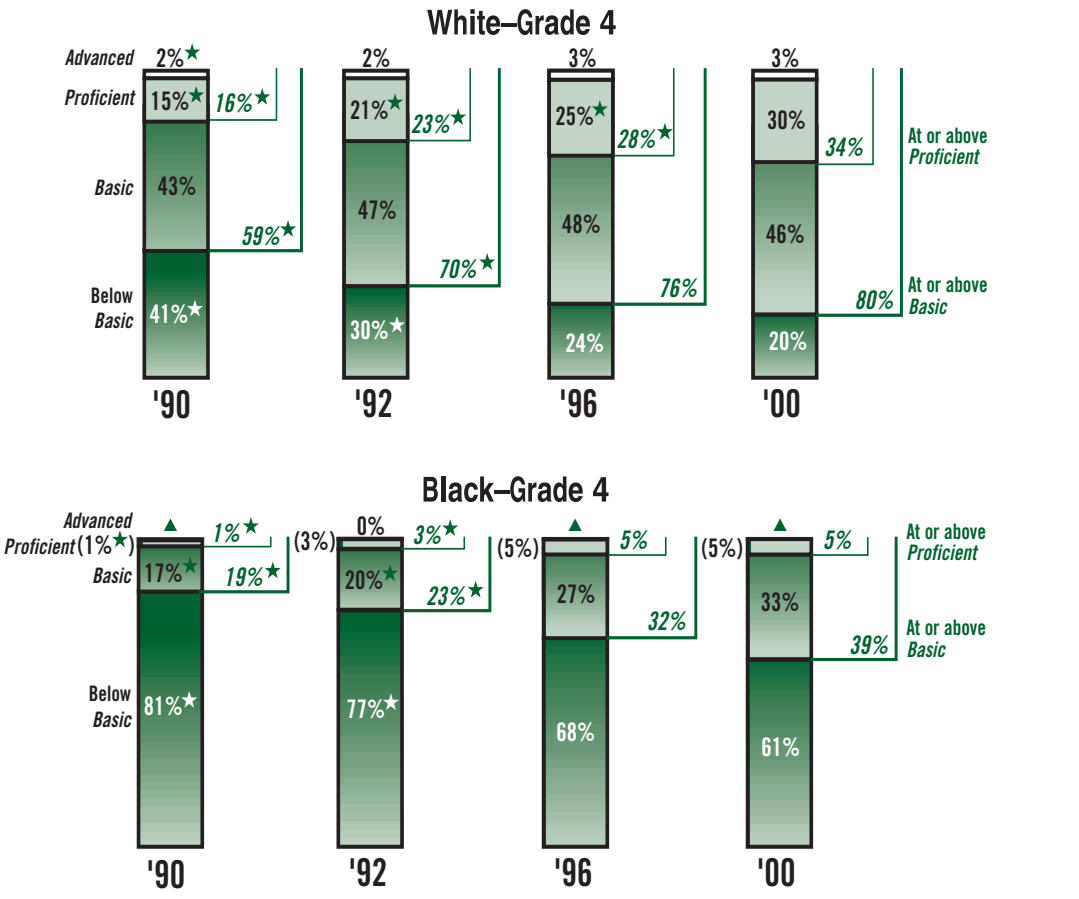
Achievement level results for the racial/ethnic subgroups are presented in figures 3.4a-c. As with the scale score results for 2000, achievement level results for these subgroups of students are mixed.

At grade 4, the percentage at or above *Proficient* increased between 1990 and 2000 for four of the groups of students—white, black, Hispanic, and American Indian. (As noted earlier, results could not be reported for Asian/Pacific Islander fourth-graders in 2000.) In fact, for each of these groups, the percentage at or above *Proficient* in 2000 was at least double that in 1990. The percentage of white fourth-graders at or above *Proficient* level increased in each assessment year from 1990 to 2000, while percentages of black and Hispanic fourth-graders increased in 2000 over 1990 and 1992. There were also higher percentages of white, black, and Hispanic students in 2000 at or above *Basic* than in 1990 or 1992. Percentages at the *Advanced* level remained small for all groups in 2000, though there was a slight increase since 1990 for white fourth-graders.

Figure 3.4a

National Achievement Level Results by Race/Ethnicity

Percentages of students within each mathematics achievement level range and at or above achievement levels by race/ethnicity, grade 4: 1990–2000

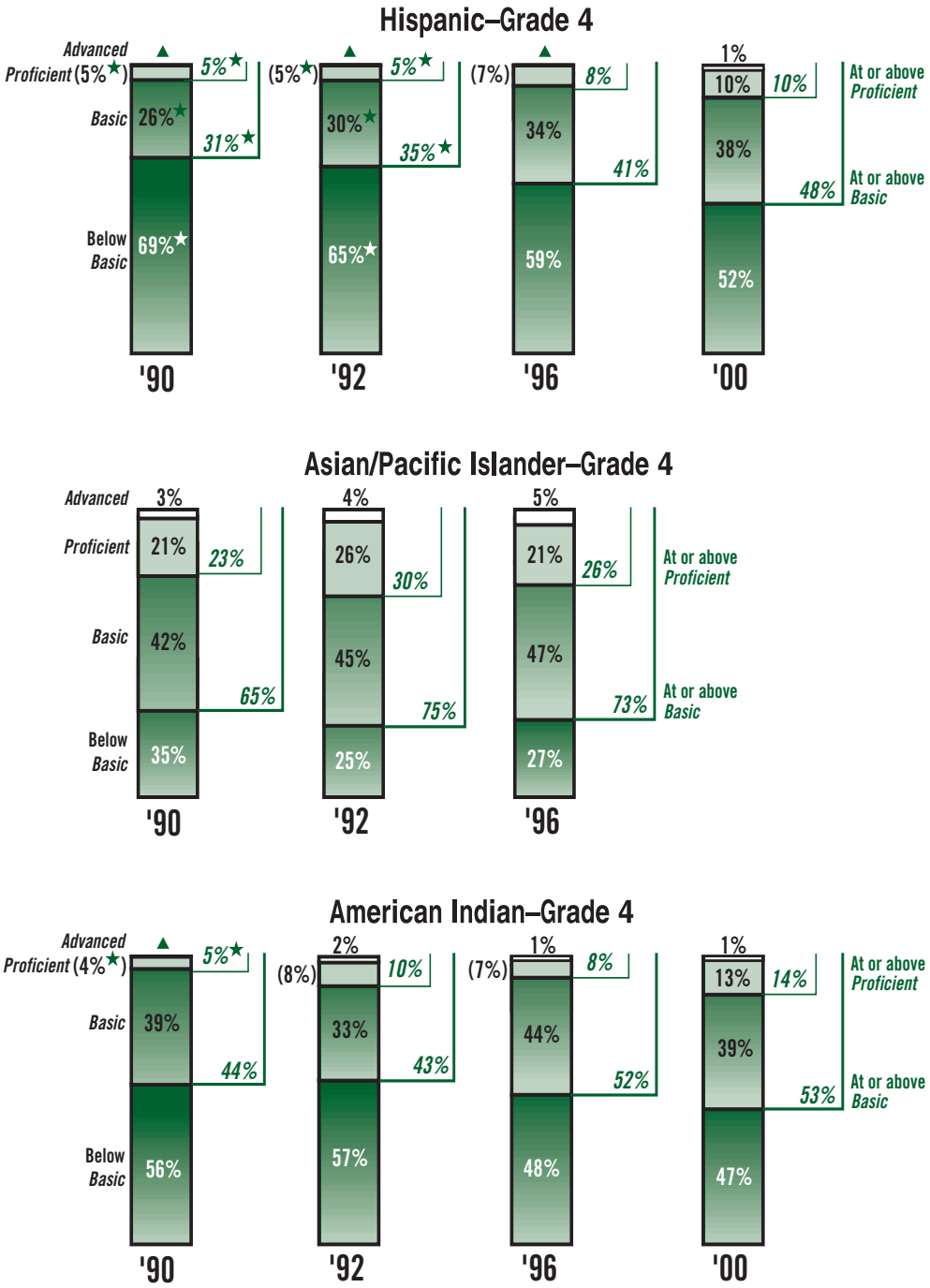


See footnotes at end of figure. ▶

Figure 3.4a

National Achievement Level Results by Race/ Ethnicity (continued)

Percentages of students within each mathematics achievement level range and at or above achievement levels by race/ethnicity, grade 4: 1990–2000



★ Significantly different from 2000.

▲ Percentage is between 0.0 and 0.5.

NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding. Special analyses raised concerns about the accuracy and precision of national grade 4 Asian/Pacific Islander results in 2000. As a result, they are omitted from the body of this report. See appendix A for a more detailed discussion.

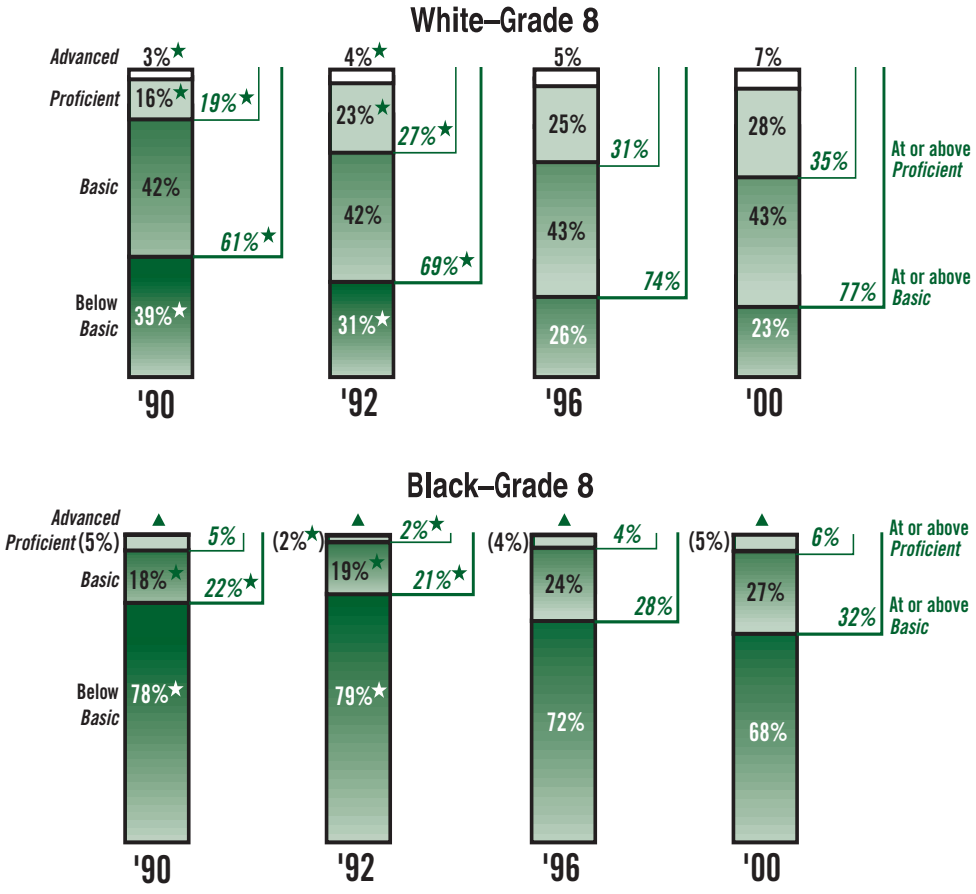
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

At grade 8, there were higher percentages of white and Hispanic students at or above *Proficient* in 2000 than in 1990 and higher percentages of white, black, and Hispanic students at or above this level than in 1992. At or above the *Basic* level, there were higher percentages of white, black and Hispanic students in 2000 than in 1990 or 1992. As seen at grade 4, few students attained the *Advanced* level, with the only increase in occurring for white students in 2000 over 1990 and 1992.

Figure 3.4b

National Achievement Level Results by Race/ Ethnicity

Percentages of students within each mathematics achievement level range and at or above achievement levels by race/ethnicity, grade 8: 1990–2000

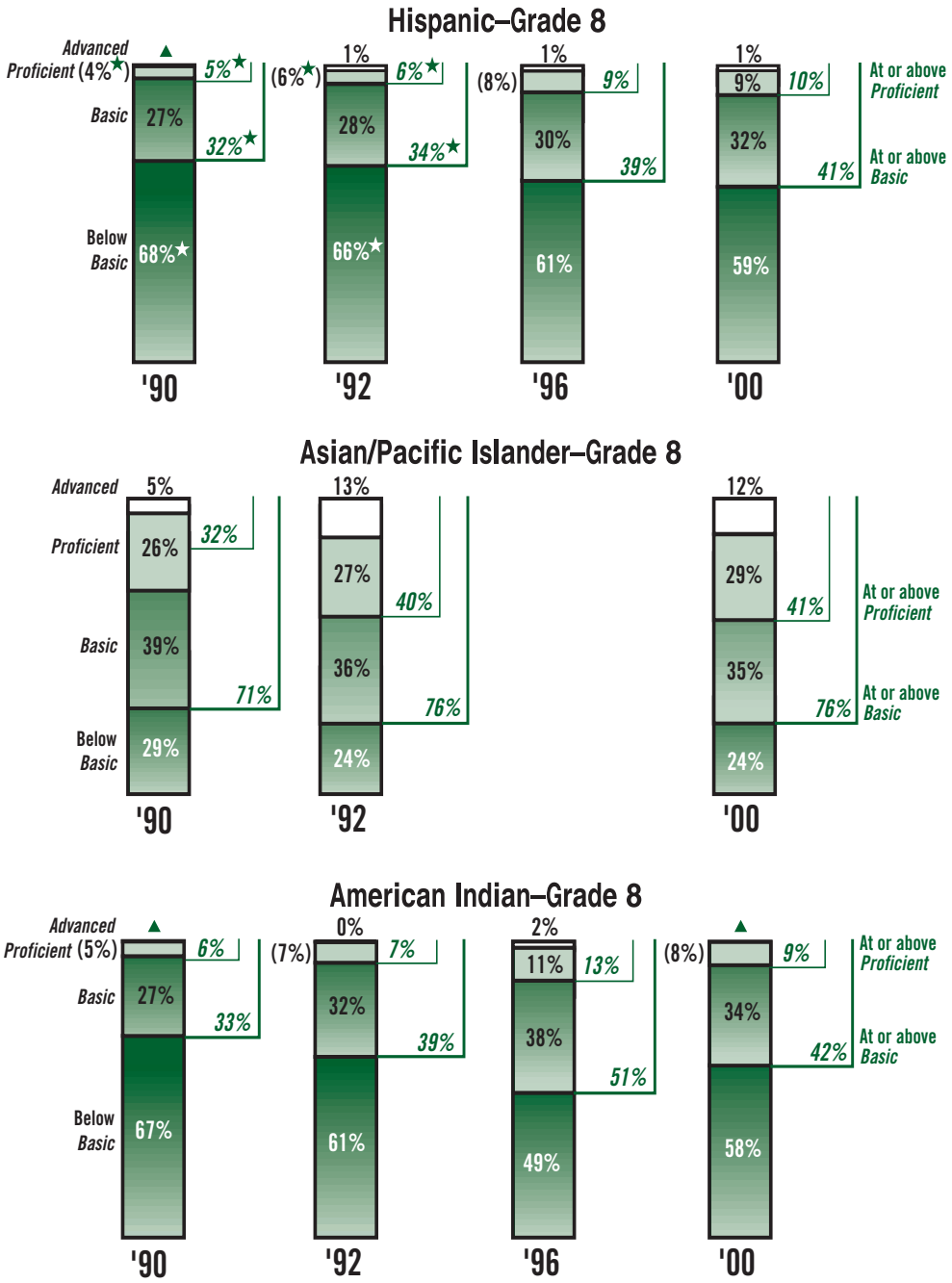


See footnotes at end of figure. ▶

Figure 3.4b

National Achievement Level Results by Race/ Ethnicity (continued)

Percentages of students within each mathematics achievement level range and at or above achievement levels by race/ethnicity, grade 8: 1990–2000



★ Significantly different from 2000.

▲ Percentage is between 0.0 and 0.5.

NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding. Special analyses raised concerns about the accuracy and precision of national grade 8 Asian/Pacific Islander results in 1996. As a result, they are omitted from the body of this report. See appendix A for a more detailed discussion.

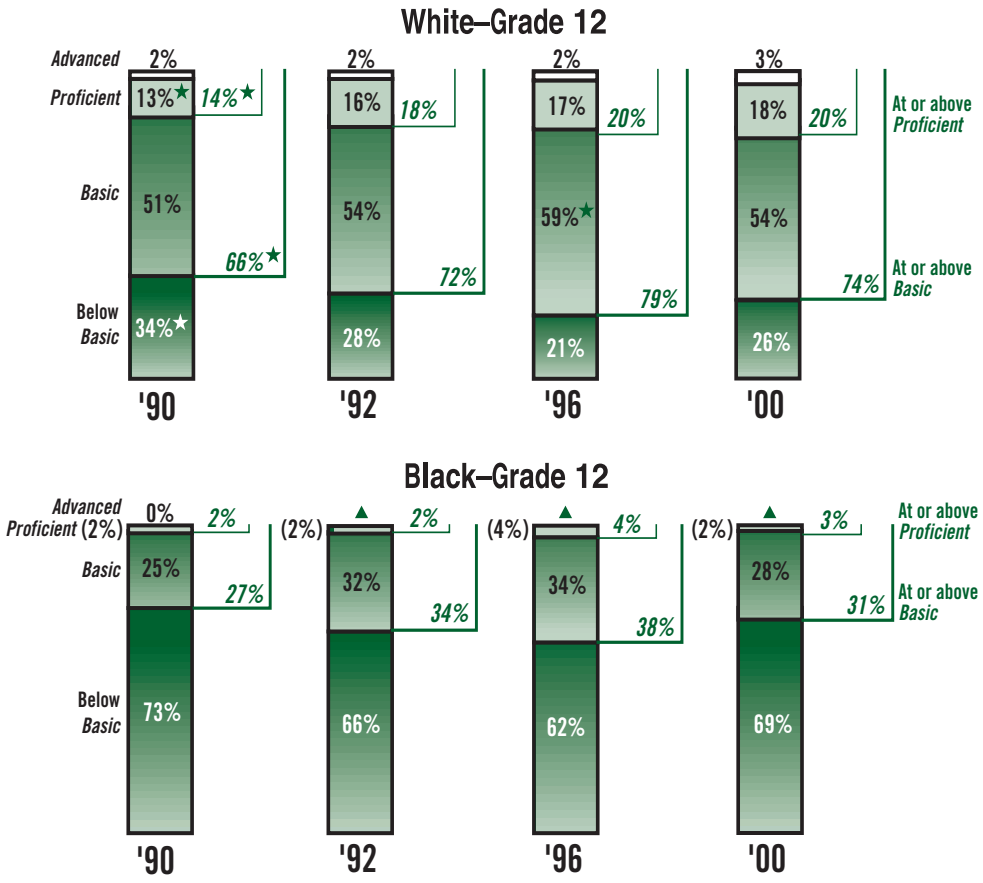
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

At grade 12, there were few changes in students' performance over the past decade. The percentages of white students at or above *Proficient* and at or above *Basic* were higher in 2000 than in 1990. There were also higher percentages of white twelfth-graders at the *Proficient* level in 2000 than in 1990 and at the *Basic* level in 2000 over 1996. These increases for white students were accompanied by a concomitant decrease in 2000 since 1990 at the below *Basic* range.

Figure 3.4c

National Achievement Level Results by Race/Ethnicity

Percentages of students within each mathematics achievement level range and at or above achievement levels by race/ethnicity, grade 12: 1990–2000

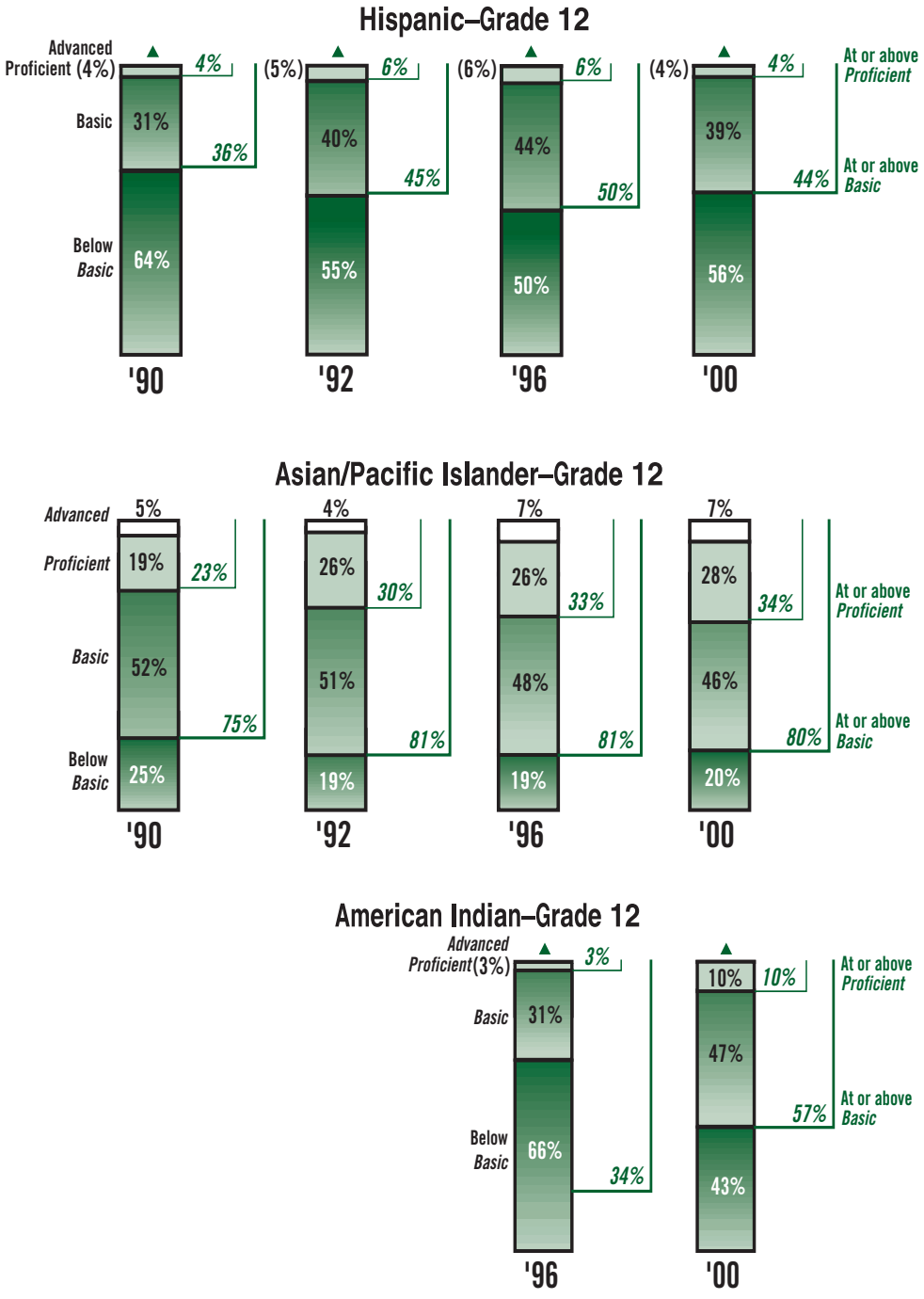


See footnotes at end of figure. ▶

Figure 3.4c

National Achievement Level Results by Race/ Ethnicity (continued)

Percentages of students within each mathematics achievement level range and at or above achievement levels by race/ethnicity, grade 12: 1990–2000



★Significantly different from 2000.

▲ Percentage is between 0.0 and 0.5.

NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding. Sample size was insufficient to permit a reliable estimate for American Indian students in 1990 and 1992.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Trends in Scale Score Differences Between Selected Subgroups

Results from the past four NAEP mathematics assessments allow for comparison of performance differences between male and female students and between racial/ethnic subgroups. These differences should be interpreted with caution. The average score of a selected subgroup does not represent the entire range of performance within that group. Furthermore, differences between groups of students can not be attributed solely to group identification.

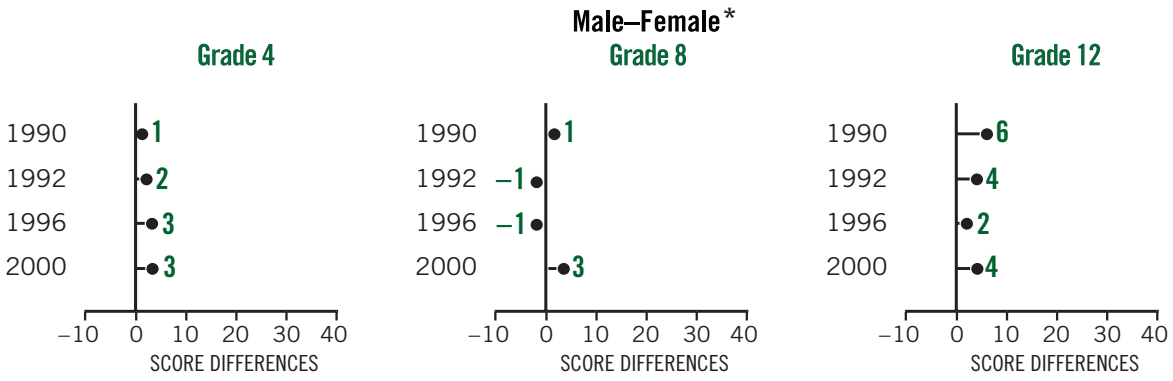
A complex array of educational and social factors interacts to affect average student performance. Analysis of the patterns of NAEP score gaps by subgroup both within and across states has been a frequent topic in recent education policy research.[2]

Differences between the average scale scores of male and female students are presented in figure 3.5. Although significant at grades 8 and 12 in 2000, the gap between average scale scores by gender has been quite small and has fluctuated only slightly over the past four mathematics assessments.

Figure 3.5

National Scale Score Differences by Gender

Gender gaps in average mathematics scale scores, grades 4, 8, and 12: 1990–2000



* Score differences are calculated based on differences between unrounded average scale scores.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

[2] Barton, P.E. (2001) *Raising achievement and reducing gaps: Reporting progress toward goals for academic achievement*. Washington, DC: National Education Goals Panel.

Haycock, K., Jerald, C., & Huang, S. (2001). New frontiers for a new century: A national overview. Thinking K-16, *Education Trust*., Vol. 5, Issue 2.

Sadowski, M. (2001). Closing the gap one school at a time, Harvard Education Letter, *Research OnLine.* [Available online at http://www.edletter.org/current/].

The College Board, (1999). *Reaching the top: A report of the national task force on minority high achievement*. New York: Author. [Available online at http://www.collegeboard.com].

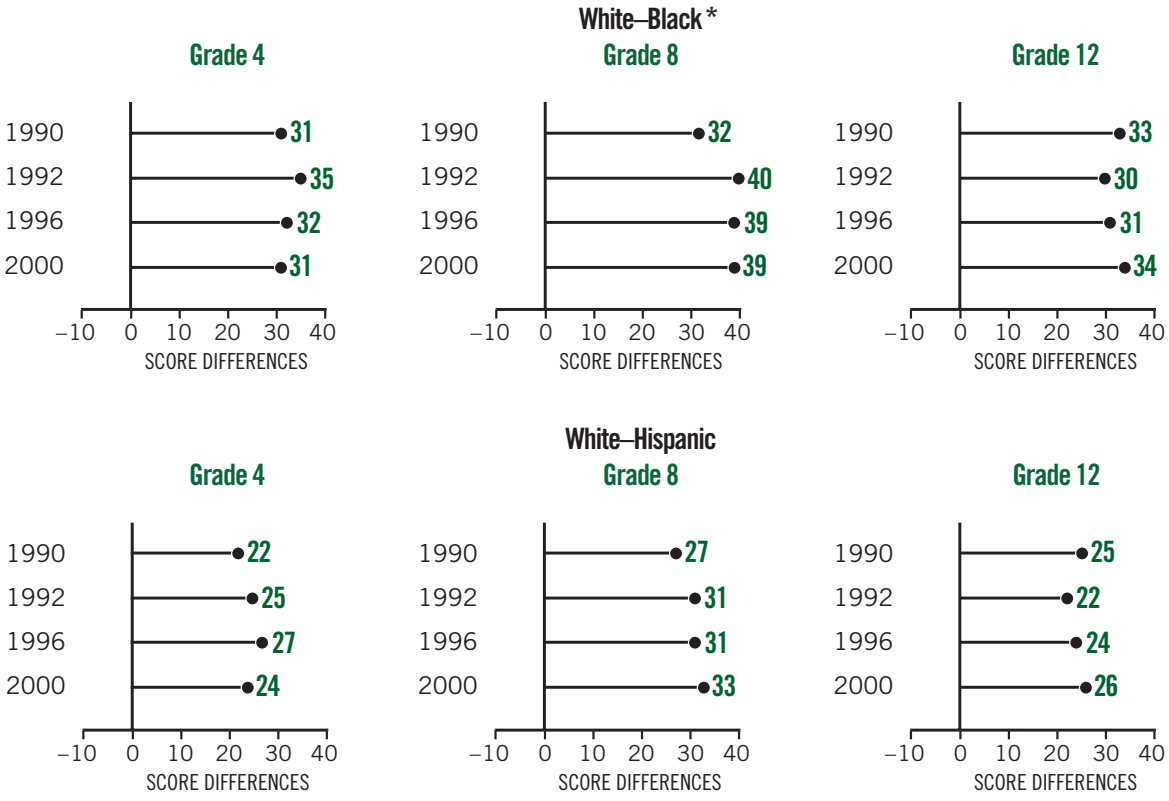
Jencks, C. and Phillips, M. (eds.) (1998). The black-white test score gap. Washington, DC: Brookings Institution.

The gaps in scale scores between white and black students and between white and Hispanic students are shown in figure 3.6. Unlike the small gaps seen between the genders, the size of the scale score gaps between the racial/ethnic subgroups presented here are much larger. The widening of the gap from 32 to 40 points between white and black eighth-graders from 1990 to 1992 is the only statistically significant change between either white and black students or white and Hispanic students over the past ten years. The 39 point gaps seen in 1996 and 2000 between white and black students at grade 8 are not significantly different from the gap in 1990.

Figure 3.6

National Scale Score Differences by Race/ Ethnicity

Racial/ethnic gaps in average mathematics scale scores, grades 4, 8, and 12: 1990–2000



* Score differences are calculated based on differences between unrounded average scale scores.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Parents' Highest Level of Education

Students who participated in the NAEP mathematics assessment were asked to indicate the highest level of education completed by each parent. Four levels of education were identified: did not finish high school, graduated from high school, some education after high school, and graduated from college. Students could also choose the response, "I don't know." For this analysis, the highest education level reported for either parent was used. Data are presented for students in grades 8 and 12 only. Data were not collected at grade 4 because in previous NAEP assessments fourth-graders' responses about their parents' education were highly variable and contained a large percentage of "I don't know" responses.

The scale score results for all levels of student-reported parent education are presented in figure 3.7. Almost one-half of both the eighth- and twelfth-graders (45 and 46 percent, respectively) reported that at least one parent had graduated college, whereas a small percentage of students reported that their parents had not graduated high school (7 and 6 percent at grades 8 and 12, respectively). Additional information on the percentages of students reporting parents' highest level of education is available in appendix B.

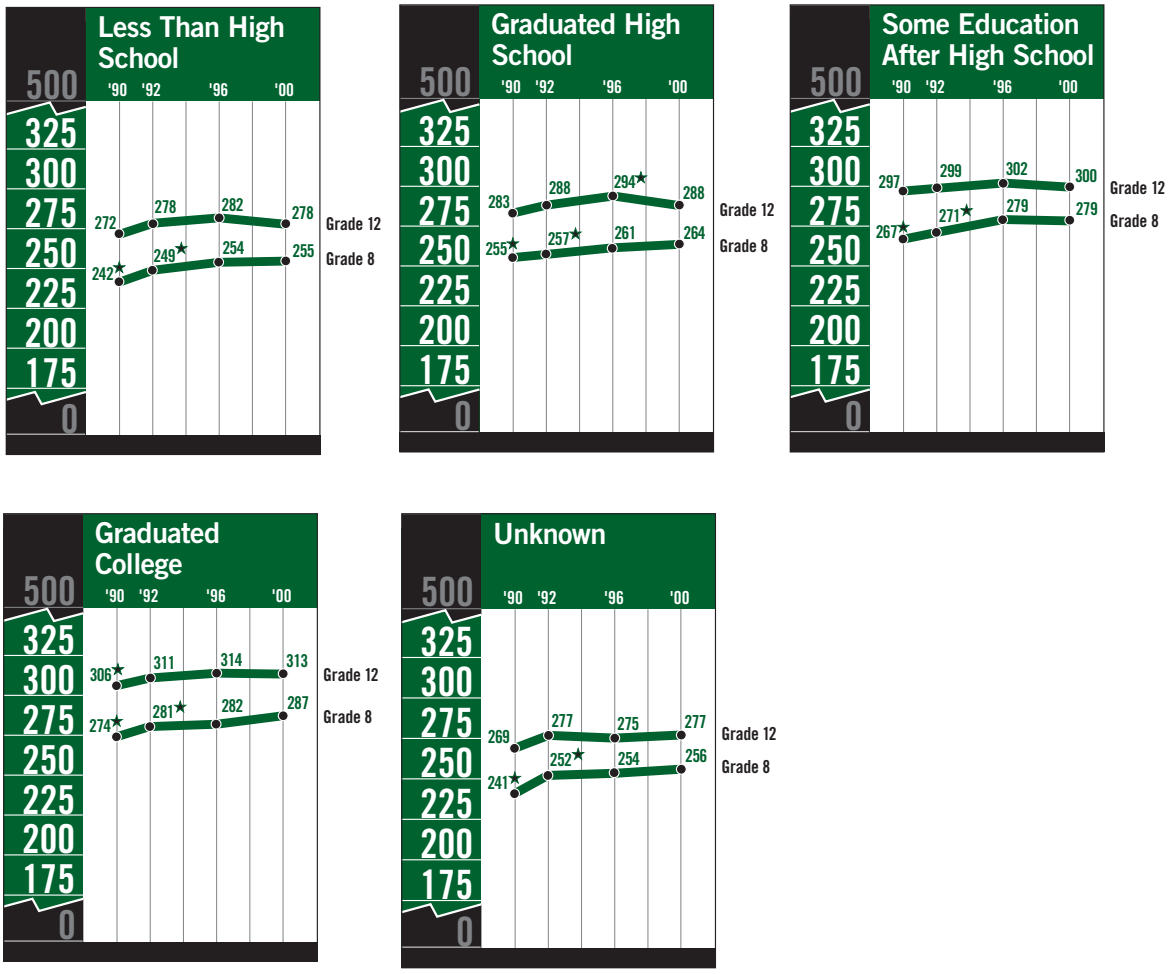
At grade 8, scale scores for students were higher in 2000 than in 1990 and 1992, regardless of the level of parental education reported. None of the other apparent changes at this grade were statistically significant.

At grade 12, the scale score for only one group of twelfth-graders—students whose parents graduated college—was higher in 2000 compared to 1990. None of the other apparent changes between 1990 and 2000 in performance by parental level of education was statistically significant, although there was a performance decline from 1996 to 2000 of those students whose parents' highest level of education was high school graduate.

Overall there is a clear, positive association at both grades 8 and 12 between increasing level of parental education and increasing scale scores on the mathematics assessment.

Figure 3.7
National Scale Score Results by Parents' Education

Average mathematics scale scores by student-reported parents' highest level of education, grades 8 and 12: 1990–2000



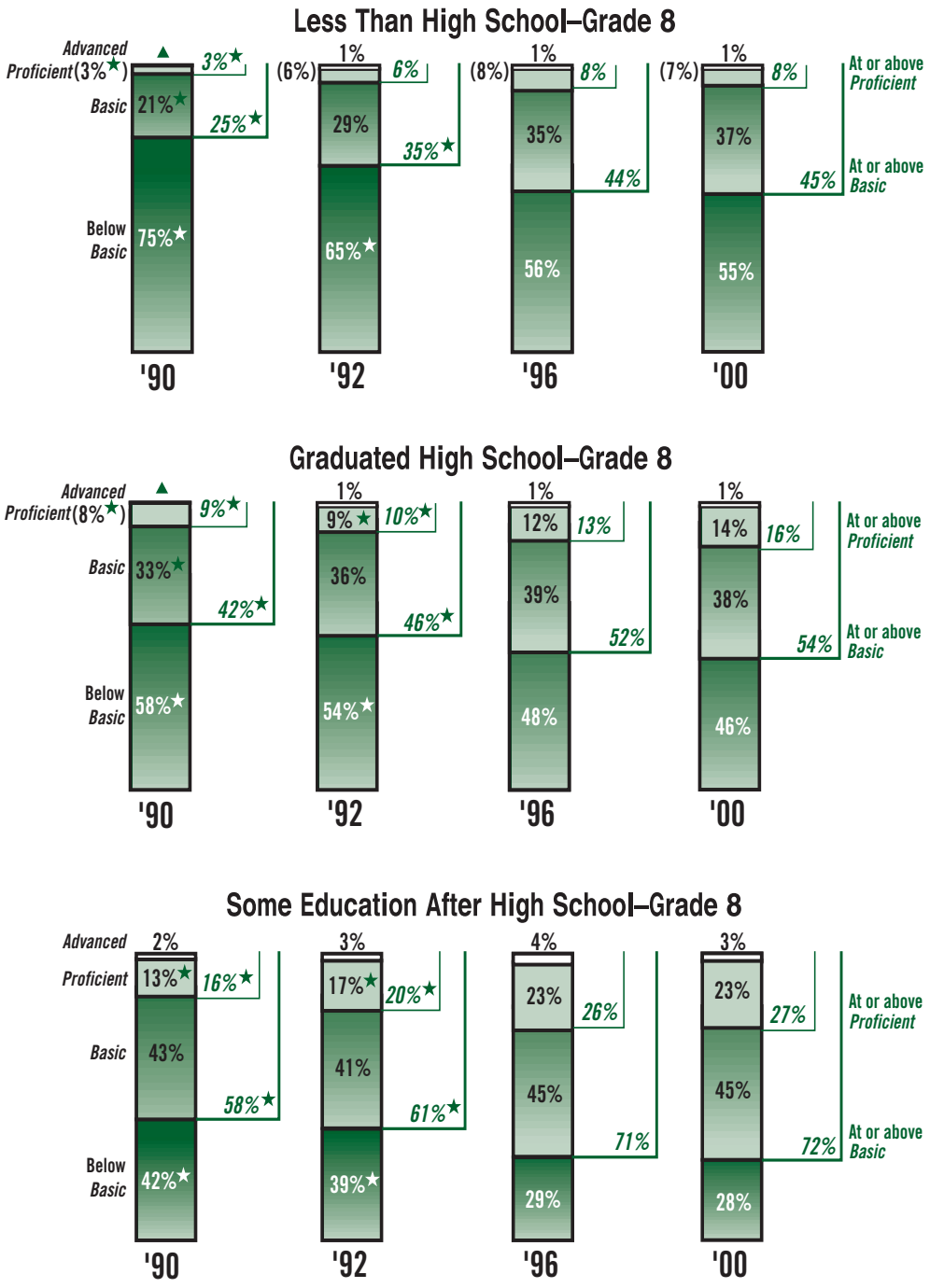
★ Significantly different from 2000.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Achievement level results across years by level of parental education are presented in figure 3.8a and b. At grade 8, students in the 2000 assessment at each level of parental education had a higher percentage at or above *Basic* than their counterparts in 1990 or in 1992 and a higher percentage at or above *Proficient* than in 1990.

At grade 12 there was an increase between 1990 and 2000 in the percentages of students at or above *Proficient* and at or above *Basic* who reported that their parents had graduated from college. None of the other apparent changes since 1990 at this grade level were statistically significant.

Figure 3.8a
National Achievement Level Results by Parents' Education

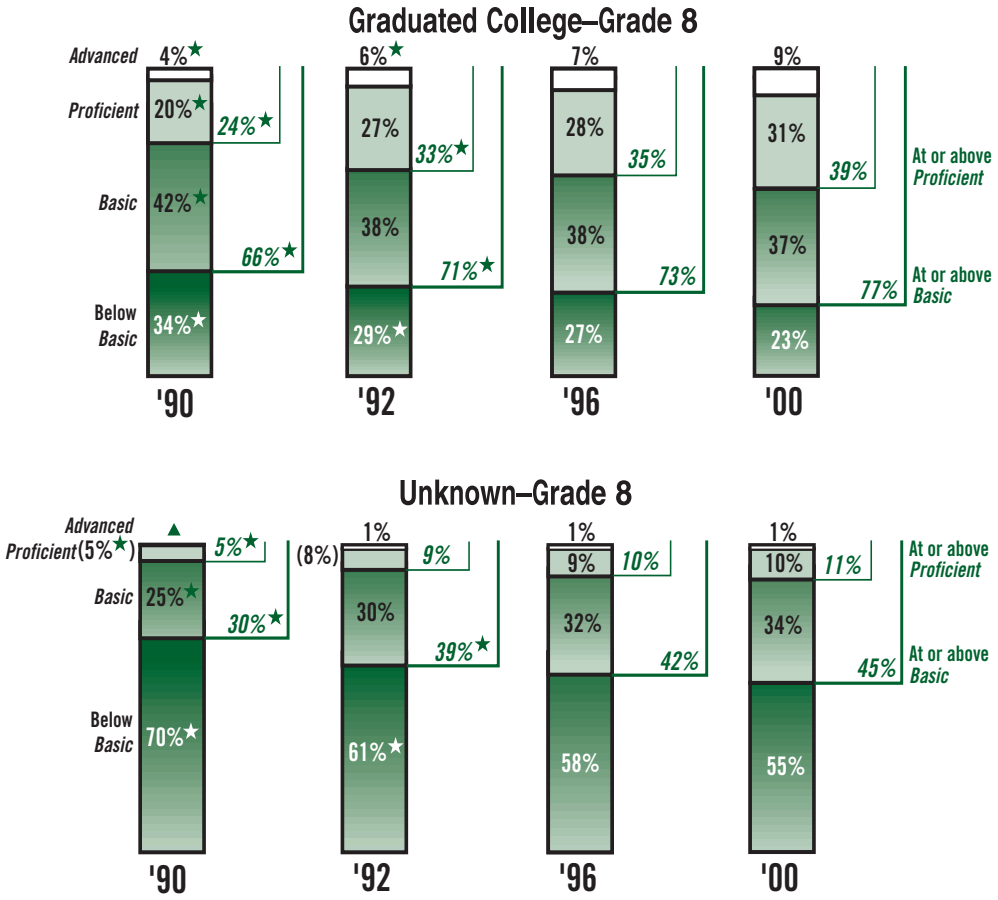
Percentage of students within each mathematics achievement level range and at or above achievement levels by parents' highest level of education, grade 8: 1990–2000



See footnotes at end of figure. ▶

Figure 3.8a
National Achievement Level Results by Parents' Education
(continued)

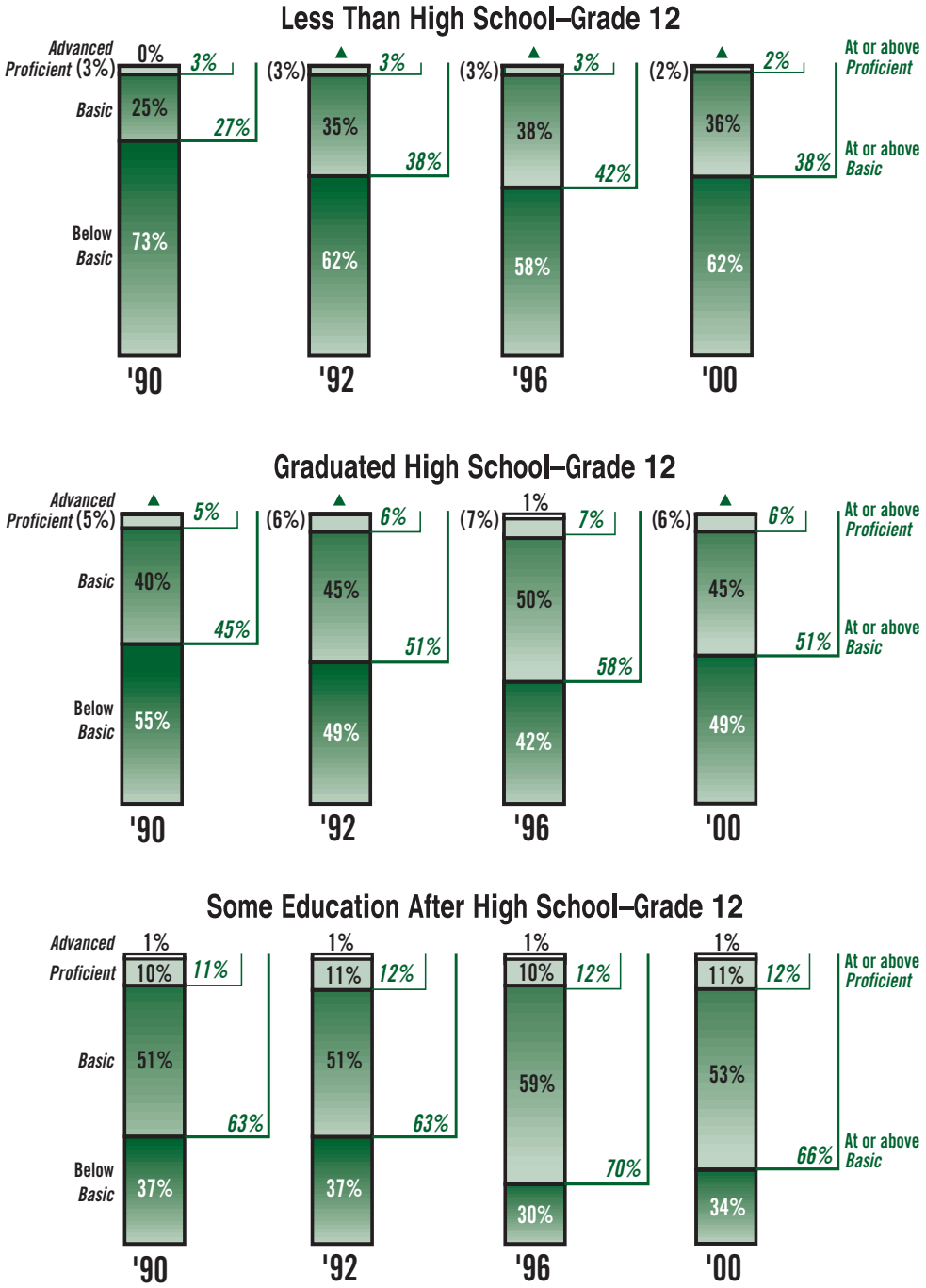
Percentage of students within each mathematics achievement level range and at or above achievement levels by parents' highest level of education, grade 8: 1990–2000



★ Significantly different from 2000.
▲ Percentage is between 0.0 and 0.5.
NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Figure 3.8b
National Achievement Level Results by Parents' Education

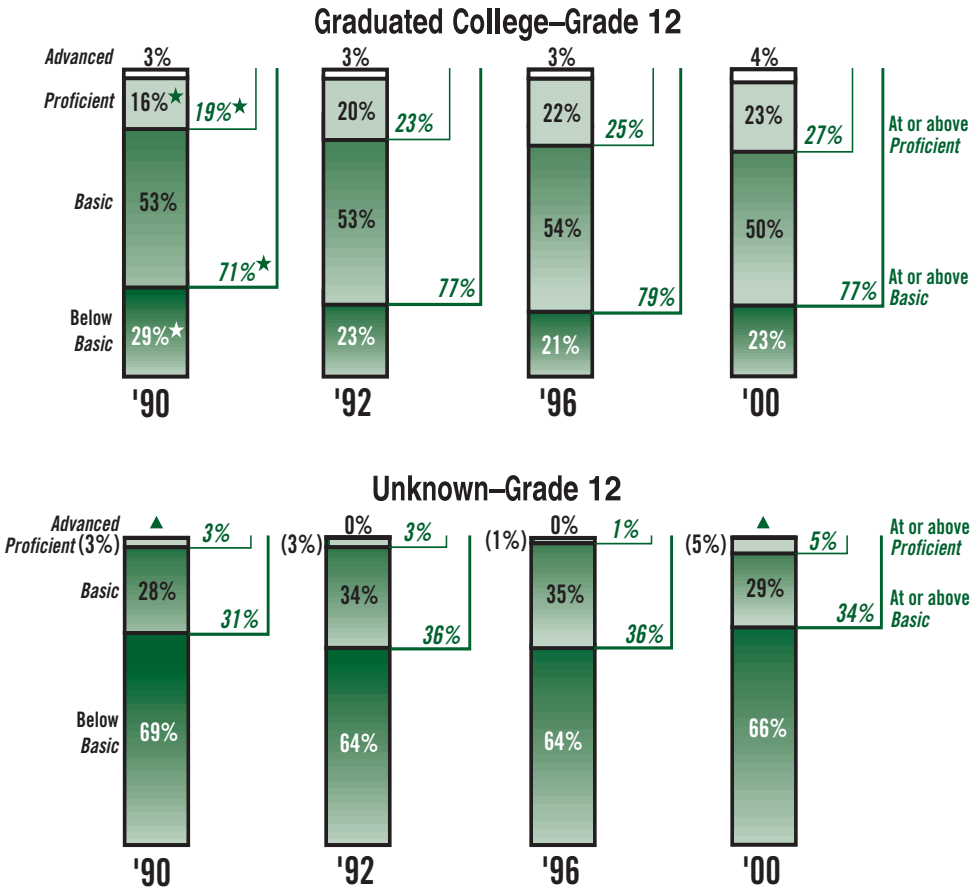
Percentage of students within each mathematics achievement level range and at or above achievement levels by parent's highest level of education, grade 12: 1990–2000



See footnotes at end of figure. ▶

Figure 3.8b
National Achievement Level Results by Parents' Education
(continued)

Percentage of students within each mathematics achievement level range and at or above achievement levels by parent's highest level of education, grade 12: 1990–2000



★ Significantly different from 2000.
▲ Percentage is between 0.0 and 0.5.
NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Type of School

The schools that participate in the NAEP assessment are classified as either public or nonpublic. A further distinction is then made within the nonpublic classification between schools that are Catholic and other nonpublic schools.[3] Differences in performance between public and nonpublic schools surveyed and reported on in NAEP mathematics assessments have shown that students attending nonpublic schools outperform their public school peers.[4] Despite this pattern of performance results, readers are cautioned about the comparative quality of instruction in public and nonpublic schools. Socioeconomic and sociological factors that may affect student performance should be considered when interpreting these results.

Average mathematics scale scores by type of school are presented in figure 3.9. In 2000, as in previous NAEP assessments, students attending nonpublic schools—both Catholic and other nonpublic—had higher mathematics scale scores than did students attending public schools at each of the three grades. However, students in public schools at grades 4 and 8 showed the steadiest improvement, with scores rising regularly in every assessment from 1990 to 2000. At grade 12, students' average scores in all school types have been relatively flat since 1992. However, twelfth-graders' scores in each of the school types were higher in 2000 than in 1990.

[3] More detail on results by school type including additional breakouts by types of nonpublic schools are available at the NAEP website (http://nces.ed.gov/nationsreportcard).

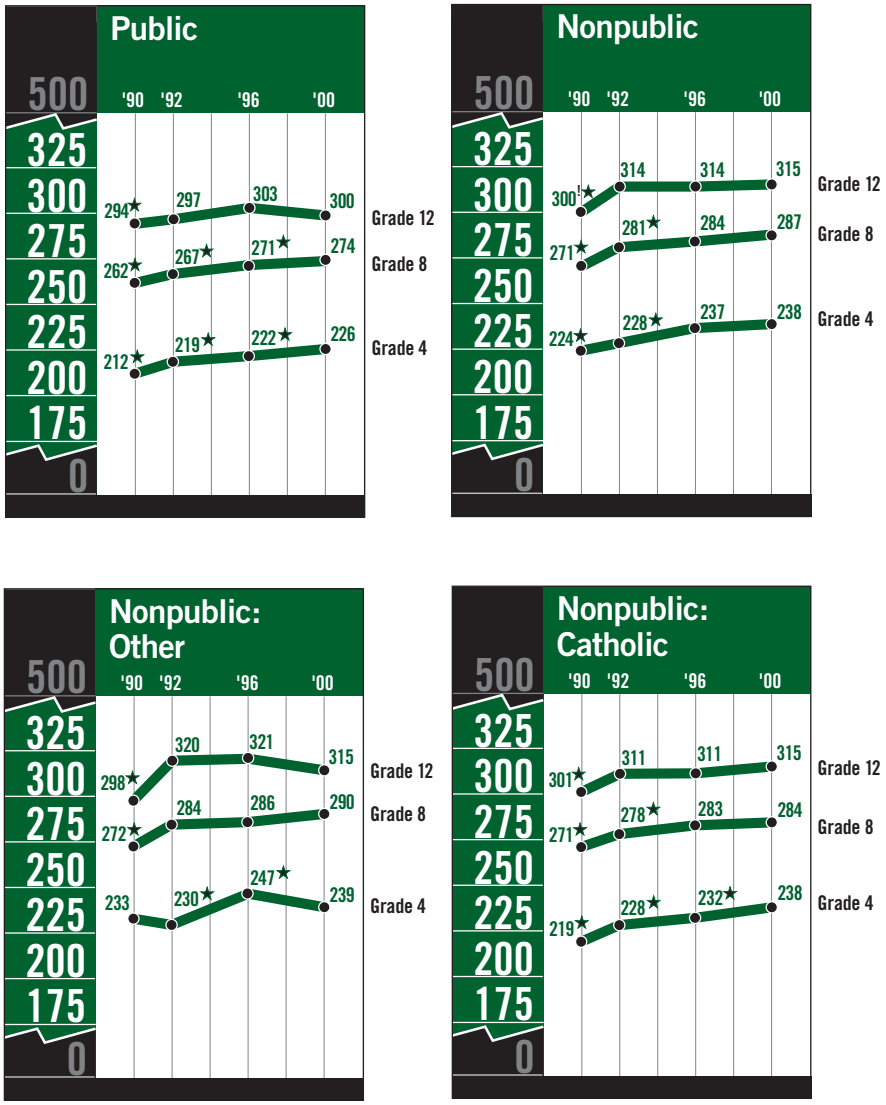
[4] Campbell, J.R., Voelkl, K.E., & Donahue, P.L. (1997). *NAEP 1996 trends in academic progress.* Washington, DC: National Center for Education Statistics.

Campbell, J.R., Hombo, C.M., & Mazzeo, J. (2000) *NAEP 1999 trends in academic progress: Three decades of student performance.* Washington, DC: National Center for Education Statistics (NCES 2000-469).

Figure 3.9

National Scale Score Results by Type of School

Average mathematics scale scores by type of school, grades 4, 8, and 12: 1990–2000



★ Significantly different from 2000.

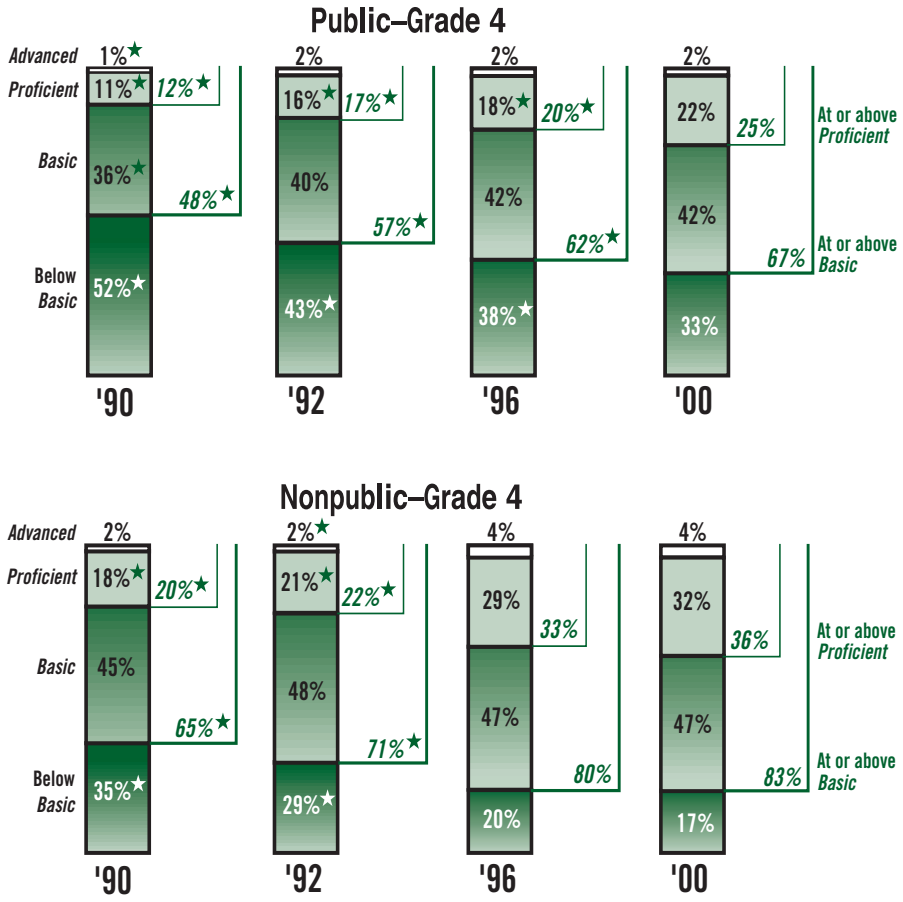
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Achievement level results by school type are presented in figures 3.10a-c. At grade 4, the percentages of public and nonpublic school students performing at or above the *Proficient* achievement level increased between 1990 and 2000. The percentage of students performing at or above *Proficient* at Catholic schools also increased in 2000 in comparison to 1990. Despite some fluctuation, the apparent increase between 1990 and 2000 in the percentage of other nonpublic school students (i.e., non-Catholic schools) at or above *Proficient* was not statistically significant. A similar pattern was evident for the percentage of students at or above *Basic*. There were also steady increases in the percentages of public school students performing at or above the *Basic* level between 1990 and 2000, while the percentages of nonpublic and Catholic school students at or above this level increased in 2000 over 1990 and 1992, and those of other nonpublic students increased between 1992 and 2000.

Figure 3.10a

National Achievement Level Results by Type of School

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of school, grade 4: 1990–2000

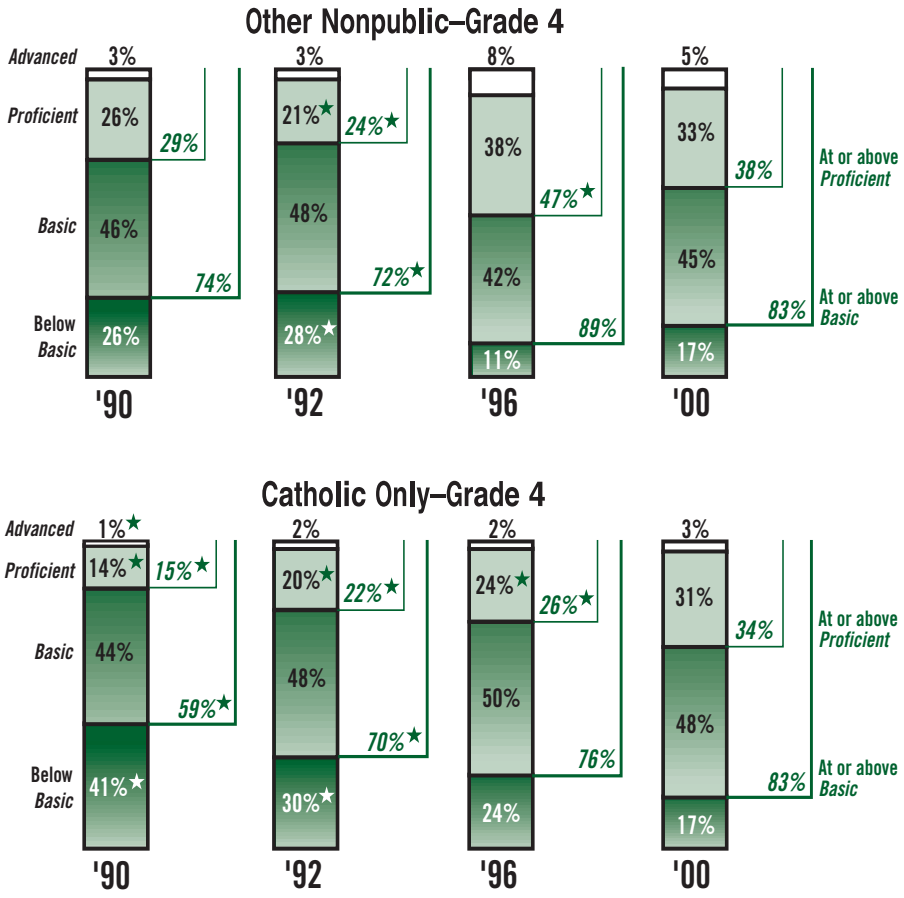


See footnotes at end of figure. ▶

Figure 3.10a

National Achievement Level Results by Type of School (continued)

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of school, grade 4: 1990–2000



★ Significantly different from 2000.

NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.

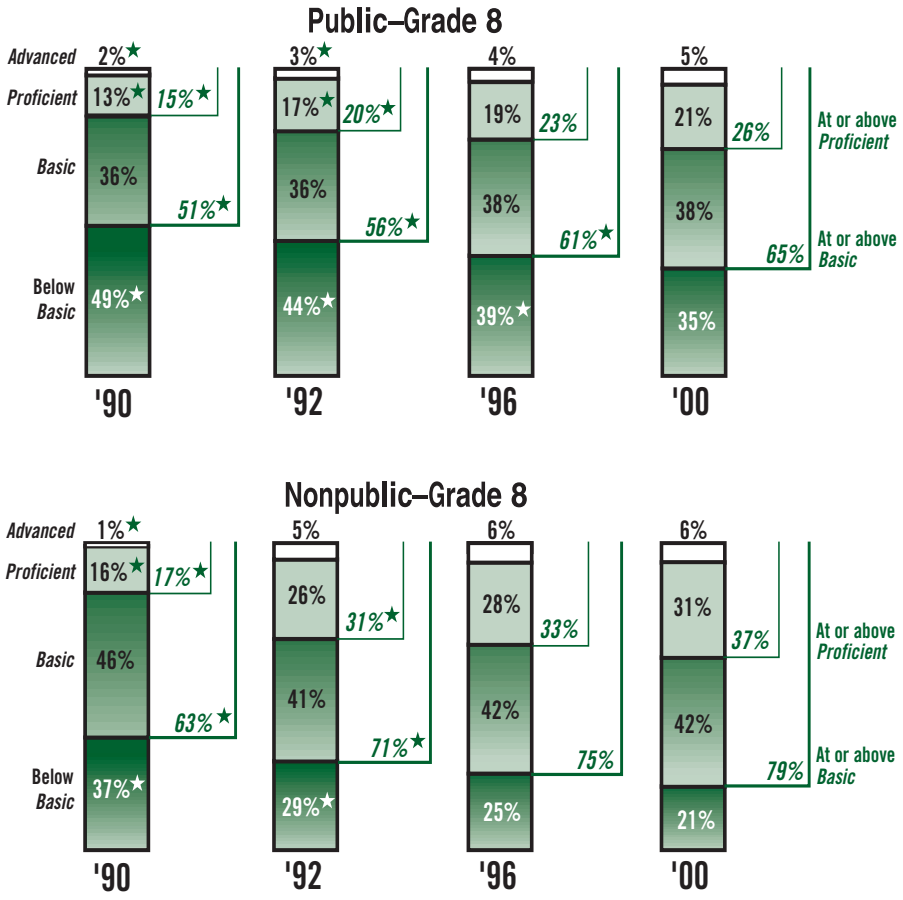
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

At grade 8, all of the school types had higher percentages of students at or above *Proficient* and at or above *Basic* in 2000 than in 1990. However, none of the apparent increases from 1996 to 2000 in percentages of students at or above *Proficient* were statistically significant for any school type. Students in public schools at grade 8 were the only group to have higher percentages at or above *Basic* in 2000 compared with 1996.

Figure 3.10b

National Achievement Level Results by Type of School

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of school, grade 8: 1990–2000

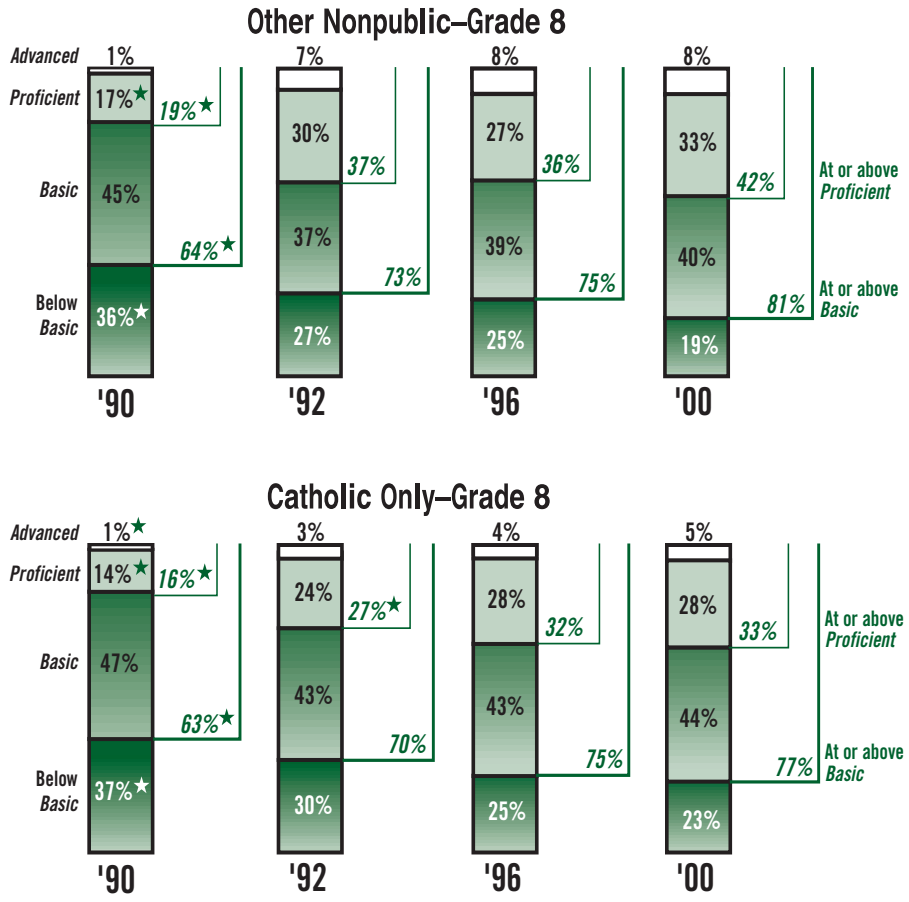


See footnotes at end of figure. ▶

Figure 3.10b

National Achievement Level Results by Type of School (continued)

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of school, grade 8: 1990–2000



★ Significantly different from 2000.

NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.

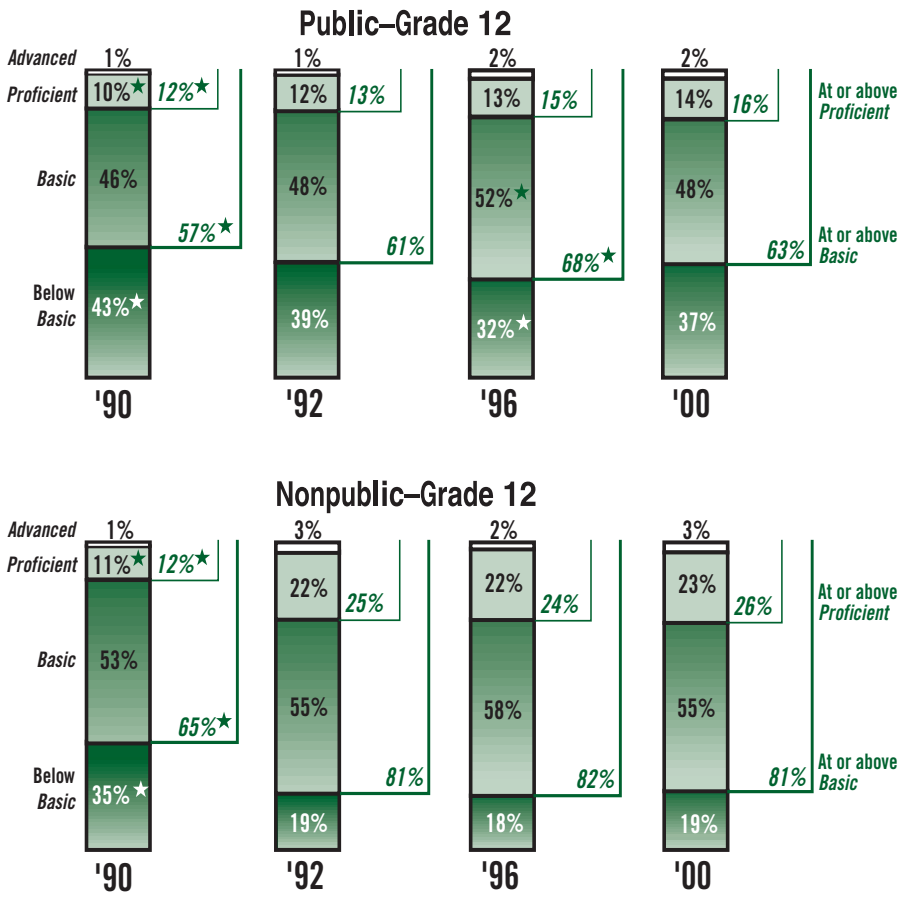
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

At grade 12, as at grade 8, all of the school types had higher percentages of students at or above the *Proficient* and *Basic* achievement levels in 2000 than in 1990. There was a decline, however, between 1996 and 2000 in the percentage of twelfth-graders attending public school who were at or above the *Basic* level.

Figure 3.10c

National Achievement Level Results by Type of School

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of school, grade 12: 1990–2000

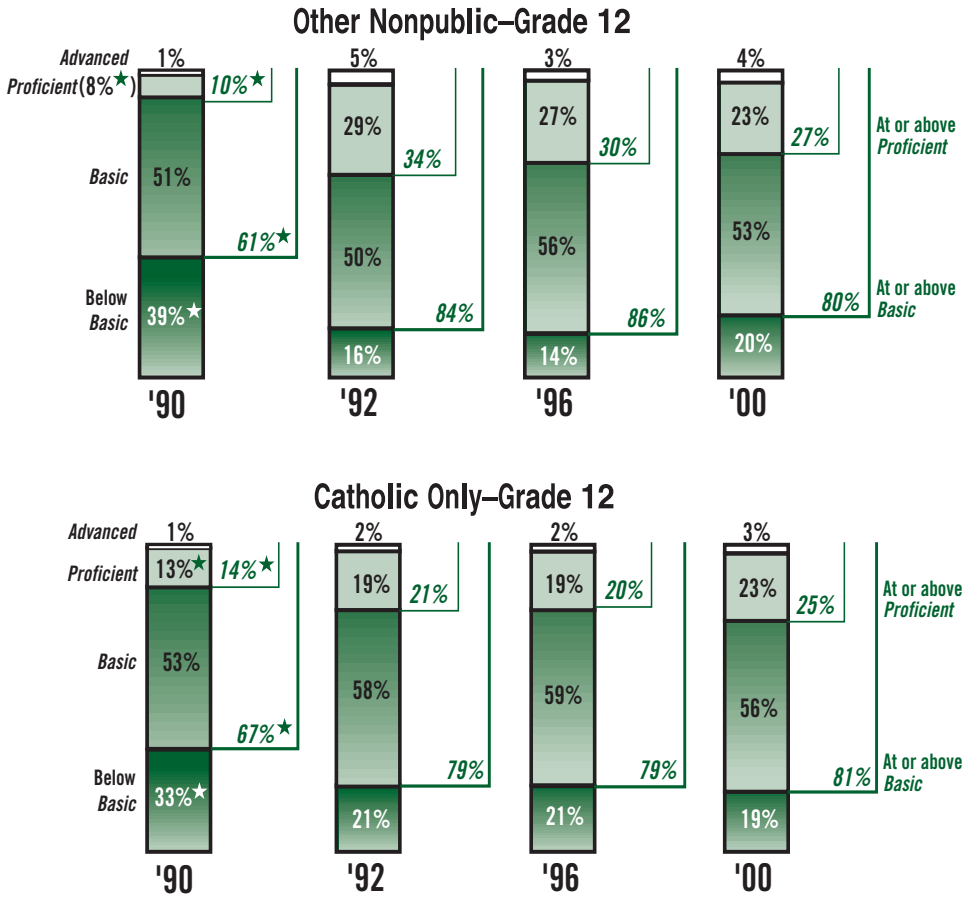


See footnotes at end of figure. ▶

Figure 3.10c

National Achievement Level Results by Type of School (continued)

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of school, grade 12: 1990–2000



★ Significantly different from 2000.

NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Type of Location

The schools from which NAEP draws its samples of students are classified according to their type of location. Based on Census Bureau definitions of metropolitan statistical areas, including population size and density, the three mutually exclusive categories are: central city, rural/small town, and urban fringe/large town. Because of slight changes by the Census Bureau in the definitions of these categories, schools were not classified in exactly the same way in 2000 as in previous years in terms of location type. Therefore, comparisons to previous years are not possible, and only the data for the 2000 assessment are reported. More information on the definitions of the 2000 assessment classifications of location type is given in appendix A.

The performance of students in the three grades by type of school location is shown in table 3.1. At all three grades, students in the urban fringe/large town locations had higher scale scores than students in central city locations. At grades 4 and 8, students in rural/small town locations also outperformed their counterparts in the central city locations.

Percentages of students in each achievement level by type of school location are presented in figure 3.11. At grade 4, within the 2000 assessment, there were higher percentages of students at *Advanced,* at or above P*roficient,* and at or above *Basic* attending schools in urban fringe/large town locations than in central city locations.

At grade 8, there were higher percentages of students at or above *Proficient* and at or above *Basic* attending schools in urban fringe/large town locations than in central city locations.

At grade 12, there were higher percentages of students at or above *Proficient* and at *Advanced* attending schools in urban fringe/large town locations than in rural school locations. There was also a higher percentage of twelfth-graders at or above the *Basic* level attending schools in urban fringe/large town locations than in central city locations.

Table 3.1: National Scale Score Results by Type of Location

Average mathematics scale scores by type of location, grades 4, 8, and 12: 2000

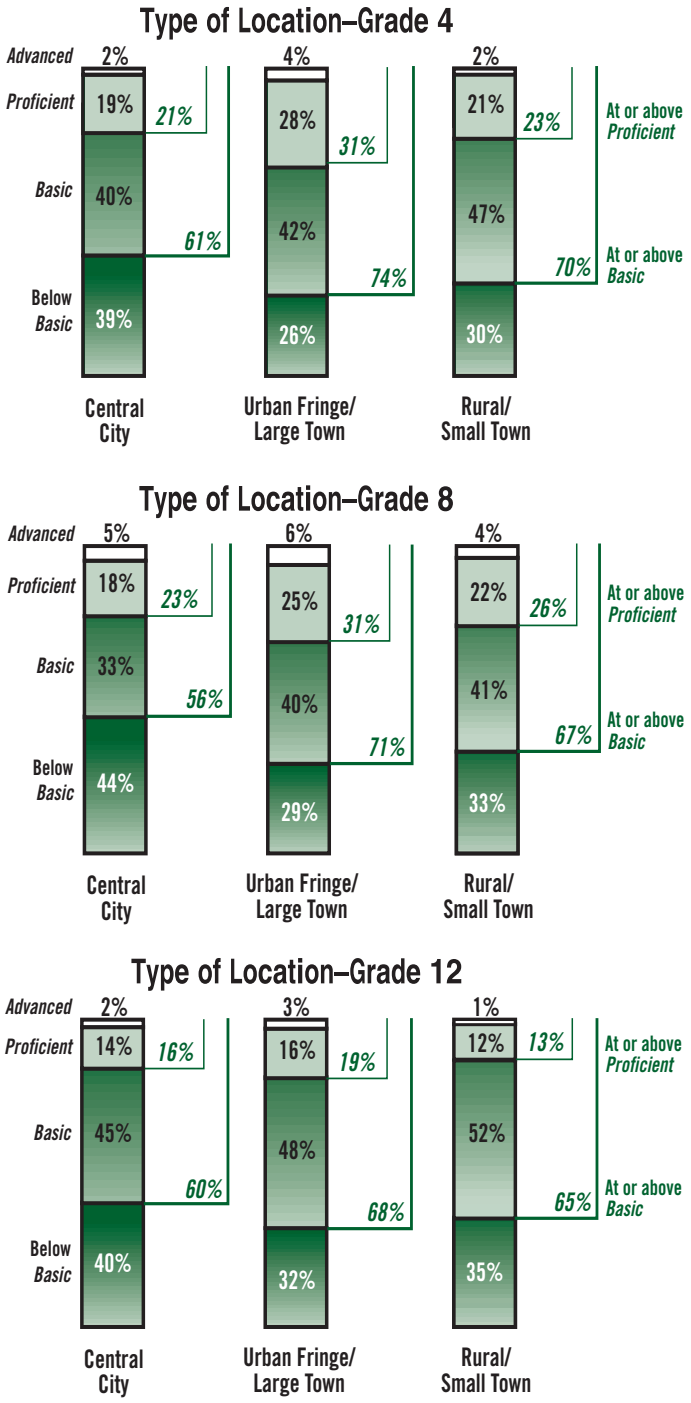
	Central City	Urban Fringe/Large Town	Rural/Small Town
Grade 12	298	304	300
Grade 8	268	280	276
Grade 4	222	232	227

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Figure 3.11

National Achievement Level Results by Type of Location

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of location, grades 4, 8, and 12: 2000



NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Free/Reduced-Price Lunch Program Eligibility

Funded by the U.S. Department of Agriculture (USDA) as part of the National School Lunch Program, the Free/Reduced-Price Lunch Program is designed to assure that children at or near the poverty line receive nourishing meals. Eligibility guidelines for the lunch program are based on the Federal income poverty guidelines and are stated by household size.[5] NAEP began collecting data on student eligibility for this program in 1996.

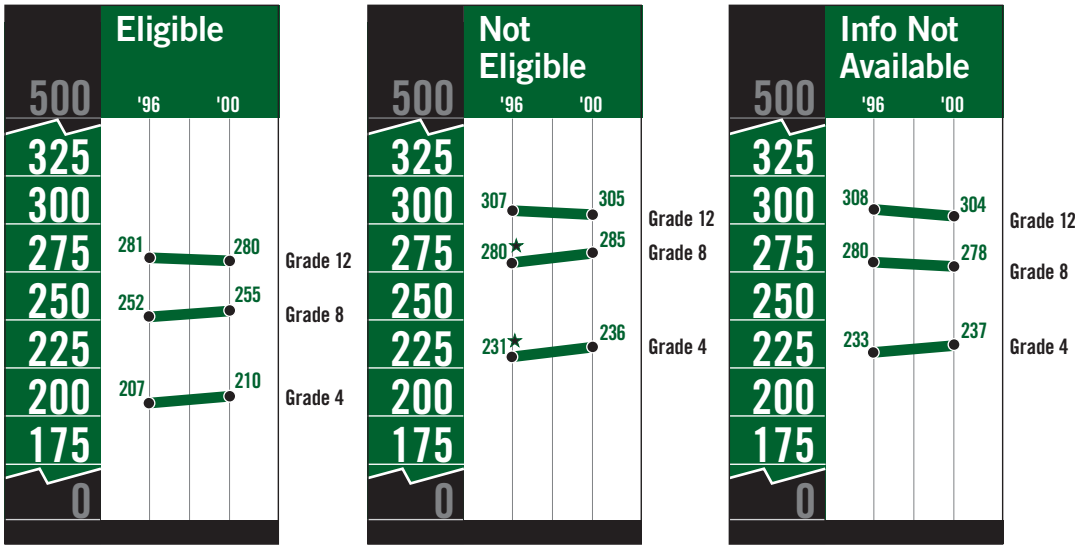
As shown in figure 3.12, at every grade, the scale scores for students who are not eligible for the Free/reduced Price Lunch Program (i.e., those above the poverty guidelines) are significantly higher than the scores for the students who are eligible for the program. Since information on eligibility is not available for a substantial percentage of the students at each grade, figure 3.13 also displays the scale score averages for this third group of students. This group also has higher scale scores at every grade than the students eligible for the free/reduced-price lunch program. Some schools do not offer free/reduced price lunches. Students from these schools are counted in the Information Not Available category.

For those students eligible for the program, none of the apparent changes from 1996 to 2000 in average scores were statistically significant at any grade. For the students at grades 4 and 8 who were not eligible for the program, average scores improved from 1996 to 2000, parallel to the finding for the assessment as a whole.

Figure 3.12

National Scale Score Results by Free/Reduced Price Lunch Eligibility

Average mathematics scale scores by student eligibility for free/reduced price lunch program, grades 4, 8, and 12: 1996–2000



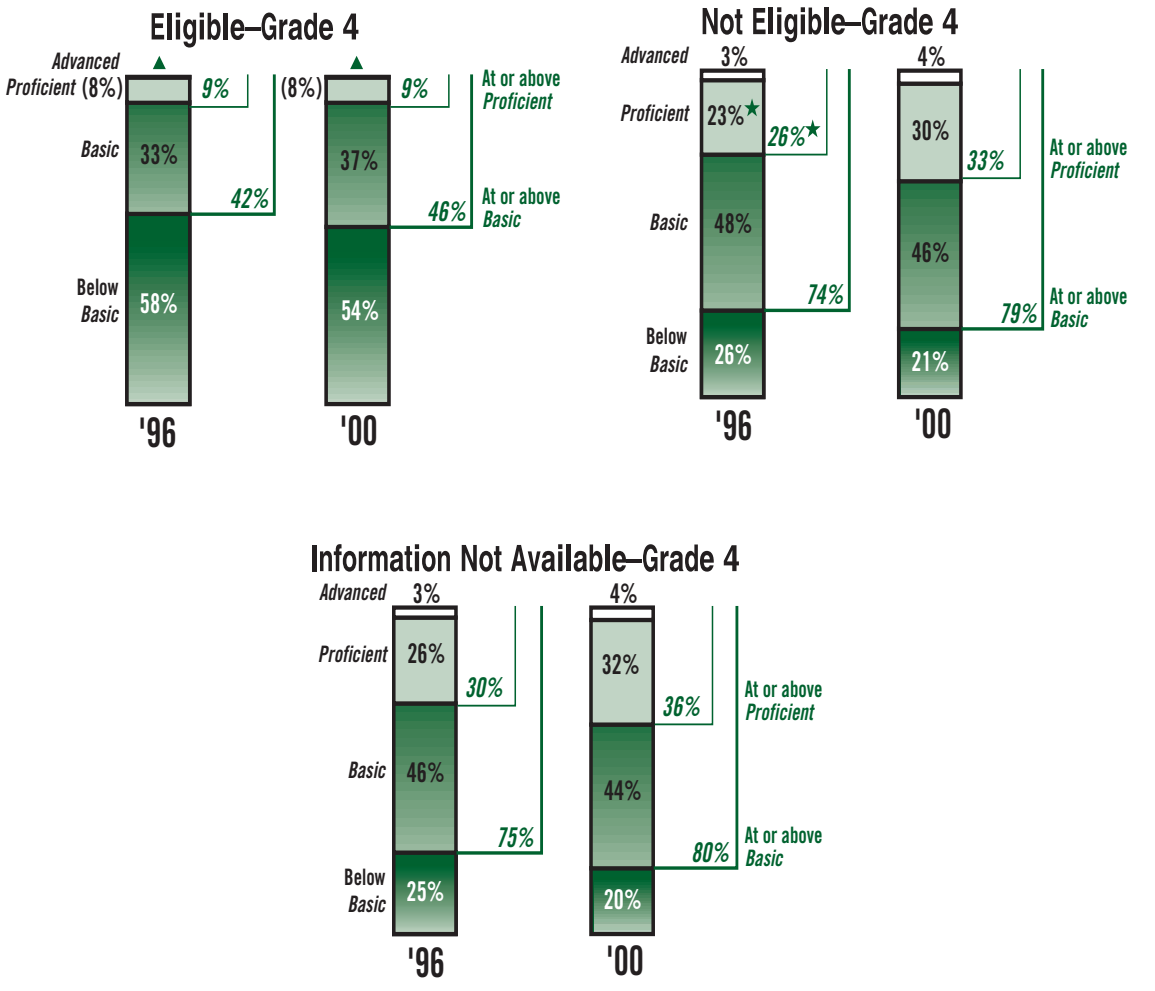
★ Significantly different from 2000.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

[5] U.S. General Services Administration. (1999) *Catalogue of federal domestic assistance*. Washington, DC: Executive Office of the President, Office of Management and Budget.

The pattern for achievement level results is displayed in figure 3.13 and parallels that seen in the scale scores. Any apparent changes between 1996 and 2000 in the percentages of students in each achievement level for those students who were eligible for the program were not statistically significant. Among students not eligible for the program, a higher percentage in 2000 than in 1996 were at or above *Proficient* in grade 4, and at or above *Basic* in grade 8. At every grade, there were higher percentages of students who were not eligible for the program at or above *Proficient* and at or above *Basic* than students who were eligible.

Figure 3.13
National Achievement Level Results by Free/Reduced Price Lunch Program Eligibilty

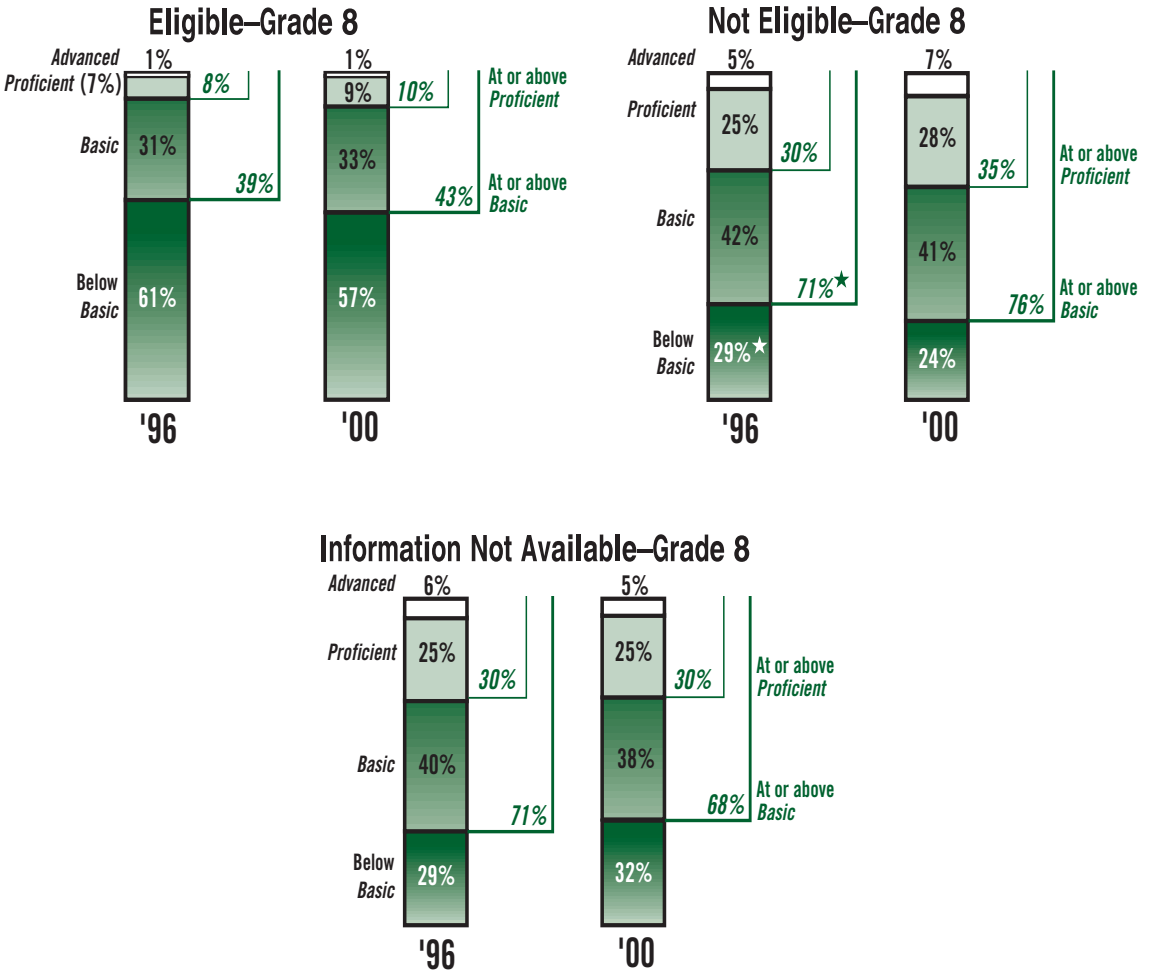
Percentage of students within each mathematics achievement level range and at or above achievement levels by student eligibility for the free/reduced-price lunch program, grades 4, 8, and 12: 1996–2000



See footnotes at end of figure. ▶

Figure 3.13
National Achievement Level Results by Free/Reduced Price Lunch Program Eligibilty (continued)

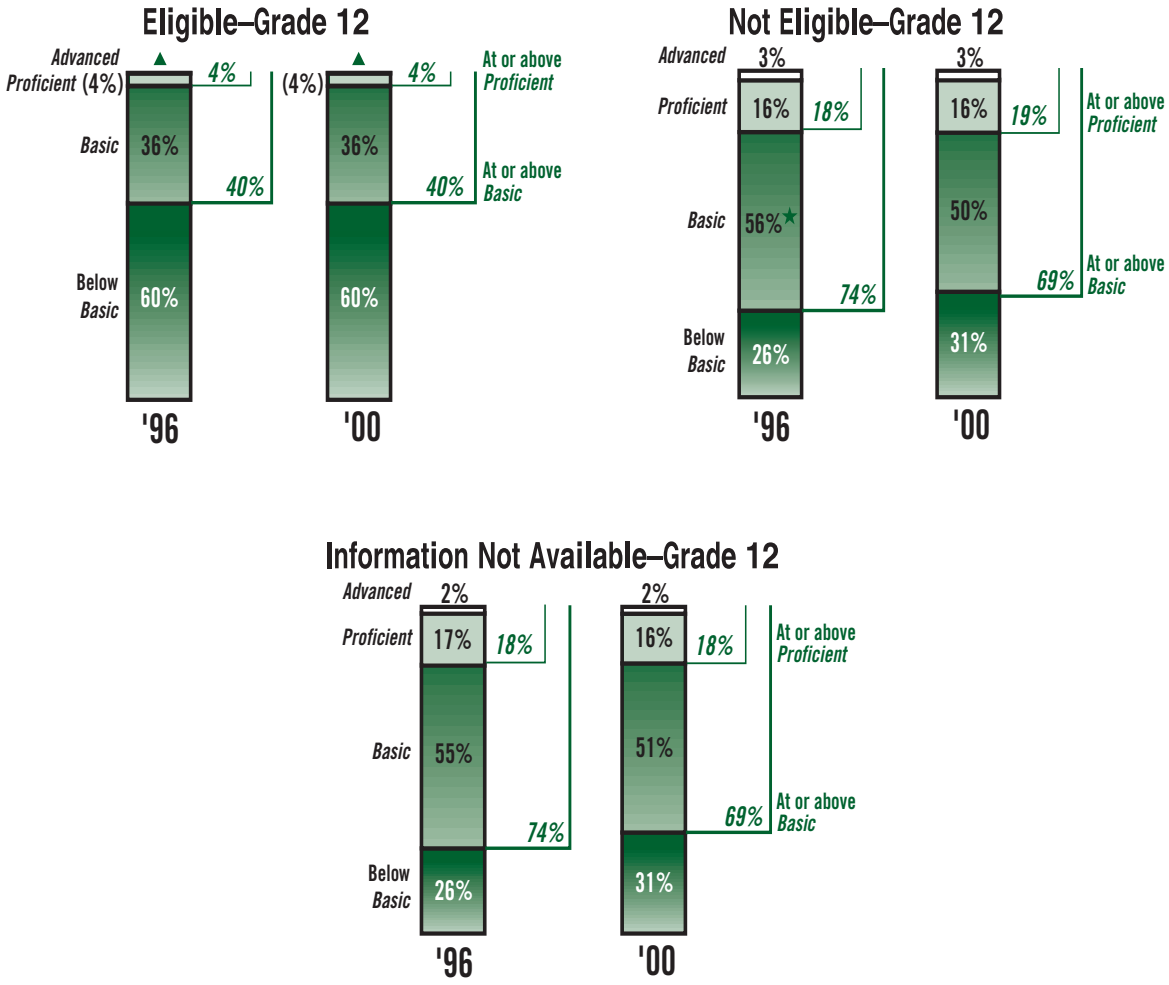
Percentage of students within each mathematics achievement level range and at or above achievement levels by student eligibility for the free/reduced-price lunch program, grades 4, 8, and 12: 1996–2000



See footnotes at end of figure. ▶

Figure 3.13
National Achievement Level Results by Free/Reduced Price Lunch Program Eligibilty (continued)

Percentage of students within each mathematics achievement level range and at or above achievement levels by student eligibility for the free/reduced-price lunch program, grades 4, 8, and 12: 1996–2000



★ Significantly different from 2000.
▲ Percentage is between 0.0 and 0.5.
NOTE: Percentages within each mathematics achievement level range may not add to 100, or to the exact percentages at or above achievement levels, due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP) 1996 and 2000 Mathematics Assessments.

State Results: Performance of Selected Subgroups

Individual state assessments were administered at grades 4 and 8 in addition to the national component of the NAEP 2000 mathematics assessment. Results for public schools in participating states and jurisdictions are presented in this section by gender and race/ethnicity. Complete data for participating jurisdictions are available on the NAEP web site at http://nces.ed.gov/nationsreportcard/tables.

State NAEP assessments began in 1990 at grade 8 and in 1992 at grade 4. Nonpublic schools were not included in the state NAEP assessments for 2000, but were included in the national samples. The national data shown for comparison at the top of the state tables in this chapter are based on the national sample (not on aggregated state samples), and also represent the performance of public schools only. The national results shown in the previous sections of this chapter represented both public and nonpublic school students combined.

In addition to results from the 2000 state assessment, results are also available from previous assessments for many of the jurisdictions. Not all jurisdictions, however, met minimum school participation guidelines in every NAEP assessment. (See appendix A for details on the participation and reporting guidelines.) In 2000, results for grades 4 and 8 in Wisconsin and grade 8 in the Virgin Islands are not included in the relevant tables and appendices because of these guidelines.

The state results presented here were obtained by assessing a representative sample of students in each state under conditions that did not permit accommodations for special-needs students. These were the same conditions under which results were obtained in previous state assessments. Consequently, it is possible to report trends in student performance across the assessment years. In 2000, a separate representative sample was assessed in each participating jurisdiction for which accommodations were offered to special-needs students. Those results are presented in chapter 4, along with a comparison of "accommodations-permitted" and "accommodations-not-permitted" results in each state. Subgroup "accommodations-permitted" results by state are available on the NAEP web site.

In examining the state results presented in this section, it should be noted that schools participating in the NAEP assessments under these conditions are permitted to exclude those students who can not be assessed meaningfully without accommodations. Exclusion rates vary considerably across years in many jurisdictions. In 2000, in the sample that did not permit accommodations the pattern in most jurisdictions was for more special-needs students to be excluded from the assessment than in previous years.

In addition to changes across years in exclusion rates for a particular jurisdiction, there is considerable variation in exclusion rates across jurisdictions. Comparisons of assessment results across jurisdictions and within jurisdictions across years should be made with caution. No adjustments have been made for differing exclusion rates across jurisdictions or across years. Thus, a comparison within a jurisdiction across years or between two jurisdictions may be based on samples with exclusion rates that differ considerably. The exclusion rates for each jurisdiction across years are presented in appendix A.

Gender Results by State

Figures 3.14 and 3.15 present male and female students' average mathematics scores for each jurisdiction that participated in the 2000 assessment. For each subgroup of students, the 2000 average score is compared to previous years' scores where available. An upward arrow (↑) in the columns labeled for previous assessment years indicates the average score in 2000 was higher than that in the indicated year. A downward arrow (↓) indicates that the average score in 2000 was lower than that in the indicated year. A circle (●) indicates that there was no significant difference between the 2000 score and the previous year's score. The dark arrows indicate that the difference between years is statistically significant when examining one jurisdiction and when using a multiple-comparison procedure based on all jurisdictions that participated both years. The lighter arrows (↑) indicate that the difference between years is statistically significant when only one jurisdiction is being examined at a time. The following discussion of trends in subgroup performance within jurisdictions is based only on results of the statistical testing using a multiple-comparison procedure, as indicated by the dark arrows in these figures.

At grade 4, the average score in 2000 was higher than that in 1992 for male students in 24 jurisdictions, and for female students in 26 jurisdictions. In 21 jurisdictions average scores increased between 1992 and 2000 for both male and female students. Between 1996 and 2000, gains are evident for males in 6 jurisdictions, and for females in 11 jurisdictions. The following 5 jurisdictions had gains for both male and female students between 1996 and 2000: Louisiana, Massachusetts, North Carolina, South Carolina, and Virginia.

At grade 8, the average score in 2000 was higher than that in 1990 for male students in 24 jurisdictions, and for female students in 28 jurisdictions. In 23 jurisdictions average scores increased between 1990 and 2000 for both male and female students. Between 1996 and 2000, gains are evident for males in 5 jurisdictions, and for females in 7 jurisdictions. In North Carolina and West Virginia, both male and female students made gains between 1996 and 2000.

Figure 3.14: State Scale Score Results by Gender, Grade 4

Comparison of 2000 state average scale scores to previous years by gender for grade 4 public schools: 1992–2000

	Male			Female		
	1992	1996	2000	1992	1996	2000
Nation	↑	↑	227	↑	↑	225
Alabama	↑	↑	217	↑	↑	219
Arizona	↑	●	220	●	●	218
Arkansas	↑	●	217	↑	●	217
California †	●	●	213	↑	↑	214
Connecticut	↑	●	235	↑	●	233
Georgia	↑	●	220	●	●	219
Hawaii	●	●	214	●	●	217
Idaho †	↑	—	227	↑	—	227
Illinois †	—	—	227	—	—	222
Indiana †	↑	↑	235	↑	↑	233
Iowa †	●	↑	235	●	●	231
Kansas †	—	—	232	—	—	232
Kentucky	↑	●	222	↑	●	220
Louisiana	↑	↑	218	↑	↑	218
Maine †	●	●	232	●	●	229
Maryland	●	●	223	↑	●	221
Massachusetts	↑	↑	237	↑	↑	233
Michigan †	↑	↑	232	↑	↑	230
Minnesota †	↑	●	237	↑	●	233
Mississippi	↑	●	210	↑	●	211
Missouri	↑	●	229	↑	↑	228
Montana †	—	●	232	—	●	228
Nebraska	●	●	227	●	●	225
Nevada	—	●	222	—	●	218
New Mexico	●	●	216	●	●	212
New York †	↑	↑	228	↑	●	225
North Carolina	↑	↑	234	↑	↑	231
North Dakota	●	●	233	●	●	229
Ohio †	↑	—	233	↑	—	228
Oklahoma	↑	—	226	↑	—	224
Oregon †	—	●	229	—	●	224
Rhode Island	↑	●	225	↑	↑	224
South Carolina	↑	↑	221	↑	↑	220
Tennessee	↑	●	222	↑	●	218
Texas	↑	↑	235	↑	●	231
Utah	●	●	227	↑	●	228
Vermont †	—	↑	232	—	↑	231
Virginia	↑	↑	233	↑	↑	228
West Virginia	↑	●	226	↑	●	223
Wyoming	●	↑	230	↑	↑	228
Other Jurisdictions						
American Samoa	—	—	156	—	—	157
District of Columbia	●	↑	193	●	↑	194
DDESS	—	●	230	—	●	226
DoDDS	—	↑	230	—	↑	226
Guam	↓	●	181	↓	●	187
Virgin Islands	—	—	183	—	—	183

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP) 1992, 1996, and 2000 Mathematics Assessments.

Figure 3.15: State Scale Score Results by Gender, Grade 8

Comparison of 2000 state average scale scores to previous years by gender for grade 8 public schools: 1990–2000

	Male				Female			
	1990	1992	1996	2000	1990	1992	1996	2000
Nation	↑	↑	↑	276	↑	↑	●	273
Alabama	↑	↑	●	262	↑	↑	●	262
Arizona †	↑	↑	●	274	↑	●	●	268
Arkansas	↑	↑	●	262	↑	↑	●	261
California †	●	●	●	262	↑	●	●	262
Connecticut	↑	↑	●	284	↑	↑	●	279
Georgia	↑	↑	↑	268	↑	↑	●	265
Hawaii	↑	↑	●	261	↑	↑	●	264
Idaho †	↑	●	—	278	↑	●	—	278
Illinois †	↑	—	—	276	↑	—	—	278
Indiana †	↑	↑	↑	285	↑	↑	↑	281
Kansas †	—	—	—	285	—	—	—	283
Kentucky	↑	↑	↑	274	↑	↑	●	270
Louisiana	↑	↑	↑	261	↑	↑	↑	258
Maine †	—	↑	●	285	—	●	●	282
Maryland	↑	↑	●	276	↑	↑	↑	276
Massachusetts	—	↑	↑	285	—	↑	●	281
Michigan †	↑	↑	●	279	↑	↑	●	278
Minnesota †	↑	↑	●	288	↑	↑	●	288
Mississippi	—	↑	●	255	—	↑	●	253
Missouri	—	●	●	276	—	●	●	271
Montana †	●	—	●	287	↑	—	●	286
Nebraska	↑	↑	●	283	●	●	↓	278
Nevada	—	—	—	269	—	—	—	267
New Mexico	●	●	●	259	↑	●	●	260
New York †	↑	↑	↑	280	↑	↑	●	273
North Carolina	↑	↑	↑	282	↑	↑	↑	278
North Dakota	●	●	●	283	↑	●	●	284
Ohio	↑	↑	—	283	↑	↑	—	282
Oklahoma	↑	●	—	273	↑	●	—	270
Oregon †	↑	—	●	281	↑	—	●	280
Rhode Island	↑	↑	●	274	↑	↑	↑	273
South Carolina	—	↑	●	266	—	↑	↑	267
Tennessee	—	●	●	265	—	●	●	261
Texas	↑	↑	●	274	↑	↑	↑	276
Utah	—	●	●	275	—	●	●	276
Vermont †	—	—	●	283	—	—	↑	283
Virginia	↑	↑	↑	278	↑	↑	↑	276
West Virginia	↑	↑	↑	270	↑	↑	↑	271
Wyoming	●	●	●	277	↑	●	●	276
Other Jurisdictions								
American Samoa	—	—	—	190	—	—	—	200
District of Columbia	●	●	●	234	●	●	●	235
DDESS	—	—	●	279	—	—	●	275
DoDDS	—	—	↑	280	—	—	●	277
Guam	●	●	●	233	●	●	↓	234

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Figures 3.16 and 3.17 present the percentages of male and female students at or above *Proficient* by jurisdiction for 2000, with dark arrow symbols indicating the results of significance testing between years, using a multiple-comparison procedure, as in the previous tables. The trends in improvement in mathematics scores from 1990 to 2000 at grade 8, 1992 to 2000 at grade 4, and 1996 to 2000 at both grades can also be seen in the achievement level data.

At grade 4, the percentage of students at or above *Proficient* in 2000 was higher than that in 1992 for male students in 19 jurisdictions, and for female students in 15 jurisdictions. In 13 jurisdictions the percentages of both males and females who were at or above *Proficient* increased between 1992 and 2000. Between 1996 and 2000, the percentages of students performing at this level increased for males in North Carolina and South Carolina, and for females in Louisiana and Massachusetts.

At grade 8, the percentage of students at or above *Proficient* in 2000 was higher than that in 1990 for male students in 28 jurisdictions and female students in 27 jurisdictions. In 25 jurisdictions the percentages of both males and females who were at or above *Proficient* increased between 1990 and 2000. Between 1996 and 2000, the percentages of students performing at this level increased for males in Indiana and West Virginia, and for both males and females in North Carolina.

Figure 3.16: State Achievement Level Results by Gender, Grade 4

Comparisons of 2000 state percentages at or above *Proficient* to previous years by gender for grade 4 public schools: 1992–2000

	Male			Female		
	1992	1996	2000	1992	1996	2000
Nation	↑	↑	27	↑	↑	22
Alabama	↑	●	15	●	●	13
Arizona	●	●	18	●	●	16
Arkansas	↑	●	14	●	●	13
California †	●	●	14	●	↑	15
Connecticut	↑	●	34	↑	●	29
Georgia	●	●	19	●	↑	17
Hawaii	●	●	14	●	●	14
Idaho †	↑	—	23	↑	—	20
Illinois †	—	—	25	—	—	17
Indiana †	↑	↑	33	↑	↑	29
Iowa †	●	●	31	●	●	24
Kansas †	—	—	32	—	—	28
Kentucky	↑	●	19	↑	●	16
Louisiana	↑	↑	14	↑	↑	14
Maine †	●	●	27	●	●	22
Maryland	●	●	24	●	●	20
Massachusetts	↑	↑	36	↑	↑	31
Michigan †	↑	↑	31	↑	↑	28
Minnesota †	↑	●	38	↑	●	30
Mississippi	↑	●	10	●	●	8
Missouri	●	●	24	●	●	23
Montana †	—	●	29	—	●	20
Nebraska	●	●	25	●	●	23
Nevada	—	●	19	—	●	13
New Mexico	●	●	14	●	●	10
New York †	●	●	24	↑	●	20
North Carolina	↑	↑	30	↑	↑	26
North Dakota	●	●	29	●	●	22
Ohio †	↑	—	30	↑	—	22
Oklahoma	●	—	18	●	—	14
Oregon †	—	●	27	—	●	20
Rhode Island	↑	↑	26	↑	↑	20
South Carolina	↑	↑	20	↑	↑	15
Tennessee	↑	●	20	↑	●	16
Texas	↑	●	31	↑	●	24
Utah	↑	●	25	●	●	23
Vermont †	—	↑	31	—	↑	28
Virginia	↑	↑	29	●	●	22
West Virginia	↑	●	21	↑	●	15
Wyoming	↑	↑	27	↑	↑	23
Other Jurisdictions						
American Samoa	—	—	▲	—	—	▲
District of Columbia	●	●	6	●	●	5
DDESS	—	●	26	—	●	22
DoDDS	—	↑	26	—	●	19
Guam	●	●	3	↓	●	2
Virgin Islands	—	—	1	—	—	1

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
▲ Percentage is between 0.0 and 0.5
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP) 1992, 1996, and 2000 Mathematics Assessments.

Figure 3.17: State Achievement Level Results by Gender, Grade 8

Comparisons of 2000 state percentages at or above *Proficient* to previous years by gender for grade 8 public schools: 1990–2000

	Male				Female			
	1990	1992	1996	2000	1990	1992	1996	2000
Nation	↑	↑	↑	29	↑	↑	●	24
Alabama	↑	↑	●	17	↑	↑	●	15
Arizona †	↑	↑	●	24	↑	●	●	18
Arkansas	↑	↑	●	15	↑	●	●	13
California †	↑	●	●	19	↑	●	●	16
Connecticut	↑	↑	●	36	↑	↑	●	31
Georgia	↑	↑	●	20	↑	↑	●	17
Hawaii	↑	↑	●	17	●	●	●	16
Idaho †	↑	●	—	28	↑	↑	—	26
Illinois †	↑	—	—	26	↑	—	—	28
Indiana †	↑	↑	↑	35	↑	↑	●	27
Kansas †	—	—	—	37	—	—	—	32
Kentucky	↑	↑	↑	23	↑	↑	●	18
Louisiana	↑	↑	↑	14	↑	●	●	10
Maine †	—	↑	●	34	—	↑	●	30
Maryland	↑	↑	●	29	↑	↑	●	29
Massachusetts	—	↑	●	34	—	↑	●	30
Michigan †	↑	↑	●	30	↑	↑	●	27
Minnesota †	↑	↑	●	40	↑	↑	●	39
Mississippi	—	●	●	10	—	●	●	7
Missouri	—	●	●	24	—	●	●	20
Montana †	↑	—	●	38	↑	—	●	37
Nebraska	↑	●	●	34	●	●	●	27
Nevada	—	—	—	21	—	—	—	18
New Mexico	●	●	●	14	↑	↑	●	12
New York †	↑	↑	●	29	↑	●	●	23
North Carolina	↑	↑	↑	31	↑	↑	↑	29
North Dakota	●	●	●	32	↑	●	●	31
Ohio	↑	↑	—	33	↑	↑	—	29
Oklahoma	↑	●	—	21	↑	●	—	17
Oregon †	↑	—	↑	34	↑	—	●	29
Rhode Island	↑	↑	●	24	↑	↑	●	23
South Carolina	—	●	●	18	—	●	↑	18
Tennessee	—	↑	●	20	—	↑	●	14
Texas	↑	●	●	24	↑	↑	●	25
Utah	—	●	●	27	—	●	●	25
Vermont †	—	—	●	33	—	—	●	32
Virginia	↑	↑	●	28	↑	↑	●	23
West Virginia	↑	↑	↑	19	↑	↑	●	17
Wyoming	↑	●	●	26	↑	●	●	24
Other Jurisdictions								
American Samoa	—	—	—	1	—	—	—	1
District of Columbia	↑	●	●	6	●	●	●	6
DDESS	—	—	●	30	—	—	●	23
DoDDS	—	—	●	28	—	—	●	25
Guam	●	●	●	4	●	●	●	4

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Race/Ethnicity

Figures 3.18 and 3.19 display the average mathematics scores in 2000 for each of the racial/ethnic groups by jurisdiction. Similar to the preceding figures, arrows indicate the direction of statistically significant changes since previous assessment years.

At grade 4, the average score in 2000 was higher than that in 1992 for white students in 29 jurisdictions, for black students in 17 jurisdictions, and for Hispanic students in 10 jurisdictions. American Indian students had mixed results—gaining in two states (North Carolina and Oklahoma) and declining in one (New Mexico). Jurisdictions that show gains for at least three of the five racial/ethnic groups include Arkansas, Connecticut, Indiana, Mississippi, New York, North Carolina, and Texas.

Between 1996 and 2000, gains in fourth-graders' average scores are evident for white students in 15 jurisdictions, for black students in 7 jurisdictions, for Hispanic students in 2 jurisdictions, and for Asian/Pacific Islander students in 1 jurisdiction. In Louisiana, white, black, and Hispanic students made gains between 1996 and 2000. In Alabama, Indiana, North Carolina, and Virginia, both white and black students' scores increased during this period.

At grade 8, the average score in 2000 was higher than that in 1990 for white students in 28 jurisdictions, for black students in 14 jurisdictions, and for Hispanic students in 17 jurisdictions. Gains for Asian/Pacific Islander and American Indian students were limited to 3 and 2 jurisdictions, respectively. Jurisdictions that showed gains among at least three of the five racial/ethnic groups included: California, Georgia, Hawaii, Illinois, Indiana, Maryland, Michigan, New York, North Carolina, Ohio, Rhode Island, Texas, Virginia, and West Virginia.

Between 1996 and 2000, gains in eighth-graders' average scores were evident for white students in 11 jurisdictions, for black students in 2 jurisdictions, and for Hispanic students in 3 jurisdictions. Apparent gains for Asian/Pacific Islander and American Indian students in any jurisdiction were not statistically significant. In North Carolina, gains are evident for three of the five racial/ethnic groups—white, black, and Hispanic students. In Indiana, both white and black students' scores increased, and in Massachusetts, both white and Hispanic students made gains.

In every state where sample sizes were large enough for reliable statistical comparisons, white students outperformed black and Hispanic students at both grades 4 and 8. Most of the apparent differences between white and Asian/Pacific Islander students were not statistically significant, with a small number of exceptions. White students had higher scale scores than Asian/Pacific Islander students in grade 4 in Hawaii, Rhode Island, and Utah, and in grade 8 in Hawaii. Asian/Pacific Islander students outperformed white students at grade 4 in Oregon and at grade 8 in Maryland and Virginia.

The percentages of students in the different racial/ethnic subgroups who were at or above *Proficient* across jurisdictions in 2000, and comparisons to earlier years, are presented in figure 3.20 (grade 4) and figure 3.21 (grade 8).

Figure 3.18: State Scale Score Results by Race/Ethnicity, Grade 4

Comparison of 2000 state average scale scores to previous years by race/ethnicity for grade 4 public schools: 1992–2000

	White			Black			Hispanic		
	1992	1996	2000	1992	1996	2000	1992	1996	2000
Nation	↑	●	235	↑	●	205	↑	●	211
Alabama	↑	↑	229	↑	↑	205	●	●	201
Arizona	↑	●	231	●	●	208	●	●	204
Arkansas	↑	●	225	↑	●	198	↑	●	205
California †	↑	●	229	↑	●	193	↑	●	201
Connecticut	↑	●	243	↑	●	209	↑	●	214
Georgia	●	↑	232	↑	↑	206	↑	●	208
Hawaii	●	●	225	●	●	204	●	●	205
Idaho †	↑	—	230	●	—	****	↑	—	213
Illinois †	—	—	237	—	—	205	—	—	213
Indiana †	↑	↑	238	↑	↑	216	↑	●	220
Iowa †	↑	↑	235	●	●	****	●	●	216
Kansas †	—	—	238	—	—	207	—	—	215
Kentucky	↑	●	225	●	●	200	●	●	207
Louisiana	↑	↑	230	↑	↑	204	●	↑	210
Maine †	●	●	231	●	●	****	●	●	****
Maryland	↑	●	237	↑	●	204	●	●	210
Massachusetts	↑	↑	241	↑	●	212	●	●	210
Michigan †	↑	↑	239	↑	●	201	●	●	210
Minnesota †	↑	↑	240	↑	↑	211	●	●	214
Mississippi	↑	●	224	↑	●	199	↑	●	201
Missouri	↑	↑	235	●	●	202	●	●	213
Montana †	—	●	234	—	●	****	—	●	219
Nebraska	●	●	232	●	●	199	●	●	206
Nevada	—	●	228	—	●	206	—	●	210
New Mexico	●	●	227	●	●	****	●	●	208
New York †	↑	↑	238	↑	↑	211	↑	↑	211
North Carolina	↑	↑	241	↑	↑	218	↑	↑	218
North Dakota	↑	●	233	●	●	****	●	●	214
Ohio †	↑	—	236	↑	—	208	↑	—	218
Oklahoma	↑	—	230	●	—	206	●	—	215
Oregon †	—	●	230	—	●	****	—	●	206
Rhode Island	↑	↑	234	●	●	201	●	●	198
South Carolina	↑	↑	233	↑	↑	204	●	↑	209
Tennessee	↑	●	227	●	●	199	●	●	207
Texas	↑	●	243	↑	↑	220	↑	↑	224
Utah	↑	●	232	●	●	****	●	●	206
Vermont †	—	↑	233	—	●	****	—	●	****
Virginia	↑	↑	240	↑	↑	212	●	●	219
West Virginia	↑	●	227	●	●	207	●	●	213
Wyoming	●	↑	232	●	●	****	●	●	215
Other Jurisdictions									
American Samoa	—	—	****	—	—	****	—	—	150
District of Columbia	●	●	241	●	↑	191	●	●	189
DDESS	—	●	237	—	●	218	—	●	220
DoDDS	—	↑	235	—	●	214	—	●	218
Guam	●	●	****	●	●	****	●	●	168
Virgin Islands	—	—	****	—	—	185	—	—	176

See footnotes at end of figure. ▶

Figure 3.18: State Scale Score Results by Race/Ethnicity, Grade 4 (continued)

Comparison of 2000 state average scale scores to previous years by race/ethnicity for grade 4 public schools: 1992–2000

	Asian			American Indian		
	1992	1996	2000	1992	1996	2000
Nation	●	●	~	●	●	215
Alabama	●	●	****	●	●	****
Arizona	●	●	234	●	●	196
Arkansas	●	●	****	●	●	213
California †	●	●	227	●	●	****
Connecticut	●	●	246	●	●	****
Georgia	●	●	****	●	●	****
Hawaii	●	●	216	●	●	****
Idaho †	●	—	****	●	—	****
Illinois †	—	—	****	—	—	****
Indiana †	●	●	****	●	●	****
Iowa †	●	●	****	●	●	****
Kansas †	—	—	****	—	—	****
Kentucky	●	●	****	●	●	****
Louisiana	●	●	****	●	●	****
Maine †	●	●	****	●	●	****
Maryland	●	●	240	●	●	****
Massachusetts	●	●	239	●	●	****
Michigan †	●	●	****	●	●	****
Minnesota †	●	↑	235	●	●	****
Mississippi	●	●	****	●	●	****
Missouri	●	●	****	●	●	****
Montana †	—	●	****	—	●	212
Nebraska	●	●	****	●	●	****
Nevada	—	●	224	—	●	212
New Mexico	●	●	****	●	●	197
New York †	●	↑	247	●	●	****
North Carolina	●	●	****	↑	●	229
North Dakota	●	●	****	●	●	208
Ohio †	●	—	****	●	—	****
Oklahoma	●	—	****	↑	—	222
Oregon †	—	●	240	—	●	****
Rhode Island	↑	●	221	●	●	****
South Carolina	●	●	****	●	●	****
Tennessee	●	●	****	●	●	****
Texas	↑	●	247	●	●	****
Utah	●	●	222	●	●	****
Vermont †	—	●	****	—	●	****
Virginia	●	●	243	●	●	****
West Virginia	●	●	****	●	●	****
Wyoming	●	●	****	●	●	224
Other Jurisdictions						
American Samoa	—	—	157	—	—	****
District of Columbia	●	●	****	●	●	****
DDESS	—	●	230	—	●	****
DoDDS	—	●	233	—	●	219
Guam	↓	●	188	●	●	****
Virgin Islands	—	—	****	—	—	****

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

**** Sample size is insufficient to permit a reliable estimate.
† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
~ Special analyses raised concerns about the accuracy and precision of national grade 4 Asian/Pacific Islander results in 2000. As a result, they are omitted from the body of this report. See appendix A for a more detailed discussion.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1992, 1996, and 2000 Mathematics Assessments.

Figure 3.19: State Scale Score Results by Race/Ethnicity, Grade 8

Comparison of 2000 state average scale scores to previous years by race/ethnicity for grade 8 public schools: 1990–2000

	White				Black				Hispanic			
	1990	1992	1996	2000	1990	1992	1996	2000	1990	1992	1996	2000
Nation	↑	↑	●	285	↑	↑	●	246	↑	↑	●	252
Alabama	↑	↑	●	275	●	↑	●	239	●	↑	●	239
Arizona †	↑	↑	↑	284	●	●	●	250	↑	●	●	252
Arkansas	↑	↑	●	272	●	●	●	235	●	●	●	234
California †	↑	●	●	278	●	●	●	242	↑	●	●	246
Connecticut	↑	↑	↑	294	↑	●	●	248	↑	●	●	252
Georgia	↑	↑	●	280	↑	●	↑	246	↑	●	●	247
Hawaii	↑	↑	●	275	●	●	●	256	↑	●	●	248
Idaho †	↑	↑	—	282	●	●	—	****	●	●	—	250
Illinois †	↑	—	—	288	↑	—	—	255	↑	—	—	261
Indiana †	↑	↑	↑	287	↑	↑	↑	260	↑	↑	●	264
Kansas †	—	—	—	288	—	—	—	257	—	—	—	261
Kentucky	↑	↑	↑	275	↑	↑	●	253	●	●	●	****
Louisiana	↑	↑	↑	276	↑	↑	●	240	●	●	●	237
Maine †	—	↑	●	285	—	●	●	****	—	●	●	****
Maryland	↑	↑	↑	290	↑	↑	↑	249	↑	↑	↑	265
Massachusetts	—	↑	↑	289	—	●	●	254	—	↑	↑	259
Michigan †	↑	↑	●	287	↑	↑	●	242	↑	●	●	259
Minnesota †	↑	↑	↑	291	●	●	●	****	↑	●	●	257
Mississippi	—	↑	●	268	—	↑	●	238	—	●	●	227
Missouri	—	↑	●	280	—	●	●	244	—	●	●	251
Montana †	↑	—	↑	290	●	—	●	****	●	—	↑	276
Nebraska	↑	●	●	285	●	●	●	246	●	●	●	255
Nevada	—	—	—	278	—	—	—	251	—	—	—	251
New Mexico	↑	↑	●	278	●	●	●	****	●	●	●	251
New York †	↑	↑	↑	289	↑	↑	●	257	↑	●	●	259
North Carolina	↑	↑	↑	291	↑	↑	↑	256	↑	↑	↑	269
North Dakota	●	●	●	286	●	●	●	****	●	●	●	262
Ohio	↑	↑	—	287	↑	↑	—	255	↑	↑	—	270
Oklahoma	↑	↑	—	277	●	●	—	248	●	●	—	254
Oregon †	↑	—	●	284	●	—	●	260	●	—	●	259
Rhode Island	↑	↑	↑	281	↑	●	●	245	↑	↑	●	246
South Carolina	—	↑	●	279	—	↑	●	249	—	↑	●	250
Tennessee	—	↑	●	271	—	●	●	237	—	↑	●	246
Texas	↑	↑	●	288	↑	●	●	252	↑	↑	↑	266
Utah	—	●	●	279	—	●	●	****	—	●	●	249
Vermont †	—	—	↑	284	—	—	●	****	—	—	●	****
Virginia	↑	↑	↑	285	↑	↑	↑	252	↑	↑	●	267
West Virginia	↑	↑	↑	272	↑	●	●	251	↑	↑	●	256
Wyoming	↑	●	●	280	●	●	●	****	●	●	●	255
Other Jurisdictions												
American Samoa	—	—	—	****	—	—	—	****	—	—	—	172
District of Columbia	●	●	●	****	●	●	●	232	●	●	●	224
DDESS	—	—	●	288	—	—	↑	267	—	—	●	269
DoDDS	—	—	●	287	—	—	●	261	—	—	●	271
Guam	●	●	●	****	●	●	●	****	●	●	●	216

See footnotes at end of figure. ▶

Figure 3.19: State Scale Score Results by Race/Ethnicity, Grade 8 (continued)

Comparison of 2000 state average scale scores to previous years by race/ethnicity for grade 8 public schools: 1990–2000

	Asian				American Indian			
	1990	1992	1996	2000	1990	1992	1996	2000
Nation	●	●	~	288	●	●	●	261
Alabama	●	●	●	****	●	●	●	****
Arizona †	●	●	●	282	●	●	●	****
Arkansas	●	●	●	****	●	●	●	****
California †	↑	●	●	282	●	●	●	****
Connecticut	●	●	●	287	●	●	●	****
Georgia	●	●	●	****	●	●	●	****
Hawaii	↑	↑	●	263	●	●	●	****
Idaho †	●	●	—	****	●	●	—	****
Illinois †	●	—	—	****	●	—	—	****
Indiana †	●	●	●	****	●	●	●	****
Kansas †	—	—	—	****	—	—	—	****
Kentucky	●	●	●	****	●	●	●	****
Louisiana	●	●	●	****	●	●	●	****
Maine †	—	●	●	****	—	●	●	****
Maryland	↑	↑	●	306	●	●	●	****
Massachusetts	—	●	↑	295	—	●	●	****
Michigan †	●	●	●	****	●	●	●	****
Minnesota †	●	●	●	****	●	●	●	****
Mississippi	—	●	●	****	—	●	●	****
Missouri	—	●	●	****	—	●	●	****
Montana †	●	—	●	****	●	—	●	253
Nebraska	●	●	●	****	●	●	●	****
Nevada	—	—	—	278	—	—	—	263
New Mexico	●	●	●	****	●	●	●	243
New York †	●	●	●	288	●	●	●	****
North Carolina	●	●	●	****	●	●	●	****
North Dakota	●	●	●	****	↑	●	●	258
Ohio	●	●	—	****	●	●	—	****
Oklahoma	●	●	—	****	↑	●	—	264
Oregon †	●	—	●	281	●	—	●	****
Rhode Island	●	●	●	271	●	●	●	****
South Carolina	—	●	●	****	—	●	●	****
Tennessee	—	●	●	****	—	●	●	****
Texas	●	●	●	292	●	●	●	****
Utah	—	●	●	281	—	●	●	****
Vermont †	—	—	●	****	—	—	●	****
Virginia	●	↑	↑	300	●	●	●	****
West Virginia	●	●	●	****	●	●	●	****
Wyoming	●	●	●	****	●	●	●	253
Other Jurisdictions								
American Samoa	—	—	—	205	—	—	—	****
District of Columbia	●	●	●	****	●	●	●	****
DDESS	—	—	●	****	—	—	●	****
DoDDS	—	—	●	283	—	—	●	****
Guam	●	●	●	236	●	●	●	****

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑↓) indicate a significant change when only one jurisdiction or the nation is being examined.

**** Sample size is insufficient to permit a reliable estimate.
† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
~ Special analyses raised concerns about the accuracy and precision of national grade 8 Asian/Pacific Islander results in 1996. As a result, they are omitted from the body of this report. See appendix A for a more detailed discussion.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Figure 3.20: State Achievement Level Results by Race/Ethnicity, Grade 4

Comparison of 2000 state percentages at or above *Proficient* to previous years by race/ethnicity for grade 4 public schools: 1992–2000

	White			Black			Hispanic		
	1992	1996	2000	1992	1996	2000	1992	1996	2000
Nation	↑	↑	33	↑	●	5	↑	●	10
Alabama	↑	↑	23	↑	●	4	●	●	5
Arizona	↑	●	26	●	●	5	●	●	6
Arkansas	↑	●	18	●	●	2	●	●	6
California †	●	●	25	●	●	2	●	●	5
Connecticut	↑	●	41	●	●	6	●	●	9
Georgia	●	↑	29	↑	↑	6	●	●	8
Hawaii	●	●	19	●	●	3	●	●	7
Idaho †	↑	—	24	●	—	****	●	—	8
Illinois †	—	—	32	—	—	5	—	—	8
Indiana †	↑	↑	34	↑	↑	14	↑	●	16
Iowa †	●	↑	30	●	●	****	●	●	13
Kansas †	—	—	36	—	—	7	—	—	11
Kentucky	↑	●	20	●	●	2	●	●	9
Louisiana	↑	↑	23	↑	↑	4	●	●	7
Maine †	●	●	25	●	●	****	●	●	****
Maryland	↑	●	36	●	●	5	●	●	10
Massachusetts	↑	↑	39	●	●	7	●	●	10
Michigan †	↑	↑	37	●	●	4	●	●	15
Minnesota †	↑	●	39	●	●	11	●	●	13
Mississippi	●	●	16	●	●	2	●	●	6
Missouri	↑	●	28	●	●	4	●	●	11
Montana †	—	●	28	—	●	****	—	●	12
Nebraska	●	●	29	●	●	6	●	●	7
Nevada	—	●	23	—	●	5	—	●	8
New Mexico	●	●	22	●	●	****	●	●	6
New York †	↑	●	34	●	●	5	●	●	7
North Carolina	↑	↑	38	↑	↑	9	●	●	13
North Dakota	●	●	27	●	●	****	●	●	12
Ohio †	↑	—	32	●	—	3	●	—	12
Oklahoma	●	—	20	●	—	3	●	—	9
Oregon †	—	●	26	—	●	****	—	●	6
Rhode Island	↑	↑	30	●	●	4	↑	●	5
South Carolina	↑	↑	28	↑	●	4	●	●	12
Tennessee	↑	●	23	●	●	4	●	●	9
Texas	↑	●	41	↑	●	12	↑	●	14
Utah	↑	●	28	●	●	****	●	●	8
Vermont †	—	↑	31	—	●	****	—	●	****
Virginia	↑	↑	35	●	●	6	●	●	11
West Virginia	↑	●	19	●	●	6	●	●	13
Wyoming	↑	↑	28	●	●	****	●	●	12
Other Jurisdictions									
American Samoa	—	—	****	—	—	****	—	—	▲
District of Columbia	●	●	49	●	●	2	●	●	4
DDESS	—	●	34	—	●	12	—	●	14
DoDDS	—	●	31	—	●	7	—	●	13
Guam	●	●	****	●	●	****	●	●	1
Virgin Islands	—	—	****	—	—	1	—	—	1

See footnotes at end of figure. ▶

Figure 3.20: State Achievement Level Results by Race/Ethnicity, Grade 4 (continued)

Comparison of 2000 state percentages at or above *Proficient* to previous years by race/ethnicity for grade 4 public schools: 1992–2000

	Asian			American Indian		
	1992	1996	2000	1992	1996	2000
Nation	●	●	~	●	●	13
Alabama	●	●	****	●	●	****
Arizona	●	●	28	●	●	4
Arkansas	●	●	****	●	●	9
California †	●	●	25	●	●	****
Connecticut	●	●	45	●	●	****
Georgia	●	●	****	●	●	****
Hawaii	●	●	15	●	●	****
Idaho †	●	—	****	●	—	****
Illinois †	—	—	****	—	—	****
Indiana †	●	●	****	●	●	****
Iowa †	●	●	****	●	●	****
Kansas †	—	—	****	—	—	****
Kentucky	●	●	****	●	●	****
Louisiana	●	●	****	●	●	****
Maine †	●	●	****	●	●	****
Maryland	●	●	40	●	●	****
Massachusetts	●	●	41	●	●	****
Michigan †	●	●	****	●	●	****
Minnesota †	●	●	32	●	●	****
Mississippi	●	●	****	●	●	****
Missouri	●	●	****	●	●	****
Montana †	—	●	****	—	●	8
Nebraska	●	●	****	●	●	****
Nevada	—	●	21	—	●	7
New Mexico	●	●	****	●	●	5
New York †	●	●	47	●	●	****
North Carolina	●	●	****	●	●	21
North Dakota	●	●	****	●	●	7
Ohio †	●	—	****	●	—	****
Oklahoma	●	—	****	●	—	12
Oregon †	—	●	36	—	●	****
Rhode Island	↑	●	21	●	●	****
South Carolina	●	●	****	●	●	****
Tennessee	●	●	****	●	●	****
Texas	●	●	48	●	●	****
Utah	●	●	16	●	●	****
Vermont †	—	●	****	—	●	****
Virginia	●	●	45	●	●	****
West Virginia	●	●	****	●	●	****
Wyoming	●	●	****	●	●	18
Other Jurisdictions						
American Samoa	—	—	▲	—	—	****
District of Columbia	●	●	****	●	●	****
DDESS	—	●	23	—	●	****
DoDDS	—	●	27	—	●	10
Guam	●	●	2	●	●	****
Virgin Islands	—	—	****	—	—	****

- ● Indicates no significant difference between earlier year and 2000 in average scores.
- ↑ Indicates the average score in 2000 was significantly higher than in the specified year.
- ↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

**** Sample size is insufficient to permit a reliable estimate.
† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
~ Special analyses raised concerns about the accuracy and precision of national grade 4 Asian/Pacific Islander results in 2000. As a result, they are omitted from the body of this report. See appendix A for a more detailed discussion.
▲ Percentage is between 0.0 and 0.5
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1992, 1996, and 2000 Mathematics Assessments.

Figure 3.21: State Achievement Level Results by Race/Ethnicity, Grade 8

Comparison of 2000 state percentages at or above *Proficient* to previous years by race/ethnicity for grade 8 public schools: 1990–2000

	White				Black				Hispanic			
	1990	1992	1996	2000	1990	1992	1996	2000	1990	1992	1996	2000
Nation	↑	↑	●	34	●	↑	●	5	↑	↑	●	9
Alabama	↑	↑	●	23	●	↑	●	4	●	●	●	6
Arizona †	↑	↑	●	31	●	●	●	8	●	●	●	8
Arkansas	↑	↑	●	19	●	●	●	2	●	●	●	4
California †	↑	●	●	27	●	●	●	4	●	●	●	7
Connecticut	↑	↑	↑	44	●	●	●	4	●	●	●	9
Georgia	↑	↑	●	28	●	●	●	4	●	●	●	5
Hawaii	↑	↑	●	28	●	●	●	8	●	●	●	5
Idaho †	↑	↑	—	30	●	●	—	****	●	●	—	9
Illinois †	↑	—	—	38	●	—	—	7	↑	—	—	11
Indiana †	↑	↑	↑	35	●	●	●	7	●	●	●	13
Kansas †	—	—	—	38	—	—	—	10	—	—	—	13
Kentucky	↑	↑	↑	23	●	●	●	7	●	●	●	****
Louisiana	↑	↑	↑	20	●	●	●	2	●	●	●	4
Maine †	—	↑	●	33	—	●	●	****	—	●	●	****
Maryland	↑	↑	●	40	↑	↑	●	7	↑	↑	●	17
Massachusetts	—	↑	●	37	—	●	●	8	—	↑	●	14
Michigan †	↑	↑	●	35	●	●	●	2	●	●	●	9
Minnesota †	↑	↑	●	42	●	●	●	****	●	●	●	13
Mississippi	—	●	●	14	—	●	●	1	—	●	●	1
Missouri	—	●	●	25	—	●	●	5	—	●	●	10
Montana †	↑	—	●	40	●	—	●	****	●	—	●	23
Nebraska	↑	●	●	34	●	●	●	8	●	●	●	11
Nevada	—	—	—	26	—	—	—	7	—	—	—	9
New Mexico	●	↑	●	26	●	●	●	****	●	●	●	6
New York †	↑	↑	●	36	●	●	●	10	↑	●	●	12
North Carolina	↑	↑	↑	41	↑	↑	●	7	↑	↑	●	18
North Dakota	●	●	●	33	●	●	●	****	●	●	●	17
Ohio	↑	↑	—	34	↑	●	—	8	↑	↑	—	21
Oklahoma	↑	●	—	22	↑	●	—	5	●	●	—	8
Oregon †	↑	—	●	34	●	—	●	15	●	—	●	13
Rhode Island	↑	↑	●	29	●	●	●	6	●	●	●	4
South Carolina	—	●	●	28	—	●	●	4	—	●	●	9
Tennessee	—	↑	●	21	—	●	●	3	—	●	●	12
Texas	↑	↑	●	37	●	●	●	6	↑	↑	●	14
Utah	—	↑	●	28	—	●	●	****	—	●	●	7
Vermont †	—	—	↑	33	—	—	●	****	—	—	●	****
Virginia	↑	↑	●	33	●	●	●	5	●	●	●	14
West Virginia	↑	↑	↑	19	●	●	●	8	↑	↑	●	14
Wyoming	↑	●	●	27	●	●	●	****	●	●	●	10
Other Jurisdictions												
American Samoa	—	—	—	****	—	—	—	****	—	—	—	▲
District of Columbia	●	●	●	****	↑	●	●	3	●	●	●	4
DDESS	—	—	●	38	—	—	●	17	—	—	●	16
DoDDS	—	—	●	36	—	—	●	10	—	—	●	18
Guam	●	●	●	****	●	●	●	****	●	●	●	2

See footnotes at end of figure. ▶

Figure 3.21: State Achievement Level Results by Race/Ethnicity, Grade 8 (continued)

Comparison of 2000 state percentages at or above *Proficient* to previous years by race/ethnicity for grade 8 public schools: 1990–2000

	Asian				American Indian			
	1990	1992	1996	2000	1990	1992	1996	2000
Nation	●	●	~	40	●	●	●	12
Alabama	●	●	●	****	●	●	●	****
Arizona †	●	●	●	35	●	●	●	****
Arkansas	●	●	●	****	●	●	●	****
California †	●	●	●	33	●	●	●	****
Connecticut	●	●	●	38	●	●	●	****
Georgia	●	●	●	****	●	●	●	****
Hawaii	↑	●	●	16	●	●	●	****
Idaho †	●	●	—	****	●	●	—	****
Illinois †	●	—	—	****	●	—	—	****
Indiana †	●	●	●	****	●	●	●	****
Kansas †	—	—	—	****	—	—	—	****
Kentucky	●	●	●	****	●	●	●	****
Louisiana	●	●	●	****	●	●	●	****
Maine †	—	●	●	****	—	●	●	****
Maryland	↑	↑	●	64	●	●	●	****
Massachusetts	—	●	●	49	—	●	●	****
Michigan †	●	●	●	****	●	●	●	****
Minnesota †	●	●	●	****	●	●	●	****
Mississippi	—	●	●	****	—	●	●	****
Missouri	—	●	●	****	—	●	●	****
Montana †	●	—	●	****	●	—	●	8
Nebraska	●	●	●	****	●	●	●	****
Nevada	—	—	—	26	—	—	—	11
New Mexico	●	●	●	****	●	●	●	4
New York †	●	●	●	42	●	●	●	****
North Carolina	●	●	●	****	●	●	●	****
North Dakota	●	●	●	****	●	●	●	6
Ohio	●	●	—	****	●	●	—	****
Oklahoma	●	●	—	****	●	●	—	8
Oregon †	●	—	●	35	●	—	●	****
Rhode Island	●	●	●	21	●	●	●	****
South Carolina	—	●	●	****	—	●	●	****
Tennessee	—	●	●	****	—	●	●	****
Texas	●	●	●	42	●	●	●	****
Utah	—	●	●	35	—	●	●	****
Vermont †	—	—	●	****	—	—	●	****
Virginia	●	●	●	49	●	●	●	****
West Virginia	●	●	●	****	●	●	●	****
Wyoming	●	●	●	****	●	●	●	7
Other Jurisdictions								
American Samoa	—	—	—	1	—	—	—	****
District of Columbia	●	●	●	****	●	●	●	****
DDESS	—	—	●	****	—	—	●	****
DoDDS	—	—	●	30	—	—	●	****
Guam	●	●	●	4	●	●	●	****

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

**** Sample size is insufficient to permit a reliable estimate.
† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
~ Special analyses raised concerns about the accuracy and precision of national grade 8 Asian/Pacific Islander results in 1996. As a result, they are omitted from the body of this report. See appendix A for a more detailed discussion.
▲ Percentage is between 0.0 and 0.5
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

At grade 4, the percentage of students at or above *Proficient* in 2000 was higher than that in 1992 for white students in 24 jurisdictions, for black students in 6 jurisdictions, for Hispanic students in 2 jurisdictions, and for Asian/Pacific Islander students in 1 jurisdiction. None of the apparent changes for American Indian students were statistically significant in any jurisdiction.

In Indiana and Texas, the percentages of students performing at or above *Proficient* increased for white, black, and Hispanic students. In Alabama, Louisiana, and North Carolina, gains were made among white and black students. Between 1996 and 2000, the percentages of students at or above *Proficient* increased for white students in 9 jurisdictions, and for black students in 3 jurisdictions. None of the other apparent racial/ethnic group changes was statistically significant in any jurisdiction.

At grade 8, the percentage of students at or above *Proficient* in 2000 was higher than that in 1990 for white students in 27 jurisdictions, for black students in 3 jurisdictions, and for Hispanic students in 5 jurisdictions. None of the apparent changes for Asian/Pacific Islander or American Indian students in any state were statistically significant. North Carolina was the only state in which the percentages of white, black, and Hispanic students at or above *Proficient* increased during this time period. In Oklahoma, both white and black students made gains, and in Illinois, New York, Ohio, and Texas both white and Hispanic students made gains. Between 1996 and 2000, the only increase in percentages of students at or above *Proficient* across the racial/ethnic groups and jurisdictions were among white students in North Carolina.

The percentages of students at or above *Basic* by state across assessment years are presented in appendix B (tables B.37 and B.40). Cumulative percentages in each achievement level in 2000 by race/ethnicity for each jurisdiction are also given in appendix B (tables B.38 and B.41).

Trends in Scale Score Differences Between Selected Subgroups by State

Similar to results for the nation, trends in the score differences or "gaps" between male and female students across the assessment years were relatively small and unchanged across the states. Also similar to the national data, the score gaps between male and female students are generally much smaller than those seen between racial/ethnic subgroups. The only change in the magnitude of the racial/ethnic gaps studied across jurisdictions was a narrowing of the gap between white and Hispanic eighth-graders in North Carolina between 1990 and 2000. None of the other changes in racial/ethnic score gaps across years were statistically significant. The gender and racial/ethnic score gap results for jurisdictions are provided in appendix B.

Free/Reduced-Price Lunch Eligibility and NAEP Scores by State

NAEP collects data on students' eligibility for the federal Free/Reduced-Price lunch program as an indicator of economic status in both the national and state-by-state samples. Figures 3.22 and 3.23 present the results by state for grades 4 and 8, respectively. As noted previously, data collection of student eligibility for this program began in 1996, so the trend data displayed have only two points. At grade 4, students eligible for the program (those meeting the low-income guidelines) had improved average scale scores from 1996 to 2000 in 10 jurisdictions, while students whose families had somewhat higher incomes, and were consequently ineligible for the program, had improved average scale scores in 11 jurisdictions. Both eligible and non-eligible students showed gains since 1996 in five jurisdictions (Alabama, Louisiana, North Carolina, South Carolina, and Virginia).

At grade 8, students eligible for the program had higher scores from 1996 to 2000 in 5 jurisdictions, while students ineligible had higher scores in 10 jurisdictions. Both eligible and non-eligible students made gains between 1996 and 2000 in three jurisdictions (Indiana, North Carolina, and Virginia).

The percentages of students at or above *Proficient* by Free/Reduced-Price Lunch eligibility are presented for each participating jurisdiction in figures 3.24 and 3.25 for grades 4 and 8, respectively. Additional data for these subgroups of students by jurisdiction are included in appendix B: The percentages of students at or above *Basic* across years are presented in tables B.49 and B.52, and the cumulative percentages of students in each achievement level in 2000 are presented in tables B.50 and B.53.

Figure 3.22: State Scale Score Results by Free/Reduced-Price Lunch Eligibility, Grade 4

State average scale scores by student eligibility for free/reduced-price lunch program for grade 4 public schools: 1996–2000

	Eligible		Not Eligible	
	1996	2000	1996	2000
Nation	●	210	↑	236
Alabama	↑	206	↑	230
Arizona	●	205	●	231
Arkansas	●	206	●	229
California †	●	200	↑	229
Connecticut	↑	216	●	242
Georgia	●	204	↑	233
Hawaii	●	205	●	226
Idaho †	—	217	—	234
Illinois †	—	209	—	235
Indiana †	↑	222	↑	240
Iowa †	●	224	●	236
Kansas †	—	217	—	241
Kentucky	●	210	●	231
Louisiana	↑	210	↑	233
Maine †	●	222	●	234
Maryland	●	204	●	233
Massachusetts	●	213	↑	243
Michigan †	●	211	↑	240
Minnesota †	●	220	●	240
Mississippi	●	202	●	226
Missouri	●	213	↑	237
Montana †	●	217	●	236
Nebraska	●	210	●	235
Nevada	●	208	●	228
New Mexico	●	205	●	227
New York †	↑	214	●	239
North Carolina	↑	220	↑	241
North Dakota	●	221	●	235
Ohio †	—	217	—	239
Oklahoma	—	217	—	234
Oregon †	●	213	●	234
Rhode Island	●	206	↑	236
South Carolina	↑	208	↑	235
Tennessee	●	204	●	231
Texas	↑	222	●	242
Utah	●	215	●	233
Vermont †	●	216	↑	237
Virginia	↑	214	↑	237
West Virginia	●	217	●	232
Wyoming	↑	220	↑	234
Other Jurisdictions				
American Samoa	—	157	—	****
District of Columbia	↑	188	●	219
DDESS	●	224	●	231
DoDDS	●	222	↑	229
Guam	●	176	●	194
Virgin Islands	—	183	—	****

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
**** Sample size is insufficient to permit a reliable estimate.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP) 1996 and 2000 Mathematics Assessments.

Figure 3.23: State Scale Score Results by Free/Reduced-Price Lunch Eligibility, Grade 8

State average scale scores by student eligibility for free/reduced-price lunch program for grade 8 public schools: 1996–2000

	Eligible		Not Eligible	
	1996	2000	1996	2000
Nation	●	255	↑	285
Alabama	●	243	●	275
Arizona †	●	252	●	280
Arkansas	●	249	●	269
California †	●	242	●	273
Connecticut	●	251	↑	292
Georgia	↑	248	●	278
Hawaii	●	251	●	270
Idaho †	—	264	—	284
Illinois †	—	259	—	285
Indiana †	↑	267	↑	288
Kansas †	—	267	—	290
Kentucky	↑	257	↑	281
Louisiana	●	246	↑	276
Maine †	●	273	●	287
Maryland	↑	251	↑	286
Massachusetts	●	261	↑	289
Michigan †	●	256	●	286
Minnesota †	●	274	●	291
Mississippi	●	241	●	267
Missouri	●	256	●	280
Montana †	●	275	●	292
Nebraska	↓	262	●	288
Nevada	—	248	—	275
New Mexico	●	250	●	272
New York †	●	261	●	286
North Carolina	↑	261	↑	289
North Dakota	●	271	●	287
Ohio	—	262	—	289
Oklahoma	—	259	—	280
Oregon †	●	263	●	287
Rhode Island	●	252	↑	283
South Carolina	↑	252	↑	278
Tennessee	●	244	●	274
Texas	↑	261	●	285
Utah	●	262	●	281
Vermont †	●	266	↑	288
Virginia	↑	258	↑	282
West Virginia	↑	259	↑	278
Wyoming	●	265	●	281
Other Jurisdictions				
American Samoa	—	195	—	****
District of Columbia	●	227	↑	261
DDESS	●	268	●	281
DoDDS	●	271	●	280
Guam	●	216	●	238

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
**** Sample size is insufficient to permit a reliable estimate.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP) 1996 and 2000 Mathematics Assessments.

Figure 3.24: State Achievement Level Results by Free/Reduced-Price Lunch Eligibility, Grade 4

State percentages at or above *Proficient* by student eligibility for free/reduced-price lunch program for grade 4 public schools: 1996–2000

	Eligible		Not Eligible	
	1996	2000	1996	2000
Nation	●	9	↑	33
Alabama	●	5	●	24
Arizona	●	7	●	26
Arkansas	●	5	●	21
California †	●	5	●	25
Connecticut	●	11	●	40
Georgia	●	5	↑	29
Hawaii	●	6	●	22
Idaho †	—	13	—	28
Illinois †	—	7	—	30
Indiana †	↑	14	↑	37
Iowa †	●	17	●	32
Kansas †	—	13	—	40
Kentucky	●	7	●	26
Louisiana	↑	7	↑	27
Maine †	●	14	●	29
Maryland	●	7	●	31
Massachusetts	●	9	↑	42
Michigan †	●	11	↑	38
Minnesota †	●	15	●	40
Mississippi	●	4	●	18
Missouri	●	9	●	31
Montana †	●	10	●	32
Nebraska	●	11	●	31
Nevada	●	6	●	22
New Mexico	●	5	●	22
New York †	●	8	●	36
North Carolina	↑	12	↑	39
North Dakota	●	16	●	29
Ohio †	—	11	—	35
Oklahoma	—	8	—	25
Oregon †	●	11	●	30
Rhode Island	●	7	↑	33
South Carolina	↑	7	↑	31
Tennessee	●	6	●	27
Texas	●	13	●	40
Utah	●	13	●	29
Vermont †	●	15	●	34
Virginia	●	9	●	32
West Virginia	●	11	●	25
Wyoming	●	16	↑	30
Other Jurisdictions				
American Samoa	—	▲	—	****
District of Columbia	●	2	●	22
DDESS	●	18	●	28
DoDDS	●	17	●	24
Guam	●	1	●	4
Virgin Islands	—	1	—	****

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
**** Sample size is insufficient to provide a reliable estimate.
▲ Percentage is between 0.0 and 0.5.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP) 1996 and 2000 Mathematics Assessments.

Figure 3.25: State Achievement Level Results by Free/Reduced-Price Lunch Eligibility, Grade 8

State percentages at or above *Proficient* by student eligibility for free/reduced-price lunch program for grade 8 public schools: 1996–2000

	Eligible		Not Eligible	
	1996	2000	1996	2000
Nation	●	10	●	35
Alabama	●	5	●	23
Arizona †	●	9	●	27
Arkansas	●	7	●	18
California †	●	4	●	24
Connecticut	●	7	●	42
Georgia	●	5	●	27
Hawaii	●	8	●	21
Idaho †	—	17	—	32
Illinois †	—	12	—	34
Indiana †	●	13	↑	36
Kansas †	—	17	—	41
Kentucky	↑	8	↑	29
Louisiana	●	4	↑	22
Maine †	●	20	●	36
Maryland	●	7	●	37
Massachusetts	●	11	●	38
Michigan †	●	9	●	35
Minnesota †	●	27	●	42
Mississippi	●	3	●	14
Missouri	●	9	●	26
Montana †	●	25	●	43
Nebraska	●	15	●	36
Nevada	—	6	—	24
New Mexico	●	6	●	21
New York †	●	12	●	34
North Carolina	↑	13	↑	38
North Dakota	●	21	●	35
Ohio	—	10	—	36
Oklahoma	—	8	—	26
Oregon †	●	16	●	37
Rhode Island	●	7	↑	31
South Carolina	●	6	↑	27
Tennessee	●	7	●	23
Texas	●	11	●	34
Utah	●	15	●	29
Vermont †	●	14	↑	38
Virginia	●	8	●	31
West Virginia	●	8	↑	25
Wyoming	●	15	●	28
Other Jurisdictions				
American Samoa	—	1	—	****
District of Columbia	●	2	●	18
DDESS	●	16	●	31
DoDDS	●	18	●	27
Guam	●	1	●	5

● Indicates no significant difference between earlier year and 2000 in average scores.

↑ Indicates the average score in 2000 was significantly higher than in the specified year.

↓ Indicates the average score in 2000 was significantly lower than in the specified year.

NOTE:
Dark arrows, (↑↓) indicate a significant difference when examining only one jurisdiction and when using a multiple comparison based on all jurisdictions that participated in both years.

Light arrows (↑ ↓) indicate a significant change when only one jurisdiction or the nation is being examined.

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
— Indicates that the jurisdiction did not participate.
**** Sample size is insufficient to provide a reliable estimate.
NOTE: Comparative performance results may be affected by changes in exclusion rates for students with disabilities and limited-English-proficient students in the NAEP samples.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools. DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP) 1996 and 2000 Mathematics Assessments.

4 Becoming a More Inclusive National Assessment

Legislation at the federal level now mandates the inclusion of all students in large-scale academic assessments.[1] As a consequence, most states have assessment programs that must make provisions for special-needs students—those with disabilities or limited English proficiency—that include the allowance of testing accommodations when appropriate. Assessing as representative a sample of the nation's students as possible is particularly important for NAEP's mission to serve as a key indicator of the academic achievement of the nation's students. This mission can be satisfactorily accomplished only if the assessment results include data gathered from all groups of students, including those classified as having special needs.

Chapter Focus

How would the NAEP results differ if accommodations were permitted for special-needs students?

Although the intent of NAEP has consistently been to include special-needs students in its assessments to the fullest degree possible, the implementation of the assessment has always resulted in some exclusion of students who could not be assessed meaningfully without accommodations. Participating schools have been permitted to exclude certain students who have been classified as having a disability under the Individuals with Disabilities Education Act, based upon their Individualized Education Programs (IEP) and Section 504 of the Rehabilitation Act of 1973.

Chapter Contents

Two sets of 2000 NAEP Mathematics Results

Results for the Nation

National Results by Gender

National Results by Race/Ethnicity

Overall State Results

[1] Goals 2000, Elementary and Secondary Education Act (ESEA), Improving America's Schools Act (IASA), Individuals with Disabilities Education Act (IDEA). See also: Title VI of the Civil Rights Act, Equal Educational Opportunities Act, Section 504 of the Rehabilitation Act.

Similarly, schools have been permitted to exclude some students they identify as being limited English proficient. Exclusion decisions are made in accordance with explicit criteria provided by the NAEP program.

In order to move the NAEP assessments toward more inclusive samples, the NAEP program began to explore the use of accommodations with special-needs students during the 1996 and 1998 assessments. An additional impetus for this change was an attempt to keep NAEP consistent with state and district testing policies that increasingly offered accommodations so that more special-needs students could be assessed. In both 1996 and 1998, the national NAEP sample was split so that some of the schools sampled were permitted to provide accommodations to special-needs students and the others were not. This sample design made it possible to study the effects on NAEP results of including special-needs students in the assessments under alternate testing conditions. Technical research papers have been published with the results of these comparisons.[2] Based on the outcomes of these technical analyses, the 1998 results of those NAEP assessments that used new test frameworks (writing and civics), and hence also began new trend lines, were reported with the inclusion of data from accommodated special-needs students.

The results presented in the 1996 mathematics report card included the performance of those students with disabilities (SD) or with limited English proficiency (LEP) who were assessed without the possibility of accommodations. They did not include the performance of students for whom accommodations were permitted in order to preserve comparability with the results from 1990 and 1992. Students in those assessments had not had accommodations offered to them. However, in both the 1996 and 2000 mathematics assessments, the NAEP program used the split-sample design, so that trends in students' mathematics achievement could be reported across all the assessment years and, at the same time, the program could continue to examine the effects of including students assessed with accommodations.

Two Sets of 2000 NAEP Mathematics Results

This report card is the first to display two different sets of NAEP mathematics results based on the split-sample design: 1) those that reflect the performance of regular and special-needs students when accommodations were not permitted, and 2) those that reflect the performance of regular and special-needs students—both those who were accommodated and those who could test without accommodations—when accommodations were permitted. It should be noted that accommodated students make up a small proportion of the total weighted number of students assessed (see table A.8, page 204 in appendix A for details). Making accommodations available may change the overall assessment results in subtle and different ways. For example, when accommodations are permitted, there may be some occurrences of students being accommodated who might have taken the test under standard conditions if accommodations were not permitted. This could lead

[2] Olson, J.F. and Goldstein, A. A. (1997). *The inclusion of students with disabilities and limited English proficient students in large-scale assessments: A summary of recent progress*. (NCES Publication No. 97–482). Washington, DC: National Center for Education Statistics.

Mazzeo, J., Carlson, J.E., Voelkl, K.E., & Lutkus, A. D. (1999). *Increasing the participation of special needs students in NAEP: A report on 1996 research activities*. (NCES Publication No. 2000–473). Washington, DC: National Center for Education Statistics.

to an overall increase in the average assessment results, if accommodations were to increase special-needs students' performance. Conversely, when accommodations are permitted, special-needs students who could not have been tested without accommodations could be included in the sample. Assuming that these are generally lower-performing students, their inclusion in the sample—even with accommodations—could result in an overall lower average score.

Chapters 1, 2, 3, 5, and 6 of this report are based on the first set of results (no accommodations offered). This chapter presents an overview of the second set of results—results that include students who were provided accommodations during the assessment administration. By including these results, the NAEP program begins a phased transition toward a more inclusive reporting sample. Future assessment results will be based solely on a student and school sample in which accommodations are permitted.

The two sets of results presented in this chapter were obtained by administering the assessment to a nationally representative sample of students and schools. In one part of the schools sampled, no accommodations were permitted; all students were assessed under the same conditions that were the basis for reporting results from the 1990, 1992, and 1996 NAEP mathematics assessments. In another part of the schools sampled, accommodations were permitted for students with disabilities and limited English proficient students who normally receive accommodations in their district or state assessment programs. Most accommodations that schools routinely provide for their own testing programs were permitted. The permitted accommodations included, but were not limited to the following:

- one-on-one testing,
- bilingual books,
- large print book,
- small-group testing,
- extended time,
- oral reading of directions, and
- use of an aide for transcribing responses.

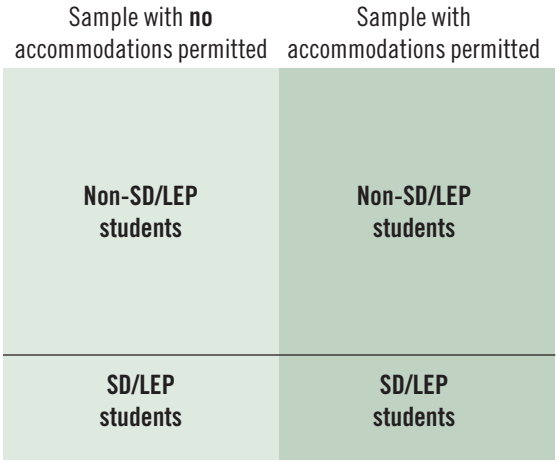
(See appendix A, table A.10, page 209, for greater detail on the numbers and percentages of students accommodated by accommodation type in the 1996 and 2000 assessments.)

Figure 4.1 provides a visual representation of how the two sets of results were based on the two samples in 1996 and 2000. Included in both sets of results (accommodations not permitted and accommodations permitted) are those students from both samples of schools who were not identified as either SD or LEP. In addition, the first set of results (accommodations not permitted) includes SD and LEP students from the sample of schools where accommodations were not permitted (see middle portion of figure 4.1). This is the set of results that allows for trend comparisons back to 1990 and are presented in the other chapters of this report.

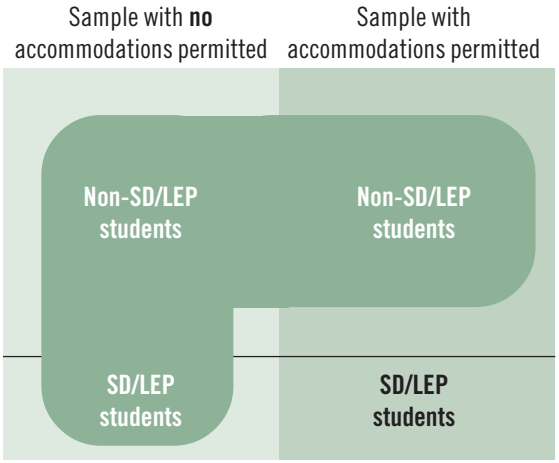
The second set of results, accommodations permitted (see bottom portion of figure 4.1), includes SD and LEP students from the sample of schools where accommodations were permitted. This is the set of results that form the new, more inclusive baseline for future reporting of trend comparisons for the NAEP mathematics assessment.

Figure 4.1 Split-Sample Design

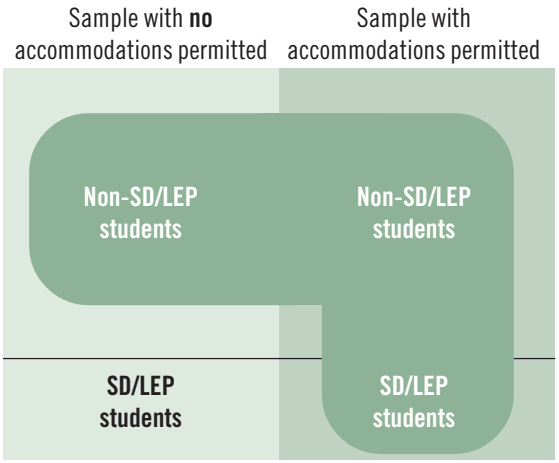
The two sets of NAEP results based on a split-sample design



Split-sample design
The national sample was split. In part of the schools, accommodations were not permitted for students with disabilities (SD) and students with limited English proficiency (LEP). In the other schools, accommodations were permitted for SD and LEP students who routinely received them in their school assessments.



Accommodations-not-permitted results
The accommodations-not-permitted results include the performance of students from both samples who were not classified as SD or LEP and the performance of SD and LEP students from the sample in which no accommodations were permitted.



Accommodations-permitted results
The accommodations-permitted results also include the performance of students from both samples who were not classified as SD or LEP; however, the SD and LEP students whose performance is included in this set of results were from the sample in which accommodations were permitted. Since students who required testing accommodations could be assessed and represented in the overall results, it was anticipated that these results would include more special-needs students and reflect a more inclusive sample.

In the NAEP 2000 sample where accommodations were not permitted, 15 percent of the students at grade 4, 14 percent at grade 8, and 9 percent at grade 12, were identified by their schools as having special needs (i.e., either as students with disabilities or limited English proficient students). In the other sample where accommodations were offered, 17 percent of the students at grade 4, 13 percent at grade 8, and 9 percent at grade 12 were identified as having special needs. In the sample where accommodations were not permitted, 48 percent of the special-needs students at each of the three grade levels (between 4 and 7 percent of all students—see appendix A, table A.6, page 201) were excluded from NAEP testing by their schools. In the sample where accommodations were offered, between 22 and 28 percent of the special-needs students were excluded from the assessment (between 2 and 4 percent of the total sample). Thus, offering accommodations would appear to lead to greater inclusion of special-needs students.

The focus of this chapter is a comparison of data from the two sets of results: 1) accommodations were not permitted, and (2) accommodations were permitted. Because the split-sample design was used in both 1996 and 2000 for the NAEP national mathematics assessment, both sets of results are presented for both years. The split-sample design was first used in the NAEP state mathematics assessment in 2000. Overall results are provided for the nation and for participating states and other jurisdictions. In addition, national results are presented by gender and by race/ethnicity. These results are discussed in terms of statistically significant differences between the two sets of results in each year, changes between assessment years, and differences between subgroups of students within each set of results. Throughout this chapter, the assessment results that include SD and LEP students for whom accommodations were not permitted will be referred to as the "accommodations-not-permitted" results. The set of results that includes SD and LEP students for whom accommodations were permitted will be referred to as the "accommodations-permitted" results.

Results for the Nation

Accommodations Not Permitted and Accommodations Permitted

Table 4.1 displays the average mathematics scale scores for the nation in 1996 and 2000 for two sets of results: 1) accommodations not permitted, and 2) accommodations permitted. At grades 4 and 8 the apparent differences between the two average scores in either 1996 or 2000 were not statistically significant. At grade 12, the accommodations-permitted average score in 1996 was two points lower than the accommodations-not-permitted average score. The small difference between the two sets of results in 2000 was not statistically significant. Although there was a decline in average scores at grade 12 in both sets of results between 1996 and 2000, the 2 point decline when accommodations were permitted was not statistically significant.

Table 4.1 Comparison of Two Sets of National Scale Score Results

National average mathematics scale scores by type of results, grades 4, 8, and 12: 1996–2000

	Accommodations not permitted	Accommodations permitted
Grade 4		
1996	224 *	224 *
2000	228	226
Grade 8		
1996	272 *	271 *
2000	275	274
Grade 12		
1996	304 *	302 †
2000	301	300

* Significantly different from 2000.
† Significantly different from the sample where accommodations were not permitted.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

As noted in the introduction to this chapter, NAEP has always sought to include special-needs students proportional to their representation in the U.S. population. Offering accommodations tends to reduce exclusion rates for special-needs students and therefore allows NAEP to offer a fairer and more accurate picture of the status of American education. Because special-needs students are typically classified as eligible for special educational services after having shown some difficulty in the regular learning environment, some may assume that the academic achievement of special-needs students would be lower than that of students without such needs. This assumption appears to have been justified only in the observed difference between the two sets of grade 12 mathematics results in 1996, where the accommodations-permitted results, which included slightly more special-needs students because of the availability of accommodations, were lower than the accommodations-not-permitted results. It is important to examine the percentages of students attaining the NAEP achievement levels, however, to see if there were higher percentages at the lower achievement levels (i.e., below *Basic* and *Basic*), when students were assessed with accommodations.

Table 4.2 shows the percentages of students attaining each of the achievement levels. The percentages are similar across the two sets of 1996 results for grades 4 and 8; apparent differences between the accommodations-not-permitted and the accommodations-permitted results were not significantly different. At grade 12, however, the percentage of students below *Basic* in 1996 was higher when accommodations were permitted than when they were not permitted. In 2000, the percentage of fourth-graders below *Basic* was higher when accommodations were permitted than when accommodations were not permitted.

Table 4.2 Comparison of Two Sets of National Achievement Level Results

Percentage of students within each mathematics achievement level range and at or above achievement levels by type of results, grades 4, 8, and 12: 1996 and 2000

	Below *Basic*	At *Basic*	At *Proficient*	At *Advanced*	At or above *Basic*	At or above *Proficient*
Grade 4						
1996: Accommodations were						
not permitted	36 *	43	19 *	2	64 *	21 *
permitted	36	43	19 *	2	64	21 *
2000: Accommodations were						
not permitted	31	43	23	3	69	26
permitted	33 †	42	22	3	67 †	25
Grade 8						
1996: Accommodations were						
not permitted	38 *	39	20 *	4	62 *	24 *
permitted	39 *	38	20 *	4	61 *	23 *
2000: Accommodations were						
not permitted	34	38	22	5	66	27
permitted	35	38	22	5	65	27
Grade 12						
1996: Accommodations were						
not permitted	31 *	53 *	14	2	69 *	16
permitted	34 †	50 †	14	2	66 †	16
2000: Accommodations were						
not permitted	35	48	14	2	65	17
permitted	36	48	14	2	64	16

* Significantly different from 2000.
† Significantly different from the sample where accommodations were not permitted.
NOTE: Percentages within each mathematics achievement level range may not add to 100 or to the exact percentages at or above achievement levels due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

National Results by Gender

Accommodations Not Permitted and Accommodations Permitted

The average mathematics scale scores by gender for both sets of results in 1996 and 2000 are provided in table B.58 (page 297) in appendix B. In 1996, female students at grade 12 had higher mathematics scores when accommodations were not permitted than when accommodations were permitted. The same was true for male students at grade 8 in 2000.

While the apparent difference in scores between male and female students in the fourth grade was not statistically significant when accommodations were not permitted in 2000, male students did score higher than females when accommodations were permitted. The reverse was true at grade 8, where male students scored higher than females when accommodations were not permitted, but the apparent difference in scores was not statistically significant when accommodations were permitted.

At grade 12, male students outperformed female students in 2000 regardless of whether or not accommodations were permitted.

There was also some variation by grade reflected in the two sets of results with respect to differences in the performance of female students between 1996 and 2000. At grade 4, female students had higher mathematics scores in 2000 than in 1996 when accommodations were not permitted and lower scores in 2000 at grade 12 when accommodations were not permitted. However, apparent differences in the performance of female students at grades 4 and 12 between 1996 and 2000 were not statistically significant when accommodations were permitted. The reverse was true at grade 8, where female students showed no statistically significant difference in performance when accommodations were not permitted but did show an increase from 1996 to 2000 when accommodations were permitted. The relationship in the performance of male students between 1996 and 2000 was similar in both sets of results.

The percentages of male and female students attaining the *Basic, Proficient,* and *Advanced* levels are provided in table B.59 (page 298) in appendix B. Comparing the two sets of results both in 1996 and 2000, no statistically significant differences were found in the percentages of students attaining each of the achievement levels at grades 4 or 8. At grade 12, however, a higher percentage of both male and female students were below *Basic* when accommodations were permitted in 1996 than when they were not.

National Results by Race/Ethnicity

Accommodations Not Permitted and Accommodations Permitted

NAEP assessments across academic subjects have typically reported large score differences according to race and ethnic group membership. If students with disabilities or limited English proficient students are over represented in a particular racial or ethnic group, that group's assessment scores may decrease. Table B.60 (page 299) in appendix B provides the average mathematics scale scores for each of the race/ethnicity categories for the two sets of results in 1996 and 2000. There were no statistically significant differences observed between the average scores when accommodations were not permitted and when accommodations were permitted for any of the race/ethnicity categories in either 1996 or 2000.

As noted in chapter 3, a pattern of performance differences by race/ethnicity can be seen in the accommodations-not-permitted results in 2000. Both white and Asian/Pacific Islander students scored higher than black, Hispanic, or American Indian students. The same pattern can be observed in the accommodations-permitted results. The only differences noted in the performance by ethnicity pattern between the two sets of results was that in the accommodations-permitted results, American Indian students scored higher than Hispanic students at grade 4 and higher than black students at grade 8. This

was not the case in the accommodations-not-permitted results. At both grades 4 and 8, black students scored higher in 2000 than in 1996 when accommodations were permitted, while the apparent increase was not significant when accommodations were not permitted.

The percentages of students in each race/ethnicity category who attained the *Basic, Proficient,* and *Advanced* levels are provided in table B.61 (page 300) in appendix B. No significant differences were found at either grade 4 or grade 8 between the accommodations-not-permitted results and the accommodations-permitted results for the percentages of students attaining each of the achievement levels in 1996 and 2000. At grade 12, a higher percentage of white students in 1996 were below *Basic* when accommodations were permitted than when accommodations were not permitted.

State Results

Accommodations Not Permitted and Accommodations Permitted

While the split-sample design was used for both the 1996 and 2000 national assessments, it was used for the first time in the state assessment of mathematics in 2000. The two sets of average scale scores for the jurisdictions that participated in 2000 are presented in tables 4.3 and 4.4 for grades 4 and 8, respectively. As with the presentation of results for jurisdictions in previous chapters, two types of statistical tests are indicated in these tables—one that involves a multiple-comparison procedure based on all jurisdictions that participated, and one that examines each jurisdiction in isolation. The following discussion of differences between the accommodations-not-permitted results and the accommodations-permitted results is based solely on the multiple-comparison procedure.

Consistent with the national results, none of the apparent differences between the accommodations-not-permitted results and the accommodations-permitted results for grade 4 were statistically significant. At grade 8, however, there were seven states that had higher average scores when accommodations were not permitted than when they were permitted: Maryland, Massachusetts, Missouri, Nevada, New York, North Carolina, and West Virginia.

Figures 4.2 and 4.3 show comparisons of scale scores across states when accommodations were permitted for fourth- and eighth-grade students, respectively. Nine states were included among the highest-performing jurisdictions at grade 4: Connecticut, Minnesota, Massachusetts, Indiana, Kansas, Vermont, Texas, Iowa and Ohio. Eight of these states were also included among the highest-performing jurisdictions when accommodations were not permitted (Ohio had lower average scores than Minnesota, Massachusetts, and Indiana when accommodations were not permitted–see chapter 2). At grade 8, the cluster of highest-performing jurisdictions when accommodations were permitted included Minnesota, Montana, and Kansas. The same three states were also the highest-performing jurisdictions when accommodations were not permitted.

Table 4.3 Comparison of Two Sets of State Scale Score Results, Grade 4

State average mathematics scale scores by type of results for grade 4 public schools: 2000

	Accommodations not permitted	Accommodations permitted
Nation	226	225
Alabama	218	217
Arizona	219	219
Arkansas	217	216
California †	214	213
Connecticut	234	234
Georgia	220	219
Hawaii	216	216
Idaho †	227	224 *
Illinois †	225	223
Indiana †	234	233
Iowa †	233	231
Kansas †	232	232
Kentucky	221	219
Louisiana	218	218
Maine †	231	230
Maryland	222	222
Massachusetts	235	233
Michigan †	231	229 *
Minnesota †	235	234
Mississippi	211	211
Missouri	229	228
Montana †	230	228
Nebraska	226	225
Nevada	220	220
New Mexico	214	213
New York †	227	225
North Carolina	232	230 *
North Dakota	231	230
Ohio †	231	230
Oklahoma	225	224
Oregon †	227	224 *
Rhode Island	225	224
South Carolina	220	220
Tennessee	220	220
Texas	233	231
Utah	227	227
Vermont †	232	232
Virginia	230	230
West Virginia	225	223
Wyoming	229	229
Other Jurisdictions		
American Samoa	157	152
District of Columbia	193	192
DDESS	228	228
DoDDS	228	226
Guam	184	184
Virgin Islands	183	181

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
*Significantly different from the sample where accommodations were not permitted when examining only one jurisdiction.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools.
DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessments.

Table 4.4 Comparison of Two Sets of State Scale Score Results, Grade 8

State average mathematics scale scores by type of results for grade 8 public schools: 2000

	Accommodations not permitted	Accommodations permitted
Nation	274	273
Alabama	262	264
Arizona †	271	269
Arkansas	261	257 *
California †	262	260
Connecticut	282	281
Georgia	266	265
Hawaii	263	262
Idaho †	278	277
Illinois †	277	275
Indiana †	283	281 *
Kansas †	284	283
Kentucky	272	270 *
Louisiana	259	259
Maine †	284	281 *
Maryland	276	272 ‡
Massachusetts	283	279 ‡
Michigan †	278	277
Minnesota †	288	287
Mississippi	254	254
Missouri	274	271 ‡
Montana †	287	285
Nebraska	281	280
Nevada	268	265 ‡
New Mexico	260	259
New York †	276	271 ‡
North Carolina	280	276 ‡
North Dakota	283	282
Ohio	283	281 *
Oklahoma	272	270
Oregon †	281	280
Rhode Island	273	269 *
South Carolina	266	265
Tennessee	263	262
Texas	275	273
Utah	275	274 *
Vermont †	283	281
Virginia	277	275
West Virginia	271	266 ‡
Wyoming	277	276
Other Jurisdictions		
American Samoa	195	192
District of Columbia	234	235
DDESS	277	274
DoDDS	278	278
Guam	233	234

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
*Significantly different from the sample where accommodations were not permitted when examining only one jurisdiction.
‡ Significantly different from the sample where accommodations were not permitted when examining only one jurisdiction and when using a multiple comparison procedure based on all jurisdictions that participated both years.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools.
DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessments.

Figure 4.2 Cross-State Scale Score Comparisons for Accommodations-Permitted Results, Grade 4

Comparisons of average mathematics scale scores for grade 4 public schools: 2000 sample where accommodations were permitted

Instructions: Read down the column directly under a jurisdiction name listed in the heading at the top of the chart. Match the shading intensity surrounding a jurisdiction's abbreviation to the key below to determine whether the average math scale score of this jurisdiction is higher than, the same as, or lower than the jurisdiction in the column heading. For example, in the column under North Carolina: North Carolina's score was lower than Connecticut and Minnesota, about the same as all the states from Massachusetts through Utah, and higher than the remaining states down the column.

Connecticut (CT)	Minnesota (MN)†	Massachusetts (MA)	Indiana (IN)†	Kansas (KS)†	Vermont (VT)†	Texas (TX)	Iowa (IA)†	Ohio (OH)†	North Carolina (NC)	North Dakota (ND)	Maine (ME)†	Virginia (VA)	Michigan (MI)†	Wyoming (WY)	Montana (MT)†	Missouri (MO)	DoDEA/DDESS (DD)	Utah (UT)	DoDEA/DoDDS (DI)	New York (NY)†	Nebraska (NE)	Idaho (ID)†	Rhode Island (RI)	Oregon (OR)†	Oklahoma (OK)	West Virginia (WV)	Illinois (IL)†	Maryland (MD)	South Carolina (SC)	Tennessee (TN)	Nevada (NV)	Kentucky (KY)	Georgia (GA)	Arizona (AZ)	Louisiana (LA)	Alabama (AL)	Hawaii (HI)	Arkansas (AR)	New Mexico (NM)	California (CA)†	Mississippi (MS)	District of Columbia (DC)	Guam (GU)	Virgin Islands (VI)	American Samoa (AS)
CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT
MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN
MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA
IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN
KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS
VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT
TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX
IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA
OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH
NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME
VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA
MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI
WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY
MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT
MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO
DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD
UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT
DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI
NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI
OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV
IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL
MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD
SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY
GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA
AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ
LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL
HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI
AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA
MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC
GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU
VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI
AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS

Jurisdiction has statistically significantly higher average scale score than the jurisdiction listed at the top of the chart.

No statistically significant difference from the jurisdiction listed at the top of the chart.

Jurisdiction has statistically significantly lower average scale score than the jurisdiction listed at the top of the chart.

The between jurisdiction comparisons take into account sampling and measurement error and that each jurisdiction is being compared with every other jurisdiction. Significance is determined by an application of a multiple-comparison procedure (see appendix A).

† Indicates that the jurisdiction did not satisfy one or more of the guidelines for school participation rates (see appendix A).

NOTE: Differences between states and jurisdictions may be partially explained by other factors not included in this table.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress, 2000 Mathematics Assessment.

Figure 4.3 Cross-State Scale Score Comparisons for Accommodations-Permitted Results, Grade 8

Comparisons of average mathematics scale scores for grade 8 public schools: 2000 sample where accommodations were permitted

Instructions: Read down the column directly under a jurisdiction name listed in the heading at the top of the chart. Match the shading intensity surrounding a jurisdiction's abbreviation to the key below to determine whether the average math scale score of this jurisdiction is higher than, the same as, or lower than the jurisdiction in the column heading. For example, in the column under Indiana: Indiana's score was lower than Minnesota, about the same as all the states from Montana through Michigan, and higher than the remaining states down the column.

Minnesota (MN)†	Montana (MT)†	Kansas (KS)†	North Dakota (ND)	Maine (ME)†	Indiana (IN)†	Connecticut (CT)	Ohio (OH)	Vermont (VT)†	Oregon (OR)†	Nebraska (NB)	Massachusetts (MA)	DoDEA/DoDDS (DI)	Michigan (MI)†	Idaho (ID)†	North Carolina (NC)	Wyoming (WY)	Virginia (VA)	Illinois (IL)†	Utah (UT)	DoDEA/DDESS (DD)	Texas (TX)	Maryland (MD)	New York (NY)†	Missouri (MO)	Kentucky (KY)	Oklahoma (OK)	Rhode Island (RI)	Arizona (AZ)†	West Virginia (WV)	Georgia (GA)	Nevada (NV)	South Carolina (SC)	Alabama (AL)	Hawaii (HI)	Tennessee (TN)	California (CA)†	New Mexico (NM)	Louisiana (LA)	Arkansas (AR)	Mississippi (MS)	District of Columbia (DC)	Guam (GU)	American Samoa (AS)
MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN	MN
MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT
KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME
IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN
CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT
OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH	OH
VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT
OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA
DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI
MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI	MI
ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID	ID
NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY	WY
VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA	VA
IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL	IL
UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT
DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD	DD
TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX	TX
MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD
NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO	MO
KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI	RI
AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ	AZ
WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV	WV
GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA
NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL
HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI
TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA
NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC
GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU	GU
AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS	AS

Jurisdiction has statistically significantly higher average scale score than the jurisdiction listed at the top of the chart.

No statistically significant difference from the jurisdiction listed at the top of the chart.

Jurisdiction has statistically significantly lower average scale score than the jurisdiction listed at the top of the chart.

The between jurisdiction comparisons take into account sampling and measurement error and that each jurisdiction is being compared with every other jurisdiction. Significance is determined by an application of a multiple-comparison procedure (see appendix A).

† Indicates that the jurisdiction did not satisfy one or more of the guidelines for school participation rates (see appendix A).

NOTE: Differences between states and jurisdictions may be partially explained by other factors not included in this table.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress, 2000 Mathematics Assessment.

Tables 4.5 and 4.6 show the percentages of students in each jurisdiction who were at or above the *Proficient* level when accommodations were not permitted and when accommodations were permitted. Again, like the national results, the percentages were similar across the two sets of results at both grades 4 and 8.

Figures 4.4 and 4.5 indicate whether differences in the percentages of students at or above *Proficient* between pairs of participating jurisdictions were statistically significant when accommodations were permitted. The cluster of seven states with the highest percentage at or above the *Proficient* level included Minnesota, Massachusetts, Connecticut, Indiana, Vermont, Kansas, and Michigan. The same seven states were also clustered at the top when accommodations were not permitted (see chapter 2). At grade 8, Minnesota and Montana had the highest percentages of students at or above *Proficient* when accommodations were permitted. Although the percentages of students in Kansas and Connecticut were not statistically significantly different from that in Montana, they were lower than the percentage of students in Minnesota. The same pattern was observed in the accommodations-not-permitted results for grade 8.

Table 4.5 Comparisons of Two Sets of State *Proficient* Level Results, Grade 4

Percentage of students at or above the *Proficient* level in mathematics by state and type of results for grade 4 public schools: 2000

	Accommodations not permitted	Accommodations permitted
Nation	25	23
Alabama	14	13
Arizona	17	16
Arkansas	13	14
California †	15	13 *
Connecticut	32	31
Georgia	18	17
Hawaii	14	14
Idaho †	21	20
Illinois †	21	20
Indiana †	31	30
Iowa †	28	26
Kansas †	30	29
Kentucky	17	17
Louisiana	14	14
Maine †	25	23
Maryland	22	21
Massachusetts	33	31
Michigan †	29	28
Minnesota †	34	33
Mississippi	9	9
Missouri	23	23
Montana †	25	24
Nebraska	24	24
Nevada	16	16
New Mexico	12	12
New York †	22	21
North Carolina	28	25 *
North Dakota	25	25
Ohio †	26	25
Oklahoma	16	16
Oregon †	23	23
Rhode Island	23	22
South Carolina	18	18
Tennessee	18	18
Texas	27	25
Utah	24	23
Vermont †	29	29
Virginia	25	24
West Virginia	18	17
Wyoming	25	25
Other Jurisdictions		
American Samoa	▲	▲
District of Columbia	6	5
DDESS	24	23
DoDDS	22	21
Guam	2	2
Virgin Islands	1	1

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
*Significantly different from the sample where accommodations were not permitted when examining only one jurisdiction.
▲ Percentage is between 0.0 and 0.5.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools.
DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Table 4.6 Comparisons of Two Sets of State *Proficient* Level Results, Grade 8

Percentage of students at or above the *Proficient* level in mathematics by state and type of results for grade 8 public schools: 2000

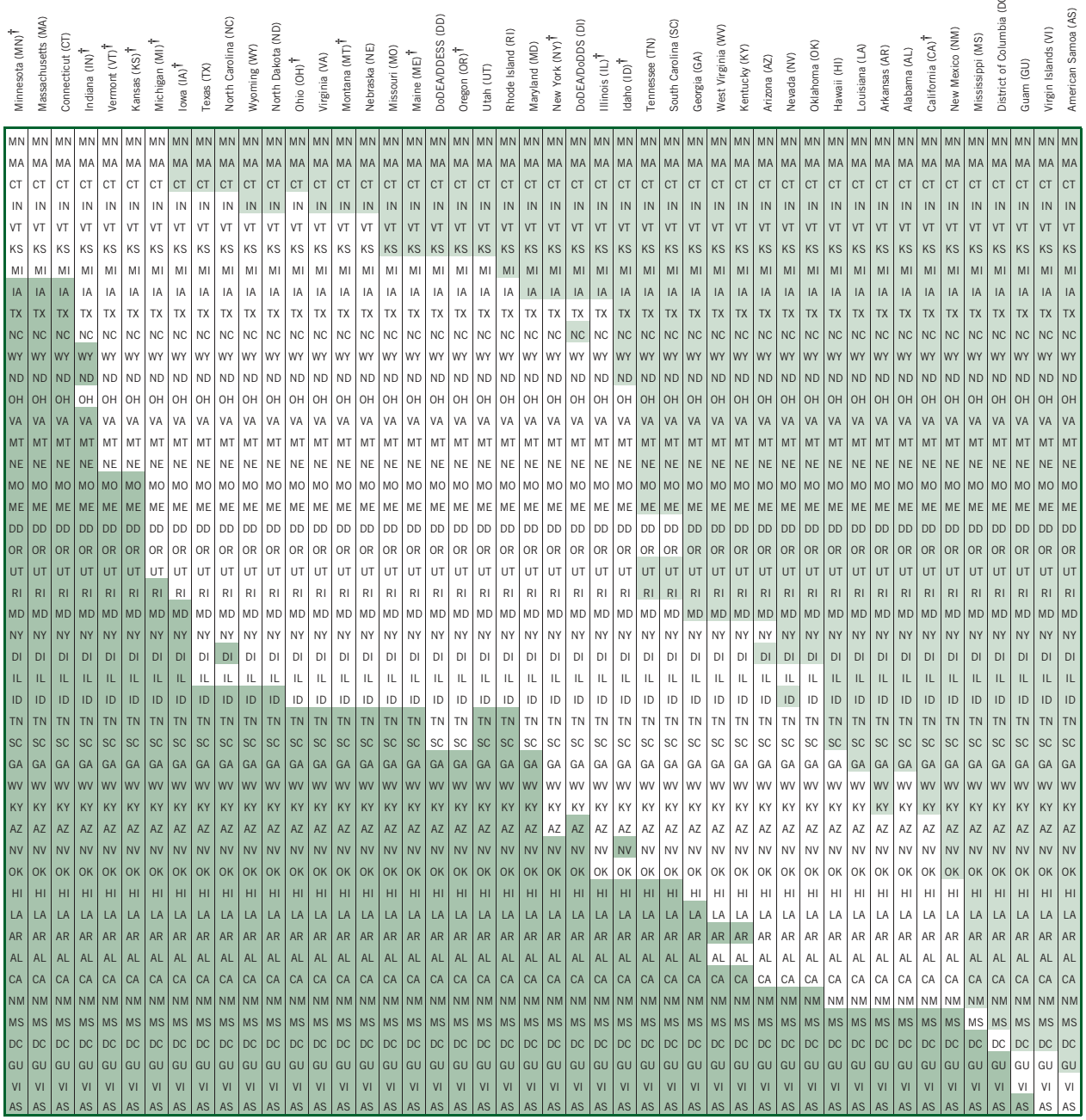
	Accommodations not permitted	Accommodations permitted
Nation	26	26
Alabama	16	16
Arizona †	21	20
Arkansas	14	13
California †	18	17
Connecticut	34	33
Georgia	19	19
Hawaii	16	16
Idaho †	27	26
Illinois †	27	26
Indiana †	31	29
Kansas †	34	34
Kentucky	21	20
Louisiana	12	11
Maine †	32	30
Maryland	29	27 *
Massachusetts	32	30
Michigan †	28	28
Minnesota †	40	39
Mississippi	8	9
Missouri	22	21
Montana †	37	36
Nebraska	31	30
Nevada	20	18
New Mexico	13	12
New York †	26	24
North Carolina	30	27 *
North Dakota	31	30
Ohio	31	30
Oklahoma	19	18
Oregon †	32	31
Rhode Island	24	22
South Carolina	18	17
Tennessee	17	16
Texas	24	24
Utah	26	25
Vermont †	32	31
Virginia	26	25
West Virginia	18	17
Wyoming	25	23
Other Jurisdictions		
American Samoa	1	1
District of Columbia	6	6
DDESS	27	24
DoDDS	27	27
Guam	4	4

† Indicates that the jurisdiction did not meet one or more of the guidelines for school participation.
*Significantly different from the sample where accommodations were not permitted when examining only one jurisdiction.
DDESS: Department of Defense Domestic Dependent Elementary and Secondary Schools.
DoDDS: Department of Defense Dependents Schools (Overseas).
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Figure 4.4 Cross-State *Proficient* Level Comparisons for Accommodations-Permitted Results, Grade 4

Comparisons of percentage of students at or above *Proficient* in mathematics for grade 4 public schools: 2000 sample where accommodations were permitted

Instructions: Read down the column directly under a jurisdiction name listed in the heading at the top of the chart. Match the shading intensity surrounding a jurisdiction's abbreviation to the key below to determine whether the average math scale score of this jurisdiction is higher than, the same as, or lower than the jurisdiction in the column heading. For example, in the column under Iowa: Iowa's score was lower than Minnesota, Massachusetts and Connecticut, about the same as all the states from Indiana through Rhode Island, and higher than the remaining states down the column.



Jurisdiction has statistically significantly higher average scale score than the jurisdiction listed at the top of the chart.

No statistically significant difference from the jurisdiction listed at the top of the chart.

Jurisdiction has statistically significantly lower average scale score than the jurisdiction listed at the top of the chart.

The between jurisdiction comparisons take into account sampling and measurement error and that each jurisdiction is being compared with every other jurisdiction. Significance is determined by an application of a multiple-comparison procedure (see appendix A).

† Indicates that the jurisdiction did not satisfy one or more of the guidelines for school participation rates (see appendix A).

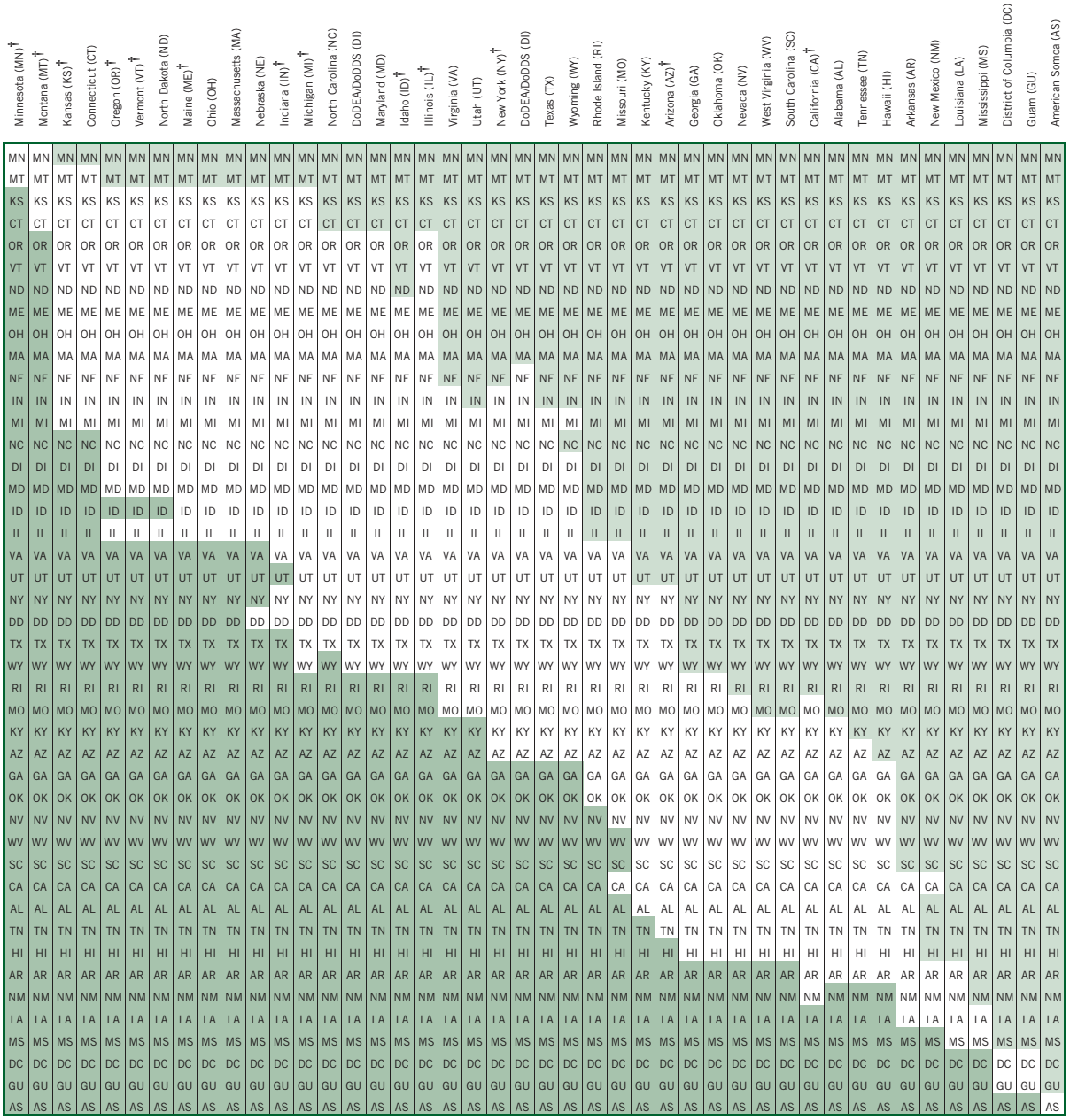
NOTE: Differences between states and jurisdictions may be partially explained by other factors not included in this table.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress, 2000 Mathematics Assessment.

Figure 4.5 Cross-State *Proficient* Level Comparisons for Accommodations-Permitted Results, Grade 8

Comparisons of percentage of students at or above *Proficient* in mathematics for grade 8 public schools: 2000 sample where accommodations were permitted

Instructions: Read down the column directly under a jurisdiction name listed in the heading at the top of the chart. Match the shading intensity surrounding a jurisdiction's abbreviation to the key below to determine whether the average math scale score of this jurisdiction is higher than, the same as, or lower than the jurisdiction in the column heading. For example, in the column under Kansas: Kansas's score was lower than Minnesota, about the same as all the states from Montana through Michigan, and higher than the remaining states down the column.



Jurisdiction has statistically significantly higher average scale score than the jurisdiction listed at the top of the chart.

No statistically significant difference from the jurisdiction listed at the top of the chart.

Jurisdiction has statistically significantly lower average scale score than the jurisdiction listed at the top of the chart.

The between jurisdiction comparisons take into account sampling and measurement error and that each jurisdiction is being compared with every other jurisdiction. Significance is determined by an application of a multiple-comparison procedure (see appendix A).

† Indicates that the jurisdiction did not satisfy one or more of the guidelines for school participation rates (see appendix A).

NOTE: Differences between states and jurisdictions may be partially explained by other factors not included in this table.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress, 2000 Mathematics Assessment.

5

School Contexts for Learning

Learning takes place in diverse contexts. This chapter and chapter 6 present information about the primary contexts that contribute to students learning mathematics: school and home. At school, students' teachers, the environment in which they learn, the availability of technology, and the amount of time devoted to instruction all have an impact on learning.[1] This chapter considers school factors, as reported by teachers and other school staff, and examines their relationship to students' average scale scores on the NAEP assessment. The information in this chapter is based on responses to background questionnaires completed by teachers of students who participated in the NAEP mathematics assessment and by administrative staff in the participating schools. Data based on teachers' responses are presented for grades 4 and 8 only. Teachers of grade 12 students were not administered a questionnaire because of the difficulty of linking students to teachers across the diversity of mathematics courses at this grade level. The information presented in this chapter and the next may help readers interpret some of the findings presented in earlier chapters of this report.

Chapter Focus

What teacher factors are related to mathematics achievement?

How does technology use and instructional time relate to achievement?

Chapter Contents

Teacher Preparation

Use of Technology

Instructional Time and Homework

The contexts for learning explored in this chapter address three areas: teacher preparation, the use of technology, and instructional time and homework. As with all NAEP data, the unit of analysis in this chapter is the student. Although

[1] Educational Resources Information Center (Fall, 1999). K-8 science and mathematics education. *ERIC Review (6)*2. (ERIC accession number ED 437931).

the data here are based on teachers' responses to the questionnaires, the results are reported in terms of the percentages of students whose teachers responded to each question in a particular manner. The results for each of the factors discussed in this chapter include the percentage of students and their corresponding average scale scores. Results from the 2000 assessment are compared to 1996, 1992, and 1990 results. In some cases, however, data for all these years were not available.

Readers are reminded that the relationship between a contextual variable and mathematics performance is not necessarily causal. For example, data from table 5.4 show that eighth-graders whose teachers reported more than 10 years of experience had higher scores than did students whose teachers reported no more than 2 years of experience. This finding seems to imply that teachers' experience has a positive impact on students' scores. Some school systems, however, allow experienced teachers to choose the school where they will teach, and some schools allow experienced teachers to select which classes they will teach. Teachers may prefer to teach in schools and classes with high-performing students. Thus, it may be that some students of experienced teachers have higher scores because experienced teachers choose to teach high-performing students, not because experienced teachers are more effective teachers. NAEP data can identify relationships between contextual variables and student performance, but cannot explain why the relationships exist.

Teacher Preparation: Area of Certification

Certification is one way that teachers can indicate they have had course work relevant to teaching. However, certification does not ensure that teachers have knowledge of the subject they teach or the skill to use that knowledge to instruct students. While most states have increased their licensing standards since 1980, more than half of the states still permit teachers to be hired who have not met the relevant licensing standards, a practice that has been on the rise in recent years as a result of the demand for teachers.[2]

Teachers who responded to the 2000 NAEP questionnaire were asked whether they had state-recognized teaching certification in various areas. Table 5.1 shows the percentages of students whose teachers indicated having certification in a particular area and the average mathematics scores of those students.

[2] Darling-Hammond, L. (1999). *Teacher quality and student achievement: A review of state policy evidence* (p. 10). (Document R-99-1). Washington, DC: University of Washington, Center for the Study of Teaching and Policy.

Table 5.1

Percentage of fourth- and eighth-graders and average score by teachers' reports on area of certification: 1992–2000

Grade 4

Teacher certification

	1992	1996	2000
Elementary or middle/junior high school education (general)			
Yes	97 * 220	95 225	95 228
No	3 * 217	5 218	5 217
Not offered	▲ ****	▲ ****	▲ ****
Elementary mathematics			
Yes	— —	40 * 225	30 228
No	— —	37 * 222	49 228
Not offered	— —	23 227	21 232
Middle/junior high school or secondary mathematics			
Yes	15 219	14 227	11 225
No	85 221	84 224	86 229
Not offered	1 * ****	2 234	3 233

Fourth-graders with teachers certified in elementary or middle education scored higher than students whose teachers did not have this certification.

See footnotes at end of table. ▶

Table 5.1 (continued)

Percentage of fourth- and eighth-graders and average score by teachers' reports on area of certification: 1992–2000

Grade 8

Teacher certification

	1992	1996	2000
Elementary or middle/junior high school education (general)			
Yes	62 268	63 271	60 275
No	36 272	36 276	40 280
Not offered	2 280	1 ****	▲ ****
Elementary mathematics			
Yes	— —	26 274	24 277
No	— —	65 275	67 279
Not offered	— —	8 278	9 277
Middle/junior high school or secondary math			
Yes	83 270	85 * 276	78 281
No	17 266	14 * 267	19 267
Not offered	▲ * ****	1 ****	3 285

Eighth-graders with teachers certified in middle/junior high school or secondary math scored higher than students whose teachers did not have this certification.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
— Comparable data were not available.
**** Sample size is insufficient to permit a reliable estimate.
▲ Percentage is between 0.0 and 0.5.

NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1992, 1996, and 2000 Mathematics Assessments.

In 2000, the relationship between teachers' reports on areas of certification and their students' average mathematics scores was mixed, and varied across the two grades. At grade 4, the students of teachers who reported having certification in elementary or middle/junior high school education scored higher, on average, than did the students of teachers who did not have this certification. Conversely, eighth-graders taught by teachers certified in elementary or middle/junior high school education actually scored lower, on average, than did eighth-graders taught by teachers without this certification.

At the eighth-grade, teachers' certification in middle/junior high school or secondary mathematics had a positive relationship with performance—students with teachers certified in this area had higher average scores than students with teachers without this certification. These results suggest that, at least at grade 8, teacher certification in a field and at a level consistent with the subject and grade-level taught does have a positive relationship with students' mathematics performance.

Few significant changes since 1992 or 1996 are evident in the percentages of students taught by teachers with different areas of certification. Almost all fourth-grade students who participated in the 1992, 1996, and 2000 mathematics assessments had teachers who reported being certified in elementary or middle/junior high school education. There was, however, a small decrease in the percentage of students taught by teachers with this certification—from 97 percent in 1992 to 95 percent in 2000. In addition, the percentage of fourth-graders with teachers certified specifically in elementary mathematics decreased from 40 percent in 1996 to 30 percent in 2000. The small percentage of fourth-graders with teachers certified in middle/junior high school or secondary mathematics did not change significantly between 1992 and 2000.

In 2000, about three-quarters of the students at grade 8 were taught by teachers who were certified in middle/junior high school or secondary mathematics, which was lower than the percentage reported in 1996. None of the other apparent changes across years in eighth-grade teachers' reports of certification area were statistically significant.

Teacher Preparation: Undergraduate Major Fields of Study

In order for students to meet higher standards in mathematics, it is important that their teachers have adequate knowledge of mathematical content and adequate skill to put that knowledge into practice in the classroom.[3] With this in mind, it is of interest to examine teachers' reports of their undergraduate major fields of study and their relationship to students' mathematics performance. Teachers who responded to the NAEP 2000 questionnaires were asked to identify their undergraduate major fields of study. Table 5.2 provides a summary of results for the various mathematics-related fields. The "yes" column provides results for students of teachers who marked a field as their major. The "no" column provides results for students of teachers who did not mark that field. It should be noted that teachers sometimes reported multiple fields of study.

[3] Kilpatrick, J., Swafford, J., Findell, B., (Eds.). (Forthcoming). *Adding it up: Helping children learn mathematics.* Washington, DC: National Academy Press.

Table 5.2

Percentage of fourth- and eighth-graders and average score by teachers' reports of undergraduate major: 1996–2000

Grade 4

Teachers' undergraduate major (more than one response could be given)

	1996		2000	
	Yes	No	Yes	No
Education	44 227	56 222	38 228	62 227
Elementary education	79 226	21 218	75 228	25 226
Secondary education	4 228	96 224	3 234	97 227
Mathematics	7 218	93 225	4 227	96 228
Mathematics education	6 232	94 224	4 233	96 227

Grade 8

	1996		2000	
	Yes	No	Yes	No
Education	31 273	69 274	30 277	70 277
Elementary education	25 271	75 274	31 275	69 277
Secondary education	33 276	67 272	29 278	71 276
Mathematics	44 278	56 269	43 282	57 273
Mathematics education	22 273	78 273	26 281	74 275

Eighth-graders had lower average scores when their teachers did not major in math or math education.

The percentage of students is listed first with the corresponding average scale score presented below.
NOTE: Percentages may not add to 100 due to rounding. Teachers may have reported more than one major.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

At the fourth-grade, students' average scores in 2000 had no significant relationship to whether or not their teacher reported majoring in any of the fields of study listed in the table. At the eighth-grade, however, two fields of study did show a relationship to student performance. In 2000, the students of teachers who majored in mathematics or mathematics education scored higher, on average, than did students whose teachers did not major in these fields. These results are consistent with those in the previous section, providing further evidence that, at grade 8, training within the field being taught does have a positive relationship to student performance.

Between 1996 and 2000, no significant change in teachers' reports of undergraduate majors is evident at either grade 4 or 8. At the fourth-grade, about three-quarters of the students in 2000 were taught by teachers who reported majoring in elementary education, while only 4 percent were taught by teachers who majored in either mathematics or mathematics education.

While fourth-graders were most commonly taught by teachers with education or elementary education majors, eighth-graders were taught by teachers who reported a wider distribution of majors. Although 43 percent of the eighth-graders in 2000 were taught by teachers who reported mathematics as a major, a substantial percentage of students were taught by teachers who reported other majors. This finding is consistent with a recent TIMMS international report in which it was noted that 41 percent of the U.S. eighth-graders were taught by teachers who have mathematics degrees compared to 71 percent of those who responded to an international survey.[4] These results are also consistent with those reported in a Council of Chief State School Officers report of classroom practices and subject content.[5] The Council's report noted that approximately 5 percent of elementary school teachers were mathematics or mathematics education majors, whereas almost one-half of middle school teachers had one of these majors.

Teacher Preparation: Preparation to Teach Mathematics Topics

To best serve the students they teach, teachers need preparation in the content areas of mathematics that are part of their students' curriculum. Therefore, it is interesting to examine the percentages and average scale scores of students whose teachers reported having different degrees of preparedness in content areas of mathematics. As noted in chapter 1, the questions used in the NAEP mathematics assessment were classified as belonging to one of five content strands: number sense, properties, and operations; measurement; geometry and spatial sense; data analysis, statistics, and probability; and algebra and functions. Teachers of students who participated in the assessment were asked how well prepared they were to teach each of these content strands. Table 5.3 presents the 2000 results for grades 4 and 8 based on teachers' responses to these questions. At both grades, the majority of students in 2000 were taught by teachers who considered themselves to be very well prepared or moderately well prepared to teach each of the content strands.

[4] Gonzales et al. (2000). *Pursuing excellence: Comparisons of eighth-grade mathematics and science achievement from a U. S. perspective, 1995 and 1999* (p. 44). Washington, DC: National Center for Education Statistics. Available online: www.nces.ed.gov/timss/timss-r

[5] Council of Chief State School Officers (May, 2000). *Using data on enacted curriculum in mathematics & science* (p. 27). Washington, DC: Author.

Table 5.3

Percentage of fourth- and eighth-graders and average score by teachers' reports on how well prepared they were to teach certain topics: 2000

Teachers' preparedness

Grade 4

	Very Well Prepared	Moderately Well Prepared	Not Very Well Prepared	Not Prepared
Number sense	74 228	25 225	▲ 218	▲ ****
Measurement	62 229	36 226	2 226	0 ****
Geometry	51 228	43 227	6 225	▲ ****
Data analysis	34 229	46 227	17 226	3 228
Algebra	36 229	45 227	16 227	3 223

Grade 8

	Very Well Prepared	Moderately Well Prepared	Not Very Well Prepared	Not Prepared
Number sense	84 279	15 267	▲ 269	▲ ****
Measurement	74 279	24 272	2 265	▲ ****
Geometry	64 280	32 274	4 258	▲ ****
Data analysis	61 280	33 272	6 272	1 247
Algebra	84 279	14 267	2 250	▲ ****

Eighth-graders whose teachers reported being very well prepared generally scored highest.

The percentage of students is listed first with the corresponding average scale score presented below.
**** Sample size is insufficient to permit a reliable estimate.
▲ Percentage is between 0.0 and 0.5.

NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Similar to the results presented in the previous two sections, the relationship between this aspect of teacher preparation and students' scores was different at each grade. At grade 4, average mathematics scores did not vary significantly according to teachers' reports on how prepared they felt to teach each of the content strands. However, a positive relationship between teacher preparedness and students' average scores is quite evident at grade 8. For each content strand, students whose teachers reported being very well prepared to teach that content area scored higher, on average, than did students whose teachers reported being moderately well prepared.

Teacher Preparation: Total Years of Teaching Experience

Students who participated in the 2000 mathematics assessment were taught by teachers with various years of teaching experience, ranging from 2 years or less to 25 years or more. This section examines how long teachers of assessed students have been teaching, and the relationship between this aspect of teacher preparation and mathematics achievement. Teachers were asked how many years in total (including part-time teaching) they had taught at either the elementary or secondary level. Table 5.4 presents the 1996 and 2000 results for fourth- and eighth-grade students.

Table 5.4

Percentage of fourth- and eighth-graders and average score by teachers' reports on the number of years of experience teaching mathematics: 1996–2000

Teaching experience

Grade 4

	1996	2000
Two years or less	11 221	15 224
Three to five years	15 218	17 228
Six to ten years	26 * 227	18 226
Eleven to twenty-four years	33 224	32 228
Twenty-five years or more	15 229	18 231

Grade 8

	1996	2000
Two years or less	13 267	18 270
Three to five years	13 271	16 277
Six to ten years	20 272	19 276
Eleven to twenty-four years	37 276	32 278
Twenty-five years or more	17 277	15 282

Eighth-graders whose teachers had more than 10 years of experience scored higher than students whose teachers had 2 years or less experience.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

Similar to the previous factors related to teacher preparation presented in this chapter, years of teaching experience had a somewhat positive relationship with student performance at grade 8, but no significant relationship at grade 4. In 2000, students' performance at grade 4 did not vary significantly in relation to the number of years of experience reported by their teachers. At grade 8, however, the scores of students whose teachers reported having more than 10 years of teaching experience were higher, on average, than the scores of students whose teachers reported having only 2 years or less of teaching experience.

About one-half of fourth- and eighth-graders in 2000 were taught by teachers with more than 10 years of experience. Teachers with only 2 years or less of experience were teaching 15 percent of fourth-graders and 18 percent of eighth-graders in 2000. These percentages did not change significantly between 1996 and 2000.

Teacher Preparation: Teachers' Familiarity with the NCTM Standards

The National Council of Teachers of Mathematics (NCTM) is a leading professional association concerned with providing leadership at the elementary and secondary levels to improve the learning and teaching of mathematics. The Council published *Curriculum and Evaluation Standards for School Mathematics* in 1989 and issued revised *Principles and Standards for School Mathematics* in 2000.[6,7] The earlier *Standards* document influenced the NAEP framework developed for the 1990 and 1992 assessments as well as the minor refinements made for the 1996 and 2000 assessments. Thus, it is of interest to find out the degree to which teachers at the fourth- and eighth-grade levels are familiar with the NCTM *Standards*. Teachers were asked how knowledgeable they were about the *Standards*, with response choices ranging from "Very knowledgeable" to "I have little or no knowledge." Table 5.5 presents the percentages of students and their average scores based on teachers' responses to this question.

6 National Council of Teachers of Mathematics (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: Author.

7 National Council of Teachers of Mathematics (2000). *Principles and standards for school mathematics.* Reston, VA: Author.

Table 5.5

Percentage of fourth- and eighth-graders and average score by teachers' reports on their level of knowledge about the NCTM standards: 1996–2000

Teacher familiarity with NCTM standards

Grade 4

	1996	2000
Very knowledgeable	5 236	6 234
Knowledgeable	17 223	16 227
Somewhat knowledgeable	32 * 224	41 227
Little or no knowledge	46 * 223	36 227

Grade 8

	1996	2000
Very knowledgeable	16 282	22 282
Knowledgeable	32 * 276	40 277
Somewhat knowledgeable	33 * 270	25 278
Little or no knowledge	19 * 267	13 265

Eighth-graders with teachers who had little or no knowledge of the NCTM standards scored lowest.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

Here again, the relationship between this aspect of teacher preparation and student scores varied across the two grades. In 2000, eighth-graders whose teachers reported being very knowledgeable about the standards had higher average scores than those whose teachers reported being knowledgeable or having little knowledge about the standards. Students with teachers who reported having little or no knowledge of the standards scored the lowest. Among fourth-graders, however, there was no significant variation in average scores by teachers' familiarity with the *Standards*.

At both grades 4 and 8, there was evidence of a moderate increase in teachers' familiarity with the *Standards* between 1996 and 2000. The percentage of fourth-graders who were taught by teachers that were somewhat knowledgeable about the NCTM *Standards* increased from 32 to 41 percent, while the percentage of students taught by teachers with little or no knowledge of the *Standards* decreased by a similar amount. Nevertheless, despite the 11 years of exposure since the appearance of the *Standards,* only 6 percent of the fourth-graders in 2000 were taught by teachers who reported that they were very knowledgeable about the standards, while only another 16 percent of the students were taught by teachers who reported they were knowledgeable.

At grade 8, the percentage of students with teachers knowledgeable about the *Standards* increased, while the percentage taught by teachers who reported less familiarity decreased between 1996 and 2000. Eighth-graders appeared more likely to be taught by teachers with greater familiarity of the *Standards* than were fourth-graders. In 2000, 62 percent of eighth-grade students were taught by teachers who reported that they were at least knowledgeable about the *Standards*.

Use of Technology: Calculators in the Classroom

The proper role of calculators in the K-12 curriculum has been and continues to be debated. Calculator use policies vary across schools and, even within the same school, teachers have different opinions about how calculators should be integrated with instruction. For the past several NAEP mathematics assessments, fourth- and eighth-grade teachers of participating students have been asked questions about calculator use in their classes. The questions asked include how often students use calculators, whether instruction in the use of calculators is provided, whether calculator usage is restricted, and whether calculators can be used on tests. Table 5.6 presents the data for each of these questions. Additional information about calculator usage based on students' responses to related but different questions can be found in chapter 6.

Table 5.6

Percentage of fourth- and eighth-graders and average score by teachers' reports on calculator usage: 1990–2000

Grade 4

Calculator usage

	1990	1992	1996	2000
How often do students use a calculator?				
Every day	— —	1 * 209	5 228	5 230
Weekly	— —	15 225	28 229	21 230
Monthly	— —	32 222	42 224	37 230
Never/Hardly ever	— —	51 * 217	26 * 219	37 225
Do you provide instruction in the use of calculators?				
Yes	— —	62 * 221	81 * 225	75 229
No	— —	38 * 216	19 * 219	25 227
Do you permit unrestricted use of calculators?				
Yes	— —	5 * 220	13 225	12 229
No	— —	95 * 219	87 224	88 228
Do you permit calculator use on tests?				
Yes	2 * ****	5 * 228	10 223	11 228
No	98 * 215	95 * 219	90 224	89 228

No significant relationship between teachers' reports of calculator use and student performance at grade 4.

See footnotes at end of table. ▶

Table 5.6 (continued)

Percentage of fourth- and eighth-graders and average score by teachers' reports on calculator usage: 1990–2000

Grade 8

Calculator usage

	1990	1992	1996	2000
How often do students use a calculator?				
Every day	—	34 *	55	48
	—	280	281	283
Weekly	—	22	21	23
	—	269	271	275
Monthly	—	21 *	14	15
	—	259	263	267
Never/Hardly ever	—	24 *	9	14
	—	265	256	268
Do you provide instruction in the use of calculators?				
Yes	—	—	83	80
	—	—	274	277
No	—	—	17	20
	—	—	273	274
Do you permit unrestricted use of calculators?				
Yes	—	30	47 *	33
	—	281	280	281
No	—	70	53 *	67
	—	264	268	274
Do you permit calculator use on tests?				
Yes	32 *	48 *	67	65
	272	276	280	281
No	68 *	52 *	33	35
	259	263	262	269

Eighth-graders whose teachers reported daily calculator use scored highest.

Unrestricted calculator use and permitting calculator use on tests were both associated with higher scores.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
**** Sample size is insufficient to permit a reliable estimate.
— Comparable data were not available.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Student performance at grade 4 showed no significant relationship to teachers' reports of calculator use—regardless of its frequency, instruction provided, or the degree of restriction placed on its use. At grade 8, however, a mostly positive relationship was evident between students' average scores and teachers' reports on calculator use. Eighth-graders whose teachers reported that calculators were used almost every day scored highest. Weekly use was also associated with higher average scores than less frequent use. In addition, teachers who permitted unrestricted use of calculators and those who permitted calculator use on tests had eighth-graders with higher average scores than did teachers who did not indicate such use of calculators in their classrooms.

The most notable change in the frequency of calculator use at grade 4 is evident in the drop in the percentage of students with teachers who reported that calculators were never or hardly ever used in class—from 51 percent in 1992, to 26 percent in 1996, and then rising to 37 percent in 2000. Despite the increase between 1996 and 2000, the percentage in 2000 remained lower than that in 1992. This was accompanied by a small increase in the percentage of fourth-graders using calculators everyday—from 1 percent in 1992 to 5 percent in 1996 and 2000.

A similar pattern was observed in the percentage of fourth-graders with teachers who reported providing instruction in calculator use, which increased from 62 percent in 1992 to 81 percent in 1996, and then decreased to 75 percent in 2000. Despite the decrease between 1996 and 2000, the percentage in 2000 remained higher than that in 1992. Even though three-quarters of fourth-grade students in 2000 had teachers who reported providing some instruction on how to use calculators, the vast majority of fourth-graders were not permitted unrestricted use of calculators, or permitted to use a calculator for testing. There is some evidence, however, that such uses of calculators in fourth-grade classrooms is increasing. The percentage of students whose teachers permitted unrestricted calculator use increased from 5 percent in 1992 to 12 percent in 2000, and the percentage of students whose teachers permitted calculator use on tests increased from 2 percent in 1990 to 11 percent in 2000.

In contrast to the reports of fourth-grade teachers, the teachers of eighth-grade students reported more frequent use of calculators. In 2000, almost half of the students at grade 8 were taught by teachers who indicated that calculators were used on a daily basis. This represents an increase since 1992 when 34 percent of the eighth-graders used calculators every day. Teacher-reported information on instruction in the use of calculators was only available for 1996 and 2000, and showed no significant change in the fact that a large majority of eighth-grade students did receive some kind of instruction in both years.

The extent to which eighth-grade students' use of calculators has been restricted seems to have fluctuated across the years, with less restricted use in 1996 than in 1992, and more restricted use in 2000 compared to 1996. One-third of the eighth-graders in 2000 had teachers who permitted unrestricted calculator use. The percentage of students at grade 8 whose teachers allowed them to use calculators on tests has doubled since 1990—from 32 to 65 percent.

Use of Technology: Availability of Computers

Over the past decade, computers have played an increasingly important role in the nation's classrooms. Furthermore, research into the use of computer technology has shown that it can have a positive impact on student achievement when implemented properly.[8] As part of the NAEP mathematics assessment, school administrators were asked about the availability of computers in the school for students at grades 4, 8, and 12. Specifically they were asked to report whether or not computers were available to students in each of the following ways: in the classroom at all times, grouped in a separate computer laboratory available to classes, or available to bring to classrooms when needed. The results presented in table 5.7 highlight the increasing availability of computers in classrooms.

[8] Wenglinsky, H. (1998). *Does it compute? The relationship between education technology and student achievement in mathematics.* Princeton, NJ: Educational Testing Service.

Table 5.7

Percentage of students and their average scores by school reports on the availability of computers at grades 4, 8, and 12: 1996–2000

Availability of computers

Grade 4

	1996		2000	
	Yes	No	Yes	No
Available at all times in classrooms	61 *	39 *	83	17
	226	221	228	225
Grouped in computer lab but available	78	22	83	17
	224	223	229	226
Available to bring to classrooms	42 *	58 *	27	73
	226	222	227	230

Grade 8

	1996		2000	
	Yes	No	Yes	No
Available at all times in classrooms	30 *	70 *	52	48
	275	272	274	278
Grouped in computer lab but available	87	13	92	8
	273	271	277	275
Available to bring to classrooms	49 *	51 *	37	63
	274	272	276	276

Grade 12

	1996		2000	
	Yes	No	Yes	No
Available at all times in classrooms	18 *	82 *	43	57
	304	304	301	302
Grouped in computer lab but available	97	3	95	5
	304	298	302	287
Available to bring to classrooms	47 *	53 *	36	64
	306	302	304	300

At each grade, the percentage of students with computers available at all times in classrooms increased by at least 20 percentage points between 1996 and 2000.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

Few significant relationships between computer availability and students' mathematics performance in 2000 are evident at any grade. Among eighth-graders, those students from schools that indicated computers were available at all times in classrooms scored lower, on average, than students from schools that did not indicate this level of computer availability. Among twelfth-graders, those students from schools that indicated computers were available in a computer laboratory had higher average scores than students from schools who did not indicate that computers were available in this manner. It should be noted, however, that only 5 percent of twelfth-graders in 2000 attended schools that did not have computers available for use in a laboratory setting.

In 2000, 83 percent of fourth-graders, 52 percent of eighth-graders, and 43 percent of twelfth-graders had access to computers in the classroom at all times. At each grade, these percentages represented an increase of at least 20 percentage points from 1996. As computers have become more available in the classrooms since 1996, there has been a concomitant decrease in the percentage of students in schools where computers are available to bring into the classroom. The availability of computers in labs has not changed significantly since 1996.

Use of Technology: Uses of Computers in Grades 4 and 8

The data presented in the previous section suggests that computers are widely available in individual classrooms, computer labs, or both places. But what instructional use is being made of these computers? Teachers of fourth- and eighth-grade students who participated in the mathematics assessment were asked, if they did use computers, what the primary uses of the computers were for mathematics instruction. The results for this question are presented in table 5.8.

Table 5.8

Percentage of fourth- and eighth-graders and average score by teachers' reports on their primary use of computers for mathematics instruction: 1996–2000

Instructional use of computers

Grade 4

	1996	2000
Drill	27 223	24 229
Demonstrate new math topics	2 222	3 234
Play math learning games	41 226	42 228
Simulations and applications	6 225	5 230
Not used	25 222	26 227

Grade 8

	1996	2000
Drill	16 270	15 271
Demonstrate new math topics	4 280	8 281
Play math learning games	13 267	14 271
Simulations and applications	12 281	12 281
Not used	54 272	52 278

Using computers for demonstrating new topics and for simulations and applications was associated with higher scores than other uses.

The percentage of students is listed first with the corresponding average scale score presented below.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

At grade 4, students' average mathematics scores in 2000 did not vary significantly across the different types of instructional uses of computers reported by teachers. At grade 8, however, there were some differences. Eighth-graders whose teachers reported using computers primarily for demonstrating new math topics or for simulations and applications had higher mathematics scores, on average, than students whose teachers reported using computers primarily for drill or for playing math learning games. In addition, the use of computers for drill and for games was associated with lower average scores than not using computers at all for instruction.

There were no significant changes between 1996 and 2000 in the patterns of computer use for mathematics instruction at either grade 4 or grade 8. In 2000, 26 percent of fourth-grade students and 52 percent of eighth-grade students had teachers who reported never using computers for instruction.

Instructional Time and Homework: Availability of Eighth-Grade Algebra

Algebra has been identified as a key course in the mathematics sequence.[9] Once offered primarily to ninth-graders, algebra is now commonly offered to eighth-grade students. Administrators in schools participating in the mathematics assessment were asked whether or not the school offers an eighth-grade algebra course for high school course placement or credit. Table 5.9 presents the results for this question.

Table 5.9

Percentage of eighth-graders and average scores by school reports on whether or not an algebra course was offered to eighth-grade students for high school credit: 1996-2000

Grade 8

Eighth-grade algebra

	1996	2000
Yes	80 275	82 277
No	20 267	18 272

The percentage of students is listed first with the corresponding average scale score presented below.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

[9] Choike, J. R. (2000). Teaching strategies for "algebra for all." *Mathematics Teacher (93)* 7, 556-560.

Although there was no significant relationship to mathematics performance, a large majority of eighth-grade students (82 percent) in 2000 were in schools that offered algebra to them for course placement or credit. This percentage has not changed significantly since 1996. Additional information about algebra, including which years students tend to be taking first- and second-year algebra, can be found in chapter 6.

Instructional Time and Homework: Math Instructional Time Per Week in Grades 4 and 8

Teachers of fourth- and eighth-grade students participating in the mathematics assessment were asked how many hours of mathematics instruction they delivered per week, ranging from two and one-half hours or less to four hours or more per week. Table 5.10 presents the results for this question.

Table 5.10

Percentage of fourth- and eighth-graders and average score by teachers' reports on the amount of instructional time spent on mathematics each week: 1992-2000

Grade 4

Time on mathematics instruction	1992	1996	2000
Two and one-half hours or less	5 224	6 228	7 222
More than two and one-half hours but less than 4 hours	25 224	26 226	20 228
Four hours or more	71 217	68 223	73 229

Grade 8

Time on mathematics instruction	1992	1996	2000
Two and one-half hours or less	13 270	20 * 269	12 273
More than two and one-half hours but less than 4 hours	55 270	47 275	49 279
Four hours or more	32 268	33 274	40 274

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1992, 1996 and 2000 Mathematics Assessments.

The amount of time teachers reported spending on mathematics instruction at grade 4 had no significant relationship to students' performance on the mathematics assessment in 2000. However, students at grade 8 whose teachers reported spending between two and one-half hours and four hours on mathematics instruction scored higher, on average, than those whose teachers spent four hours or more.

In 2000, 73 percent of fourth-grade students had teachers who reported spending four hours or more on mathematics instruction each week. This drops to 40 percent at grade 8 where almost half of the students were in classes where teachers spend between two and one-half and four hours per week on mathematics. These patterns of instructional time have remained fairly stable since 1992 with the exception of a decrease in the percentage of eighth-grade students with teachers reporting spending two and one-half hours or less on mathematics—from 20 percent in 1996 to 12 percent in 2000.

Instructional Time and Homework: Amount of Homework Assigned in Grades 4 and 8

In 1999, American eighth-graders scored above the 38-nation average in mathematics in the Third International Mathematics and Science Study-Repeat (TIMSS-R), but did not distinguish themselves as high achievers.[10] One of the factors related to achievement in mathematics is homework.[11]

For the 2000 NAEP mathematics assessment, teachers of fourth- and eighth-graders who participated in the assessment were asked how much mathematics homework they assigned to students each day. The results are presented in table 5.11.

[10] Gonzales, et al. (2000). *Pursuing excellence: Comparisons of eighth-grade mathematics and science achievement from a U. S. perspective, 1995 and 1999* (p. 116). Washington, DC: National Center for Education Statistics. Available online: www.nces.ed.gov/timss/timss-r

[11] Campbell, J.R., Hombo, C.M., and Mazzeo, J. *NAEP 1999 trends in academic progress: Three decades of student performance*. Washington, DC: National Center for Education Statistics.

Table 5.11

Percentage of fourth- and eighth-graders and average score by teachers' reports on the amount of mathematics homework assigned per day: 1992–2000

Mathematics homework assigned

Grade 4

	1992	1996	2000
None	6 222	4 232	6 231
15 minutes	52 222	50 226	47 230
30 minutes	37 218	40 222	40 227
45 minutes	4 203	4 214	5 212
1 hour	1 ****	1 206	1 219
More than 1 hour	▲ ****	1 ****	1 ****

Grade 8

	1992	1996	2000
None	3 238	2 241	2 255
15 minutes	29 263	30 266	25 269
30 minutes	49 269	54 276	55 276
45 minutes	16 282	10 * 284	15 290
1 hour	4 289	4 284	3 298
More than 1 hour	▲ ****	1 273	▲ ****

Eighth-graders whose teachers assigned 45 minutes of homework daily scored higher than students whose teachers assigned lesser amounts of homework.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
**** Sample size is insufficient to permit a reliable estimate.
▲ Percentage is between 0.0 and 0.5.

NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1992, 1996 and 2000 Mathematics Assessments.

In 2000, fourth-grade teachers who reported that they assigned 45 minutes of mathematics homework had students with lower average scores than teachers who assigned less homework. There were no significant differences among the average scores for students of teachers who assigned lesser amounts of homework. The relationship between amount of homework and mathematics performance was different at grade 8. In 2000, eighth-grade teachers who reported that they assigned 45 minutes of homework had students with higher average scores than did students with teachers who assigned lesser amounts of homework. Also, the average score of students whose teachers assigned no homework was lower than that for students of teachers who assigned 30 minutes, 45 minutes, or 1 hour of homework.

Most fourth- and eighth-graders in 2000 were taught by teachers who reported assigning either 15 or 30 minutes of homework in each of the three assessment years. There were no significant changes across the years at the fourth grade. For eighth-graders, the only significant change was an increase from 10 to 15 percent between 1996 and 2000 in the percentage of students whose teachers assigned 45 minutes of homework.

6 Classroom Practices and Home Contexts for Learning

The classroom teacher guides the learning of mathematics. However, unless students make a commitment to learning, even a rich and well-taught curriculum can fail to achieve the desired result. Evidence from a variety of sources makes it clear that a substantial number of students are not learning the mathematics they need to function in daily life and in the workplace.[1] In fact, earlier chapters of this report revealed that the performance of some population subgroups continues to lag far behind the performance of others.

Chapter Focus

What classroom practices and home factors are related to mathematics achievement? How have these practices and factors changed across years?

This chapter continues the examination of the school contexts in which students learn. However, unlike chapter 5, which considers students' performance on NAEP in terms of teachers' and school administrators' perceptions, this chapter looks at performance in light of students' perceptions. In addition, it looks at the course-taking patterns reported by eighth- and twelfth-graders and provides average scale scores for those who have taken particular courses in grades eight through twelve. This chapter also examines students' performance on NAEP with regard to their own perceptions about home factors, such as television viewing habits and hours worked at a job for pay, that may have an impact on mathematics achievement.

Chapter Contents

Teachers' Classroom Practices

Calculator Use

Mathematics Course-Taking

Beyond-School Activities

Attitudes Toward Mathematics

[1] National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics* (p.4). Reston, VA: Author

The information presented in this chapter is based on students' responses to background questions administered as part of the NAEP 2000 mathematics assessment. In some cases, results from the 2000 assessment are compared with results from prior mathematics assessments to observe trends in students' responses. In other cases, data from previous years are not available.

As mentioned in the previous chapter, it is important to keep in mind that the relationship between a contextual variable and students' mathematics performance is not necessarily causal. For example, data from table 6.4 show that twelfth-graders who reported using graphing calculators had higher scores than those who did not. This finding may suggest that the use of graphing calculators is responsible for the higher level of performance. However, another plausible explanation for this result is that those students who use graphing calculators at grade 12 have taken more advanced mathematics courses or are otherwise more mathematically able than those students who reported not using graphing calculators at this grade level. NAEP data can identify relationships between contextual variables and student performance, but cannot explain why the relationships exist.

Classroom Practices

Table 6.1 presents three of the instructional practices students were asked about, including how often they do math problems from textbooks, talk with other students during class about how to solve problems, and use a calculator for mathematics. This table provides the percentages and corresponding average scores of students by frequency of these activities.

In 2000, fourth-graders generally seemed to perform best when certain classroom activities were engaged in on a moderate basis, rather than on a daily basis. Fourth-grade students who reported never or hardly ever doing math problems from a textbook scored lower in 2000 than those who did so more frequently. Students who reported talking with others about how to solve math problems on a monthly basis not only scored higher than students who never talked with other students, but also had higher average scores than those students who did so daily or weekly. A similar relationship was associated with fourth-grade students' performance and calculator use.

At grade 8, higher average scores were more likely to be associated with engaging in certain practices more frequently. Eighth-grade students who reported doing math problems from a textbook every day scored higher than those who engaged in this practice less frequently. The same was true for students' reported calculator use. Students who reported never or hardly ever engaging in these activities consistently had the lowest scores.

More frequent engagement in certain classroom activities was also associated with higher scores on the assessment at grade 12. Twelfth-grade students who reported doing math problems from a textbook every day, or using a calculator every day, scored higher than those who engaged in these activities less frequently. Twelfth-grade students who reported talking with others about how to solve math problems at least weekly scored higher than those students who reported talking with others either monthly or never.

Table 6.1

Percentage of students and average scores by students' reports on how often they do certain classroom activities at grades 4, 8, and 12: 1996–2000

Grade 4

Classroom Activities

	1996	2000
Do math problems from textbook		
Every day	57 227	56 230
Weekly	21 223	21 228
Monthly	6 221	7 230
Never/Hardly ever	15 217	16 221
Talk with other students during class about how to solve problems		
Every day	21 218	19 222
Weekly	18 * 224	22 229
Monthly	12 * 230	15 235
Never/Hardly ever	49 * 226	44 229
Use a calculator for mathematics		
Every day	10 207	10 214
Weekly	23 225	20 228
Monthly	26 234	25 238
Never/Hardly ever	41 222	45 228

Fourth-graders who reported never doing math problems from a textbook scored lowest.

Fourth-graders who reported monthly use of a calculator scored highest.

See footnotes at end of table ▶

Table 6.1 (continued)

Percentage of students and average scores by students' reports on how often they do certain classroom activities at grades 4, 8, and 12: 1996–2000

Grade 8

Classroom Activities

	1996	2000
Do math problems from textbook		
Every day	76 * 277	72 281
Weekly	15 * 261	18 265
Monthly	3 * 257	4 268
Never/Hardly ever	7 256	6 255
Talk with other students during class about how to solve problems		
Every day	31 * 270	38 277
Weekly	17 * 273	27 278
Monthly	13 274	13 279
Never/Hardly ever	39 * 273	22 269
Use a calculator for mathematics		
Every day	48 280	48 282
Weekly	26 268	25 274
Monthly	14 267	13 272
Never/Hardly ever	12 258	13 263

Eighth-graders who reported doing math problems from a textbook daily scored highest.

Eighth-graders who reported using a calculator daily scored highest.

See footnotes at end of table ▶

Table 6.1 (continued)

Percentage of students and average scores by students' reports on how often they do certain classroom activities at grades 4, 8, and 12: 1996–2000

Grade 12

Classroom Activities

	1996	2000
Do math problems from textbook		
Every day	71 * 311	65 309
Weekly	10 * 293	13 293
Monthly	3 284	4 286
Never/Hardly ever	16 * 286	18 283
Talk with other students during class about how to solve problems		
Every day	23 * 307	42 309
Weekly	15 * 306	24 306
Monthly	13 * 307	9 300
Never/Hardly ever	50 * 302	24 285
Use a calculator for mathematics		
Every day	69 311	69 309
Weekly	15 294	14 289
Monthly	7 285	6 283
Never/Hardly ever	9 283	11 279

Twelfth-graders who reported doing math problems from a textbook daily scored highest.

Twelfth-graders who reported using a calculator daily scored highest.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

Except for an increase in the percentage of fourth-graders who reported talking with other students about how to solve math problems on a weekly or monthly basis, there has been little change in the frequency of classroom activities reported at grade 4 since 1996. The percentage of eighth-grade students who reported doing textbook problems every day dropped from 76 percent in 1996 to 72 percent in 2000. Similarly, the percentage of twelfth-graders decreased from 71 percent to 65 percent in the same span of time. In contrast, the percentage of students who reported solving problems with other students every day or weekly increased at both grades between 1996 and 2000. Most notably, the percentage of twelfth-graders engaged in this activity on a daily basis increased from 23 to 42 percent.

Frequency of Calculator Use for Classwork, Homework, and Quizzes

Students are permitted to use calculators on approximately one-third of the NAEP mathematics assessment blocks at each grade level. At grade 4, a four-function calculator is provided; at grades 8 and 12, a scientific calculator is provided. Although calculator use is permitted on some blocks, many of the questions in these blocks can be answered without the use of a calculator. Students must decide when the use of a calculator is helpful.

Students in all three grades were asked how frequently they used a calculator for classwork, homework, and on tests or quizzes. Table 6.2 presents the percentages and average scores for students who responded that they used a calculator for these activities every day, weekly, monthly, or never or hardly ever.

The relationship between calculator use and students' performance was markedly different at grade 4 than it was at either grade 8 or grade 12. Whereas lower scores on the mathematics assessment were associated with more frequent calculator use at grade 4, the opposite was generally true for eighth- and twelfth-grade students.

In 2000, about one-quarter of the fourth-grade students reported using calculators every day for classwork or for homework, and only a small percentage (4 percent) for tests and quizzes. Students at grade 4 who indicated that they used a calculator every day, whether for classwork, for homework, or for tests and quizzes, consistently scored lower than students who reported less frequent use of calculators for the same purposes. In contrast, students at both grades 8 and 12 who reported using calculators daily for these same purposes scored higher on the mathematics assessment than those at the same grade level who reported less frequent calculator use.

While there has been a decline since 1996 in the percentage of fourth-grade students who reported using a calculator every day for classwork and for homework, there has been no significant change in the proportion of students using calculators on tests and quizzes every day. At grade 8, there has been a decrease in the percentage of students using calculators daily for classwork (from 58 percent in 1996 to 44 percent in 2000) and for homework (from 52 percent in 1996 to 41 percent in 2000). There has been no significant change since 1996 in the reported frequency of calculator use by twelfth-grade students.

Table 6.2

Percentage of students and average scores by students' reports on how often they use a calculator for mathematics activities at grades 4, 8, and 12: 1996-2000

Grade 4

Frequency of Calculator Use

	1996	2000
Classwork		
Every day	33 * 208	24 210
Weekly	17 227	14 230
Monthly	17 241	17 240
Never/Hardly ever	34 * 232	44 235
Homework		
Every day	30 * 208	24 211
Weekly	16 223	16 222
Monthly	14 * 236	15 238
Never/Hardly ever	40 * 234	45 238
Tests and Quizzes		
Every day	5 198	4 202
Weekly	17 * 210	15 213
Monthly	18 * 220	13 222
Never/Hardly ever	60 * 233	68 236

More frequent use of calculators was generally associated with lower scores at grade 4.

See footnotes at end of table ▶

Table 6.2 (continued)

Percentage of students and average scores by students' reports on how often they use a calculator for mathematics activities at grades 4, 8, and 12: 1996-2000

Grade 8

Frequency of Calculator Use

	1996	2000
Classwork		
Every day	58 * 271	44 279
Weekly	21 * 275	25 276
Monthly	9 * 277	12 275
Never/Hardly ever	13 * 269	18 268
Homework		
Every day	52 * 274	41 283
Weekly	24 271	26 274
Monthly	10 * 275	13 275
Never/Hardly ever	14 * 266	21 265
Tests and Quizzes		
Always	—	24 292
Sometimes	—	45 274
Never	—	31 267

More frequent use of calculators was associated with higher scores at grade 8.

See footnotes at end of table ▶

Table 6.2 (continued)

Percentage of students and average scores by students' reports on how often they use a calculator for mathematics activities at grades 4, 8, and 12: 1996-2000

Grade 12

Frequency of Calculator Use

	1996	2000
Classwork		
Every day	68 309	68 308
Weekly	14 302	14 292
Monthly	4 290	3 286
Never/Hardly ever	14 287	14 283
Homework		
Every day	61 312	61 310
Weekly	16 296	15 293
Monthly	5 291	5 291
Never/Hardly ever	18 287	19 283
Tests and Quizzes		
Always	—	58 309
Sometimes	—	29 296
Never	—	13 280

More frequent use of calculators was associated with higher scores at grade 12.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
— Comparable data were not available.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

Type of Calculator Used

Since calculator usage is so prevalent, and because enhancements are added regularly to calculators to increase their power, it is important to examine the types of calculators students are using in their regular schoolwork and to observe how students who customarily use different types of calculators perform on the NAEP assessment. This information is presented for fourth-grade students in table 6.3 and eighth- and twelfth-grade students in table 6.4.

At grade 4, students who use calculators generally work with a fairly simple four-function model. Fourth-graders participating in the mathematics assessment were asked whether or not they have a calculator that can be used to do mathematics schoolwork. Their responses are summarized in table 6.3

In 2000, more than one-half (55 percent) of the fourth-grade students indicated that they had access to a calculator to use for mathematics schoolwork. Fourth-graders who indicated that they have a calculator scored higher than their peers who did not. The extent to which fourth-grade students have reported having access to a calculator seems to have fluctuated over the years, increasing from 46 percent with access in 1992 to 62 percent in 1996, and then decreasing to 55 percent in 2000.

Table 6.3

Percentage of students and average scores by fourth-grade students' reports on whether or not they have a calculator for schoolwork: 1992-2000

Grade 4

Availability of a Calculator for Schoolwork

	1992	1996	2000
Yes	46 * 221	62 * 227	55 231
No	54 * 219	38 * 225	45 227

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP, 1992, 1996 and 2000 Mathematics Assessments.

Scientific and graphing calculators are the most common types of calculators used in grades 7-12. Eighth- and twelfth-graders who participated in the mathematics assessment were shown pictures and descriptions of scientific and graphing calculators. They were asked whether or not they used either of these types of calculators for their mathematics schoolwork. These students were also asked whether or not they used a calculator that can manipulate symbols, solve equations, and carry out other procedures (sometimes referred to as "symbol manipulators" or as having "algebraic logic"). For this question, a picture of a sample calculator screen was presented with the question to illustrate how the calculator screen for this type of calculator might look. Students' responses to these questions are shown in table 6.4.

Table 6.4

Percentage of students and average scores by students' reports on whether or not they use a particular type of calculator at grades 8 and 12: 1996-2000

Type of Calculator Used

Grade 8

	1996	2000
Scientific		
Yes	61 *	67
	277	279
No	39 *	33
	265	269
Graphing		
Yes	11 *	18
	275	286
No	89 *	82
	272	273
Symbol Manipulator		
Yes	—	9
		259
No	—	91
		277

Use of scientific or graphing calculator associated with higher scores at grade 8.

Grade 12

	1996	2000
Scientific		
Yes	70	68
	305	299
No	30	32
	303	306
Graphing		
Yes	51 *	62
	316	311
No	49 *	38
	292	286
Symbol Manipulator		
Yes	—	15
		301
No	—	85
		302

Use of graphing calculator associated with higher scores at grade 12.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
— Comparable data were not available.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Mathematics Assessments.

There was a relationship at both grades 8 and 12 between whether or not students used a particular type of calculator and how they performed on the mathematics assessment. This relationship was, however, dependent on the specific type of calculator and grade level.

In 2000, about two-thirds of the students at both grades 8 and 12 reported using a scientific calculator. While eighth-grade students who indicated they used a scientific calculator had higher average scores than their peers who did not use one, students at grade 12 who reported using a scientific calculator scored lower than other twelfth-graders who indicated that they did not. Using a graphing calculator was associated with higher mathematics scores at both grades 8 and 12. At grade 12, those students who reported using a graphing calculator scored an average of 25 scale score points higher than those who did not. Relatively few students at either grade 8 or grade 12 reported using a symbol manipulator. While eighth-grade students who indicated that they did not use a symbol manipulator had higher average scores than those who did, there was no relationship between student performance and the use of a symbol manipulator at grade 12.

Students' reported use of both scientific and graphing calculators at grade 8 has increased since 1996. While more twelfth-grade students reported using a graphing calculator in 2000 than in 1996, there has been no change in the proportion of students using a scientific calculator.

Mathematics Course-Taking in Grade 8

There was considerable variety in the mathematics classes eighth-graders reported taking. This section looks at the classes they reported taking and how percentages of students and average scale scores varied by class. Students were asked what mathematics class they were taking during the year in which the assessment took place. The response choices offered a wide range of courses from which students could choose. Eighth-graders' responses, broken down by males and females for each of the classes listed, are shown in table 6.5.

In 2000, most eighth-grade students reported being enrolled in either an eighth-grade mathematics course (37 percent), a prealgebra course (31 percent), or a first-year algebra course (25 percent). Eighth-graders who were enrolled in either an eighth-grade mathematics course or in prealgebra had lower mathematics scores than those enrolled in a first- or second-year algebra course, geometry, or integrated or sequential mathematics. There were no significant differences in performance for eighth-graders enrolled in first- or second-year algebra, geometry, or integrated or sequential mathematics. These same relationships between the course eighth-grade students were enrolled in and their performance on the mathematics assessment carried over for both male and female students.

Table 6.5

Percentage of students and average scores by eighth-grade students' reports on what mathematics class they are currently taking: 2000

Grade 8

Current Eighth-Grade Mathematics Course

	2000
All Students	
Eighth-grade mathematics	37 264
Prealgebra	31 270
First-year algebra	25 301
Geometry	2 295
Second-year algebra	1 291
Integrated or sequential math	2 296
Other math class	3 247
Male	
Eighth-grade mathematics	38 265
Prealgebra	29 272
First-year algebra	25 302
Geometry	2 296
Second-year algebra	2 293
Integrated or sequential math	2 298
Other math class	3 248
Female	
Eighth-grade mathematics	36 263
Prealgebra	32 268
First-year algebra	25 299
Geometry	1 294
Second-year algebra	1 287
Integrated or sequential math	2 293
Other math class	3 246

Eighth-graders taking eighth-grade mathematics or prealgebra scored lower than students taking first- or second-year algebra, geometry, or integrated math.

Eighth-grade males taking eighth-grade mathematics or prealgebra scored lower than students taking first- or second-year algebra, geometry, or integrated math.

Eighth-grade females taking eighth-grade mathematics or prealgebra scored lower than students taking first- or second-year algebra, geometry, or integrated math.

The percentage of students is listed first with the corresponding average scale score presented below.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Trends in Courses Taken by Twelfth-Grade Students

Assessment results are strongly linked to the opportunity to study challenging material and the degree to which students take advantage of these opportunities. This includes not only the way students apply themselves in the courses they take, but also the particular courses students choose to take as they progress through school. In grades 8–12, students can take a variety of mathematics courses. In 2000, students who participated in the twelfth-grade assessment were asked the following question about a group of 13 mathematics courses:

Which courses have you taken from eighth-grade to present? You should fill in more than one oval in each row if you have taken a course of that description more than once. If you have never taken a particular course, fill in the oval in the column "Course not taken." Fill in at least one oval in each row.

The specific courses listed started with general mathematics and ended with calculus. Table 6.6 presents the results for this question for each of the courses listed.

The "Not Taken" column provides evidence about the popularity of the various courses. Of the course titles listed, only 6 percent marked first-year algebra as not taken, so this was taken by nearly all high-school students (i.e., by 94 percent of the students). Some students marked more than one grade for a particular course. For example, they may have marked geometry in both grades 9 and 10. In such cases, the last year in which the course was taken was the one considered in the tabulation. It is of interest to peruse the table and note the most common grade in which various courses were taken and the average scores of students who took the course in that grade. For first-year algebra, 50 percent of the students took the course in grade 9 with an average score of 303. This is the traditional grade for taking first-year algebra. There has been a trend toward moving algebra earlier to make room for other mathematics courses. So it is not surprising to see that 23 percent of the students reported that they took first-year algebra in grade 8 and that their average score of 328 was higher than the average score of 303 for students who reported taking this course in grade 9.

The first four mathematics courses listed (general, business, applied, and introduction to algebra) are not considered to be part of the typical college preparatory curriculum. As one might expect, for each of these courses, the average score of students who reported that they did not take the course was higher than the average for those who did take the course in various other years.

Some schools offer students the opportunity to take unified, integrated, or sequential mathematics. Students may take courses by one of these names in more than one grade. For example, a student may take Course 1, Course 2, and Course 3 of unified mathematics in grades 9, 10, and 11. These courses would build on one another and get progressively more advanced as one moves from Course 1 to Course 3. Since, for a given course, the tabulations were done by considering only the last year in which a course was taken, a student who marked this course in grades 9, 10, and 11 would have had this response tabulated under grade 11, the last year the unified course was taken. Note that the percentages are generally low for this course, but the average scores tend to increase from grade 8 to grade 12.

The course with the highest average score at any grade is calculus taken in grade 12. Other courses with high average scores were precalculus at grade 11 (336) and geometry at grades 8 (339) and 9 (330).

Table 6.6

Percentage of students and average scores by twelfth-grade students' reports on mathematics courses taken since eighth-grade: 2000

Grade 12

Twelfth-Grade Course-Taking Patterns

Twelfth-graders who had taken higher-level courses generally scored higher.

	Not Taken	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
1. General mathematics	36 318	53 296	5 274	2 276	2 276	3 288
2. Business mathematics	80 306	2 285	4 280	3 283	4 291	7 289
3. Applied mathematics	82 307	4 294	5 276	3 278	3 280	3 290
4. Introduction to algebra	26 317	42 310	23 285	6 267	2 270	1 263
5. Algebra I	6 283	23 328	50 303	16 283	4 274	1 269
6. Geometry	12 271	2 339	20 330	44 306	16 291	5 280
7. Algebra II	20 276	1 306	6 328	27 323	36 305	10 290
8. Trigonometry	74 299	▲ ****	▲ 300	3 332	12 324	10 307
9. Precalculus	63 291	▲ ****	▲ ****	2 335	18 336	17 318
10. Unified, integrated, or sequential mathematics	89 304	1 276	2 281	2 303	4 304	3 307
11. Statistics	82 303	1 275	2 289	2 300	5 311	8 317
12. Discrete/finite mathematics	95 304	1 272	1 ****	1 288	1 302	2 315
13. Calculus	82 297	▲ ****	▲ ****	▲ ****	2 329	16 342
14. Other	83 305	1 288	2 288	2 288	4 296	8 302

The percentage of students is listed first with the corresponding average scale score presented below.
**** Sample size is insufficient to permit a reliable estimate.
▲ Percentage is between 0.0 and 0.5.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Mathematics Courses Taken vs. NAEP Performance

Students who take certain courses listed in table 6.6 may be better prepared to take the NAEP twelfth-grade assessment than are students who take, for example, only one or two of the more basic courses such as general mathematics or introduction to algebra. To explore how the particular pattern of courses students take relates to performance, four groupings of the courses were considered. A description of each grouping is presented in figure 6.1. The groupings are generally consistent with the course sequencing practices of most school districts. The course groups are organized in ascending order of mathematics preparation with Group I representing the lowest level of course taking and Group IV the highest. The groupings are imperfect because course titles are imperfect representations of course content. For example, a course listed as "introduction to algebra" at one school may be just as demanding as first-year algebra at another school. Nevertheless, the courses in each successive grouping represent a generally agreed upon hierarchy of courses offered in grades 8 through 12.

Figure 6.1 Groupings of Courses Taken	Mathematics courses associated with each group as related to the twelfth-grade mathematics assessment
Group I Level	Students were placed in Group I if they had not taken any math course or if the only courses they had taken were those numbered 1 through 4 in table 6.6 (general mathematics through introduction to algebra). Students in this group have had the opportunity to be exposed to some mathematical content in each of the five mathematics content strands, but not at the level needed to deal with much of the content assessed by NAEP.
Group II Level	Students were placed in Group II if they took first-year algebra no later than grade 9 or took course 10, unified, integrated, or sequential mathematics in grade 9. Students who, in addition, took one or more of the Group I courses (numbers 1-4) were included in this group. Students who took courses such as geometry, second-year algebra, or other higher-numbered courses were not included in this group. The primary difference between this group and the previous group is the higher level of preparation in algebra.
Group III Level	Students were placed in Group III if they marked one or more of courses 6, 7, or 10 with course 6 (geometry) taken in grade 10 or earlier and course 10 (unified) taken in grades 10, 11, or 12. Students who, in addition, took courses listed in Group I or II above were included in this group. Students who took any of the more advanced courses numbered 8, 9, 11, 12, or 13 were not included in this group. As an example, a student who took general mathematics, first-year algebra, and geometry would be considered to be in Group III.
Group IV Level	Students were placed in Group IV if they took at least one of courses 8, 9, 11, 12, or 13. Students who, in addition, took any of the courses listed above were also included in this group. For example, a student who took first-year algebra, geometry, second-year algebra, precalculus, and calculus would be considered in this group. Students in this group should have had the opportunity to learn most of the material needed to answer NAEP mathematics questions, and in certain cases (e.g., precalculus or calculus) to learn material beyond that required by NAEP.

Table 6.7 provides the percentage of students who fall in each of the four course groupings described in figure 6.1 and their average scale scores. Groups III and IV account for 32 percent and 50 percent, respectively, of the twelfth-grade students. There is a strong relationship between group membership and average scores. The average score of the students in each group is higher than the average for students in any lower numbered group. For example, the average score of students in Group III (294) is higher than that of Group I (275) and Group II (282). These findings indicate that successively more advanced course taking had a positive relationship with average mathematics scores.

These performance results are consistent with data presented in the 2000 College Bound Seniors Report.[2] In that report, the average SAT I mathematics scores of college bound seniors who studied mathematics for 2 years was 449, whereas the average for 4 years of study was 522. Relative to mathematics courses taken, the average SAT I score for students who took geometry was 518, while for those who took calculus the average was 610. ACT results show a similar relationship to achievement.[3] Students who reported taking core mathematics courses (three or more years of mathematics, including Algebra I, Algebra II, and Geometry) had an average ACT score of 21.8 compared to 19.0 for those who took less than the core courses.

Table 6.7

Percentage of students and average scores by mathematics course groupings based on twelfth-grade students reports on courses taken since eighth grade: 2000

Grade 12

Mathematics Courses Taken vs. Performance at Grade 12

	Group I	Group II	Group III	Group IV
	15 275	4 282	32 294	50 318

The percentage of students is listed first with the corresponding average scale score presented below.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

2 The College Board. (2000). *College bound seniors national report* (p.3). New York, NY: Author.

3 ACT. (2000). *ACT assessment 2000 results: Summary report national* (p.4). Iowa City, IA: Author.

Students' Reported Time Spent on Mathematics Homework

It has been observed that the correlation between homework and achievement is weaker in elementary school than in secondary school.[4] One of the possible reasons advanced to explain this observation is that elementary school teachers are more likely to use homework to review class material, whereas secondary school teachers more often used homework to prepare for and enrich class lessons.

Table 6.8 presents information about time spent on mathematics homework in 2000 for grades 4, 8, and 12. Most students at all three grades reported spending between 15 and 45 minutes per day on mathematics homework in 2000 (keeping in mind that 29 percent of the students at grade 12 reported not taking a mathematics course at all in their senior year). Although the relationship between student performance and the amount of time spent on mathematics homework varied by grade level, there was a common pattern that suggested more time was not necessarily better.

Fourth-grade students who reported spending 15 or 30 minutes per day on math homework had higher average scores than students who reported spending more time. In addition, fourth-graders who reported not doing any homework performed similarly to those who spent anywhere from 15 to 45 minutes per day, and actually had higher average scores than those who spent one hour or more on homework.

Students at grade 8 who reported not doing mathematics homework had lower average scores than those students who spent between 15 minutes and one hour on mathematics homework, but did not differ in performance from students who reported spending more than one hour on homework. Eighth-grade students who reported spending as little as 15 minutes per day doing math homework had higher scores than those who spent an hour or more; however, only 3 percent of eighth-graders reported spending more than one hour daily on homework.

Students at grade 12 who reported not spending any time doing mathematics homework scored lower than their peers who reported spending anywhere from 15 minutes to as much as an hour or more on homework. However, there was no significant difference in the performance of students who reported spending any amount of time from 15 minutes to an hour or more on mathematics homework.

[4] Muhlenbruck, L., Cooper, H., Nye, B., & Lindsay, J. (2000). Homework and achievement: Explaining the different strengths of relation at the elementary and secondary levels. *Social Psychology of Education,* 3, 295-317.

Table 6.8

Percentage of students and average scores by students' reports on time spent per day on mathematics homework at grades 4, 8, and 12: 2000

Time Spent on Mathematics Homework

Grade 4

	2000
None	6 228
15 minutes	44 232
30 minutes	28 230
45 minutes	10 224
One hour	8 217
More than one hour	4 217

Fourth-graders who spent 15 to 30 minutes per day on homework scored higher than students who spent more time.

Grade 8

	2000
None	9 265
15 minutes	32 280
30 minutes	34 277
45 minutes	14 278
One hour	8 274
More than one hour	3 271

Eighth-graders who did not do homework scored lower than students who spent 15 minutes to one hour per day on homework.

See footnotes at end of table ▶

Table 6.8 (continued)

Percentage of students and average scores by students' reports on time spent per day on mathematics homework at grades 4, 8, and 12: 2000

Grade 12

Time Spent on Mathematics Homework

	2000
Not taking math this year	29 293
None	12 290
15 minutes	16 307
30 minutes	20 308
45 minutes	11 310
One hour	8 311
More than one hour	4 309

Twelfth-graders who did not do homework scored lower than students who did.

The percentage of students is listed first with the corresponding average scale score presented below.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Time Spent Working at a Part-Time Job

Most twelfth-graders spend time working at part-time jobs. This section reports how much time students are spending at these jobs and provides average scale scores for those who worked various numbers of hours. Students were asked how many hours per week they usually work in a part-time job, and were told to exclude vacations. The response choices to this question ranged from "None" to "More than 30 hours." The full range of responses is shown in table 6.9.

In 2000, 71 percent of twelfth-grade students reported working at a part-time job. Students who reported working 21 hours per week or more had lower average scores than those who did not work at all or worked fewer hours. There was no difference between the performance of students who didn't work at all and those who worked up to 20 hours per week.

Table 6.9

Percentage of students and average scores by twelfth-grade students' reports on hours spent at a part-time job: 2000

Grade 12

Time Spent Working at a Part-Time Job

	2000
None	29 306
Fewer than six hours	5 312
Six to ten hours	10 308
Eleven to fifteen hours	12 308
Sixteen to twenty hours	17 305
Twenty-one to twenty-five hours	13 296
Twenty-six to thirty hours	8 292
More than thirty hours	6 287

Twelfth-graders who worked 21 hours or more each week scored lowest.

The percentage of students is listed first with the corresponding average scale score presented below.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Mathematics Assessment.

Time Spent Watching Television

The impact of television on school learning has been a topic for discussion and debate for many years. Although many television programs have sound educational value, watching too much television is widely believed to detract from academic pursuits. Other forms of entertainment such as video games, computer games, and surfing the internet also compete for students' time, but they are not considered in this report.

After-school activities such as television viewing, extracurricular activities, homework, and jobs have been found to be related to test scores and grades.[5] While more time in extracurricular and other structured activities were associated with higher test scores and class grades, more time spent watching television and at jobs were associated with lower test scores and grades.

Students who participated in the 2000 assessment in grades 4, 8, and 12 were asked how much television they usually watch each day and could choose a response ranging from "None" to "6 hours or more." For this analysis, their responses have been collapsed into three categories. Table 6.10 presents the results for grades 4, 8, and 12, respectively. Results are presented for the 2000 mathematics assessment as well as for the mathematics assessments in 1990, 1992, and 1996 when this same question was asked.

About one-third of the students at both grades 4 and 8, and less than one-fifth at grade 12, reported watching television four hours or more per day in 2000. The relationship between students' performance in mathematics and more frequent television watching was similar at all three grades—that is, students who watched television for four or more hours per day scored lower than those who watched less frequently. At grade 4, however, students who watched television two or three hours per day scored higher than those who watched one hour or less, while the reverse was true at grades 8 and 12.

At grades 4 and 8, students' reports indicate a trend toward less television viewing on a daily basis. The percentage of students watching four hours or more of television each day decreased between 1990 and 2000—from 44 percent of fourth-graders and 43 percent of eighth-graders in 1990 to only 33 percent at each grade in 2000. Only minimal changes across years are evident in the television viewing habits of twelfth-graders, with no significant differences between the reports of students in 1990 and those in 2000.

[5] Cooper, H., Valentine, J., Nye, B., & Lindsay, J. (1999). Relationship between five after-school activities and academic achievement. *Journal of Educational Psychology*, 91(2), 369-378.

Table 6.10

Percentage of students and average scores by students' reports on the amount of time spent watching television each day at grades 4, 8, and 12: 1990-2000

Time Spent Watching Television

Grade 4

	1990	1992	1996	2000
One hour or less	19 * 213	21 * 223	25 * 225	28 230
Two or three hours	36 * 220	36 * 226	36 * 230	39 233
Four hours or more	44 * 208	43 * 213	39 * 217	33 219

Grade 8

	1990	1992	1996	2000
One hour or less	13 * 270	17 * 279	18 * 278	20 285
Two or three hours	44 * 267	46 275	46 277	47 280
Four hours or more	43 * 256	37 * 256	37 * 262	33 264

Grade 12

	1990	1992	1996	2000
One hour or less	33 304	33 * 309	34 314	36 310
Two or three hours	47 295	46 300	46 304	46 301
Four hours or more	20 278	20 * 284	20 * 288	18 285

Students at each grade who watched four hours or more of TV per day scored lowest.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.

Students' Attitudes Toward Mathematics

Students' attitudes about a subject have been found to be related to performance.[6] In fact, as will be seen in this section, the attitudes of students who took the NAEP assessment relate rather strongly to performance. Students who participated in the mathematics assessment at all three grades were asked to consider several statements (not all of which are included in this report) about mathematics, such as "I like mathematics," and to indicate the extent to which they agreed with each statement. There were five response choices associated with each statement: strongly agree, agree, undecided, disagree, and strongly disagree. These choices were collapsed for reporting purposes as follows: strongly agree or agree were collapsed to "agree"; and disagree and strongly disagree were collapsed to "disagree." Table 6.11 presents the results for four statements at grades 4, 8, and 12. Results for two of these questions are presented for the 2000 mathematics assessment as well as for the mathematics assessments in 1990, 1992, and 1996 when the same questions were asked.

All three grade levels showed a positive relationship between students' performance and their attitudes toward mathematics. Students who agreed that they liked math and that math was useful for solving problems had higher average scores than those who disagreed. Students at all three grades who disagreed that math was mostly memorizing facts and that there was only one way to solve a problem scored higher than those who agreed with these statements. In addition, students at grade 12 who indicated that they would not study mathematics if they had the choice scored lower than those who indicated that they would.

The extent to which students' attitudes toward mathematics have changed since the early 1990s varies somewhat by grade. While there has been no change since 1990 in the percentage of fourth-graders who reported liking math, fewer eighth- and twelfth-grade students reported liking math in 2000 than in the early 1990s. While the percentage of fourth-grade students who agreed that math was useful for solving everyday problems increased from 63 percent in 1990 to 71 percent in 2000, the percentage of twelfth-grade students who responded similarly decreased from 73 percent in 1990 to 61 percent in 2000. The percentage of students who disagreed that math was mostly memorizing facts increased at all three grade levels between 1992 and 2000.

[6] National Academy Press. (1999). *Global perspectives for legal action: Using TIMSS to improve U.S. mathematics and science education* (p.18). Washington, DC: Author.

Table 6.11

Percentage of students and average scores by students' reports on their attitudes toward mathematics at grades 4, 8, and 12: 1990-2000

Grade 4

Students' Attitudes Toward Mathematics

	1990	1992	1996	2000
I like Math				
Agree	70 215	71 222	69 226	70 231
Undecided	16 213	16 221	17 225	16 229
Disagree	14 204	12 209	14 219	14 221
Math is useful for solving problems				
Agree	63 * 216	66 * 224	69 229	71 234
Undecided	22 * 213	21 * 219	17 222	18 225
Disagree	14 * 203	13 * 208	14 * 213	11 217
Math is mostly memorizing facts				
Agree	—	57 * 218	54 221	52 225
Undecided	—	28 225	25 * 228	27 233
Disagree	—	16 * 224	21 235	21 240
Only one way to solve a problem				
Agree	—	—	17 207	16 212
Undecided	—	—	20 221	19 225
Disagree	—	—	63 232	65 236

Fourth-graders who said they like math scored highest.

Fourth-graders who thought math is useful for solving problems scored highest.

Fourth-graders who did not think math is mostly memorizing facts or that there's only one way to solve a problem scored highest.

See footnotes at end of table ▶

Table 6.11 (continued)

Percentage of students and average scores by students' reports on their attitudes toward mathematics at grades 4, 8, and 12: 1990-2000

Grade 8

Students' Attitudes Toward Mathematics

	1990	1992	1996	2000
I like Math				
Agree	57 267	57 * 273	56 277	54 282
Undecided	22 261	20 268	21 271	21 277
Disagree	21 * 254	23 * 260	23 * 263	26 267
Math is useful for solving problems				
Agree	76 266	81 * 271	80 * 275	75 279
Undecided	15 262	12 * 269	12 * 274	15 280
Disagree	9 245	7 * 259	8 * 259	10 269
Math is mostly memorizing facts				
Agree	—	44 * 259	41 * 263	37 268
Undecided	—	26 * 273	28 275	28 278
Disagree	—	30 * 283	31 * 284	35 289
Only one way to solve a problem				
Agree	—	—	8 246	9 255
Undecided	—	—	14 264	13 268
Disagree	—	—	78 277	78 282

Eighth-graders who said they like math scored highest.

Eighth-graders who thought math is useful for solving problems scored highest.

Eighth-graders who did not think math is mostly memorizing facts or that there's only one way to solve a problem scored highest.

See footnotes at end of table ▶

Table 6.11 (continued)

Percentage of students and average scores by students' reports on their attitudes toward mathematics at grades 4, 8, and 12: 1990-2000

Grade 12

Students' Attitudes Toward Mathematics

	1990	1992	1996	2000
I like Math				
Agree	54 * 304	51 * 308	50 * 313	47 312
Undecided	17 286	17 297	17 301	17 298
Disagree	29 * 284	32 * 288	33 * 293	37 289
Math is useful for solving problems				
Agree	73 * 298	71 * 302	70 * 307	61 305
Undecided	15 * 289	18 * 298	16 * 301	19 302
Disagree	12 * 286	12 * 292	14 * 296	19 292
Math is mostly memorizing facts				
Agree	—	41 * 288	35 292	36 290
Undecided	—	20 * 297	21 299	22 297
Disagree	—	39 * 314	44 317	42 314
Only one way to solve a problem				
Agree	—	—	6 291	6 284
Undecided	—	—	12 290	12 288
Disagree	—	—	82 308	83 305
Would not study math if given choice				
Agree	—	—	31 * 295	37 293
Undecided	—	—	22 * 301	19 299
Disagree	—	—	47 * 312	43 311

Twelfth-graders who said they like math scored highest.

Twelfth-graders who thought math is useful for solving problems scored highest.

Twelfth-graders who did not think math is mostly memorizing facts or that there's only one way to solve a problem scored highest.

Twelfth-graders who would not study math if given a choice scored lowest.

The percentage of students is listed first with the corresponding average scale score presented below.
* Significantly different from 2000.
— Comparable data were not available.
NOTE: Percentages may not add to 100 due to rounding.
SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1990, 1992, 1996, and 2000 Mathematics Assessments.