

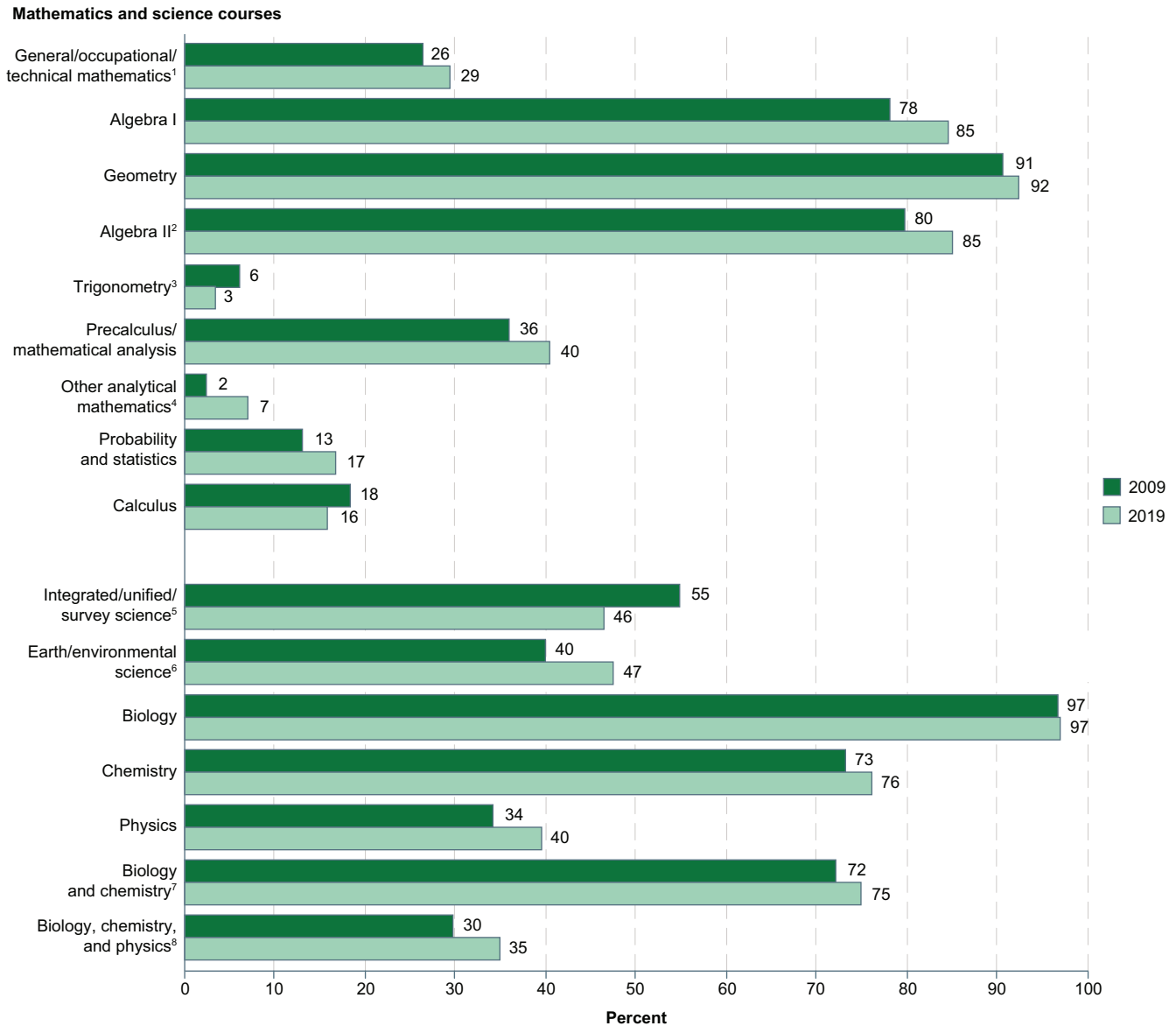
High School Mathematics and Science Course Completion

Greater percentages of high school graduates in 2019 than in 2009 had completed algebra II (85 vs. 80 percent), precalculus/mathematical analysis (40 vs. 36 percent), and biology, chemistry, and physics (35 vs. 30 percent). However, the percentage of graduates who had completed calculus was lower in 2019 than in 2009 (16 vs. 18 percent).

In addition to administering student assessments, the National Assessment of Educational Progress (NAEP) periodically collects data on the transcripts of high school graduates. The transcript survey gathers information about the types of courses that graduates take, how many credits they earn, their grade point averages, and the relationship between coursetaking patterns and

graduates' achievement based on their performance on the NAEP grade 12 assessment. The transcript data include only information about the coursework that graduates completed while they were enrolled in grades 9 through 12. This indicator focuses on differences in graduates' completion of mathematics and science courses.

Figure 1. Percentage of public and private high school graduates who completed selected mathematics and science courses in high school: 2009 and 2019



¹ Includes courses that are generally taken before or with algebra I. Occupational and technical mathematics courses may cover basic elements of algebra and geometry.

² Includes courses that taught both algebra II and trigonometry.

³ Taken as a separate course.

⁴ Includes courses such as discrete and finite mathematics.

⁵ Includes general life science and physical science courses.

⁶ Includes astronomy, geology, and marine science courses.

⁷ Indicates graduate completed both biology and chemistry courses.

⁸ Indicates graduate completed all three subjects of biology, chemistry, and physics.

NOTE: Completion of a mathematics or science course means that the graduate earned credits in a course within the category. It differs from graduates who took a course but did not pass or complete the course. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate's transcript contained 16 or more Carnegie credits, and (5) the graduate's transcript contained at least 1 Carnegie credit in English courses. Although rounded numbers are displayed, the figures are based on unrounded data.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009 and 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, tables 225.40 and 225.45.

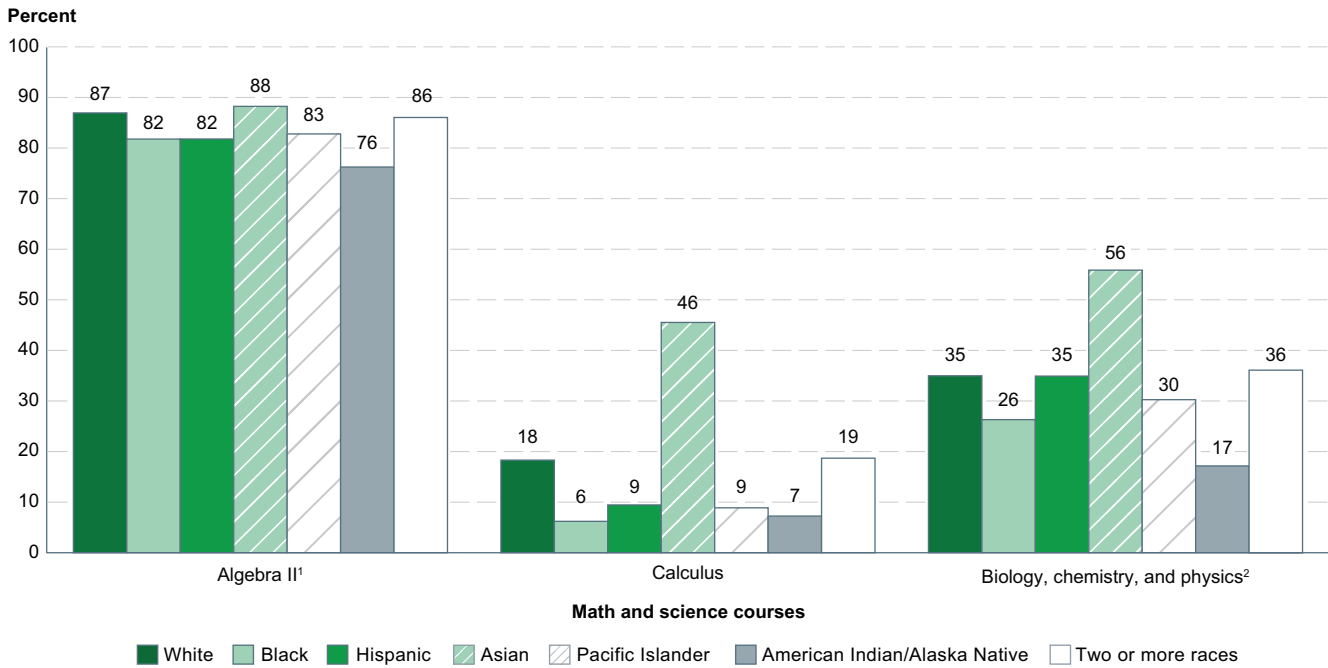
In general, greater percentages of high school graduates¹ had completed² mathematics courses in 2019 than in 2009. Specifically, the percentage of graduates who had completed mathematics courses was higher in 2019 than in 2009 in the following seven courses: general/occupational/technical mathematics³ (29 vs. 26 percent); algebra I (85 vs. 78 percent); geometry (92 vs. 91 percent); algebra II, including courses that taught both algebra II and trigonometry (85 vs. 80 percent); precalculus/mathematical analysis (40 vs. 36 percent); other analytical mathematics⁴ (7 vs. 2 percent); and probability and statistics (17 vs. 13 percent). However, lower percentages of graduates had completed trigonometry when taken as a separate course (3 vs. 6 percent) and calculus (16 vs. 18 percent) in 2019 than in 2009.

Similar patterns over time can be observed for high school graduates' completion of science courses. The percentage of graduates who had completed science courses was higher in 2019 than in 2009 in the following: earth/environmental science⁵ (47 vs. 40 percent); chemistry (76 vs. 73 percent); and physics (40 vs. 34 percent). In both 2009 and 2019, about 97 percent of graduates had completed a biology course. More specifically, a higher percentage had completed both biology and chemistry

courses in 2019 than in 2009 (75 vs. 72 percent), and a higher percentage had completed courses in all three subjects of biology, chemistry, and physics in 2019 than in 2009 (35 vs. 30 percent; hereafter referred to as “completed biology, chemistry, and physics”). In contrast, a lower percentage of graduates had completed integrated/unified/survey science⁶ in 2019 than in 2009 (46 vs. 55 percent).

Although mathematics and science course completion rates were generally higher in 2019 than a decade earlier in 2009, there were differences by student and school characteristics in the percentages of high school graduates completing courses in 2019. For example, a higher percentage of female graduates than of male graduates had completed algebra II in 2019 (87 vs. 83 percent). However, the completion rate in calculus was not measurably different between female and male graduates (both 16 percent). The percentage of graduates who had completed biology, chemistry, and physics was lower for females than for males (33 vs. 36 percent). This was primarily driven by the lower completion rate in physics for female graduates compared with that of their male peers (37 vs. 42 percent).

Figure 2. Percentage of public and private high school graduates who completed selected mathematics and science courses in high school, by race/ethnicity: 2019



¹ Includes courses that taught both algebra II and trigonometry.

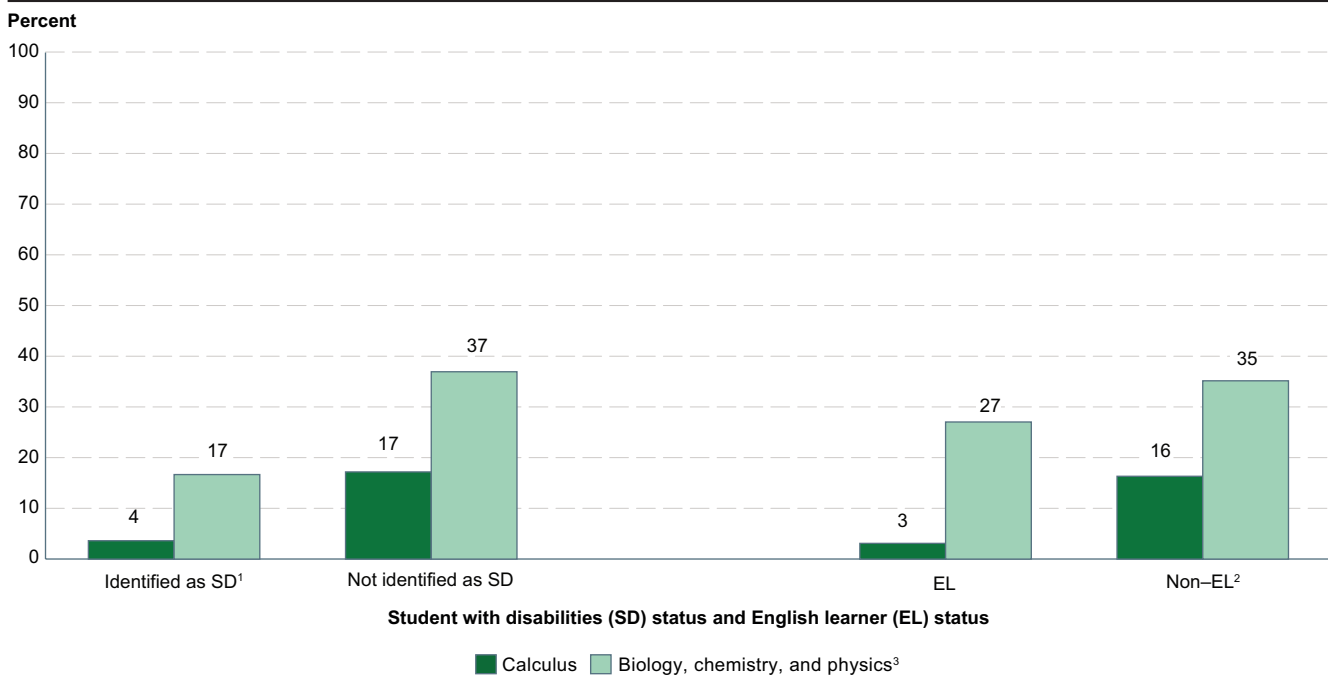
² Indicates graduate completed all three subjects of biology, chemistry, and physics.

NOTE: Completion of a mathematics or science course means that the graduate earned credits in a course within the category. It differs from graduates who took a course but did not pass or complete the course. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate's transcript contained 16 or more Carnegie credits, and (5) the graduate's transcript contained at least 1 Carnegie credit in English courses. Race categories exclude persons of Hispanic ethnicity. Although rounded numbers are displayed, the figures are based on unrounded data. SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, tables 225.40 and 225.45.

In 2019, high school graduates who were Asian, White, and of Two or more races often had higher mathematics and science course completion rates than did their peers of other racial/ethnic groups. Higher percentages of Asian graduates (88 percent), White graduates (87 percent), and graduates of Two or more races (86 percent) had completed algebra II, compared with their Hispanic and Black peers (82 percent each). The completion rates in algebra II among these groups were all higher than the rate for American Indian/Alaska Native graduates (76 percent). The percentage of graduates who had completed calculus was highest for those who were Asian (46 percent), followed by those who were of Two or more

racers (19 percent) and those who were White (18 percent). The percentage for calculus was lower among other racial/ethnic groups (9 percent for Hispanic graduates, 9 percent for Pacific Islander graduates, 7 percent for American Indian/Alaska Native graduates, and 6 percent for Black graduates). Finally, the percentage of graduates who had completed biology, chemistry, and physics was highest for those who were Asian (56 percent) and lowest for those who were American Indian/Alaska Native (17 percent). In between, the percentages were higher for those who were of Two or more races (36 percent), White (35 percent), and Hispanic (35 percent) than for those who were Black (26 percent).

Figure 3. Percentage of public and private high school graduates who completed selected mathematics and science courses in high school, by student with disabilities (SD) status and English learner (EL) status: 2019



¹ SD estimates include both students with an Individualized Education Plan (IEP) and students with a plan under Section 504 of the Rehabilitation Act (a “504 plan”). IEPs are only for students who require specialized instruction, whereas 504 plans apply to students who require accommodations but may not require specialized instruction.

² Includes students who were formerly English learners.

³ Indicates graduate completed all three subjects of biology, chemistry, and physics.

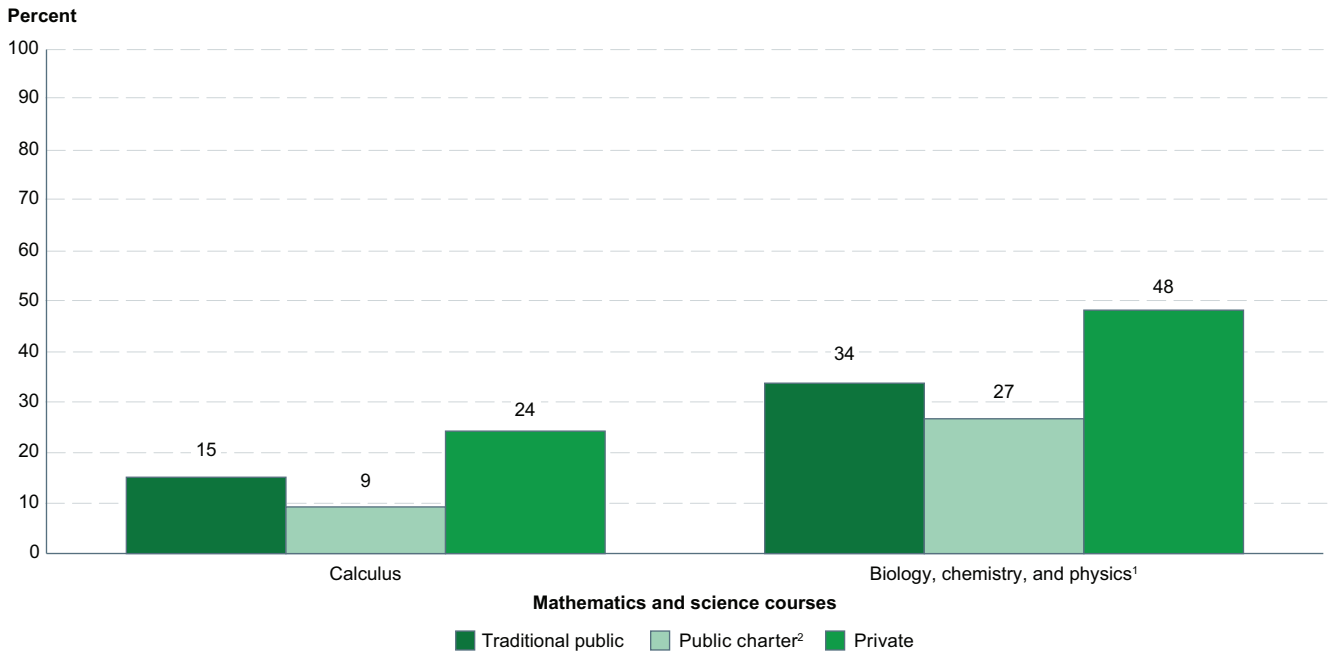
NOTE: Completion of a mathematics or science course means that the graduate earned credits in a course within the category. It differs from graduates who took a course but did not pass or complete the course. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate’s transcript contained 16 or more Carnegie credits, and (5) the graduate’s transcript contained at least 1 Carnegie credit in English courses. Although rounded numbers are displayed, the figures are based on unrounded data.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, tables 225.40 and 225.45.

In 2019, high school graduates identified as students with disabilities and those who were English learners had lower completion rates in the more advanced mathematics and science courses, compared with their peers who were not identified as students with disabilities or English learners. For example, lower percentages of graduates who were identified as students with disabilities than of those who

were not had completed calculus (4 vs. 17 percent) and biology, chemistry, and physics (17 vs. 37 percent). In addition, lower percentages of graduates who were English learners than of those who were not had completed calculus (3 vs. 16 percent) and biology, chemistry, and physics (27 vs. 35 percent).

Figure 4. Percentage of public and private high school graduates who completed selected mathematics and science courses in high school, by school type: 2019



¹ Indicates graduate completed all three subjects of biology, chemistry, and physics.

² Information about public charter schools was collected from the schools prior to the NAEP assessment.

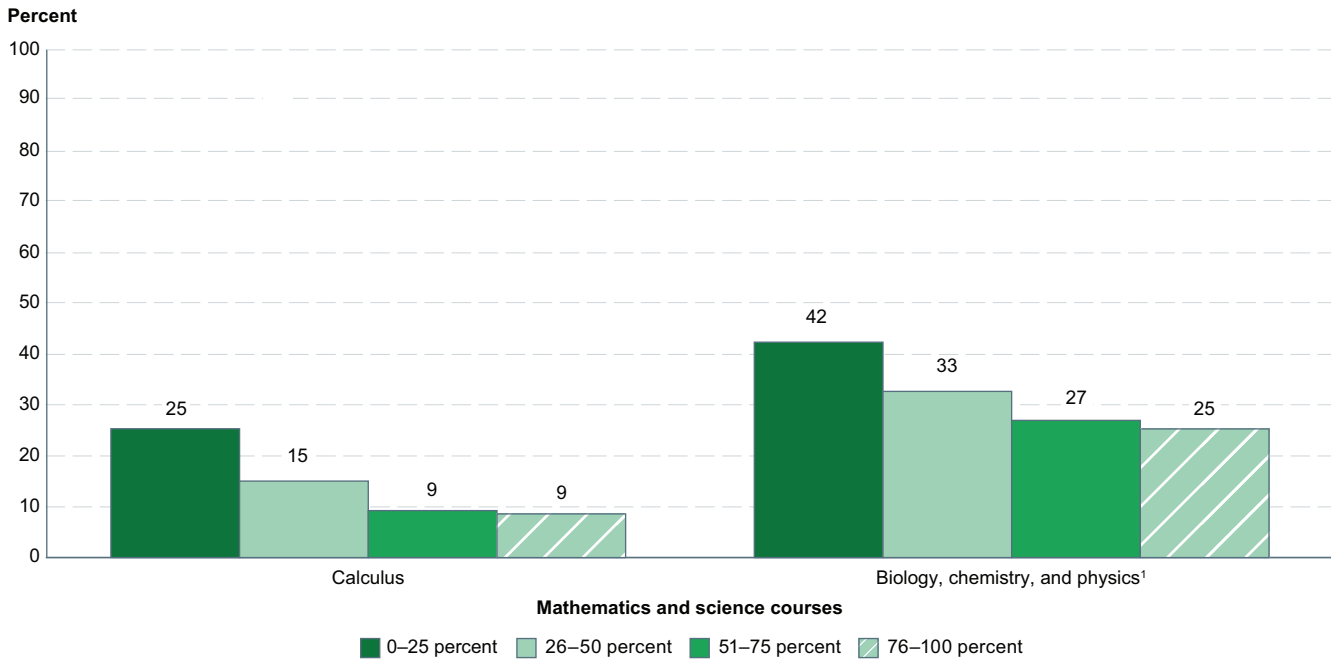
NOTE: Completion of a mathematics or science course means that the graduate earned credits in a course within the category. It differs from graduates who took a course but did not pass or complete the course. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate's transcript contained 16 or more Carnegie credits, and (5) the graduate's transcript contained at least 1 Carnegie credit in English courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, tables 225.40 and 225.45.

In 2019, high school graduates from private schools had higher completion rates in the more advanced mathematics and science courses, compared with their peers from traditional public and public charter schools. Some 24 percent of private school graduates had completed calculus, compared with 15 percent of graduates from traditional public schools. Both percentages were higher than the percentage of graduates from public charter schools who had completed calculus

(9 percent). The percentage of graduates who had completed biology, chemistry, and physics was higher for those from private schools (48 percent) than for those from traditional public schools and public charter schools (34 and 27 percent, respectively). However, unlike for calculus, the percentage of graduates who had completed biology, chemistry, and physics was not measurably different between those from traditional public schools and public charter schools.

Figure 5. Percentage of public and private high school graduates who completed selected mathematics and science courses in high school, by percentage of students at their school who were eligible for free or reduced-price lunch: 2019

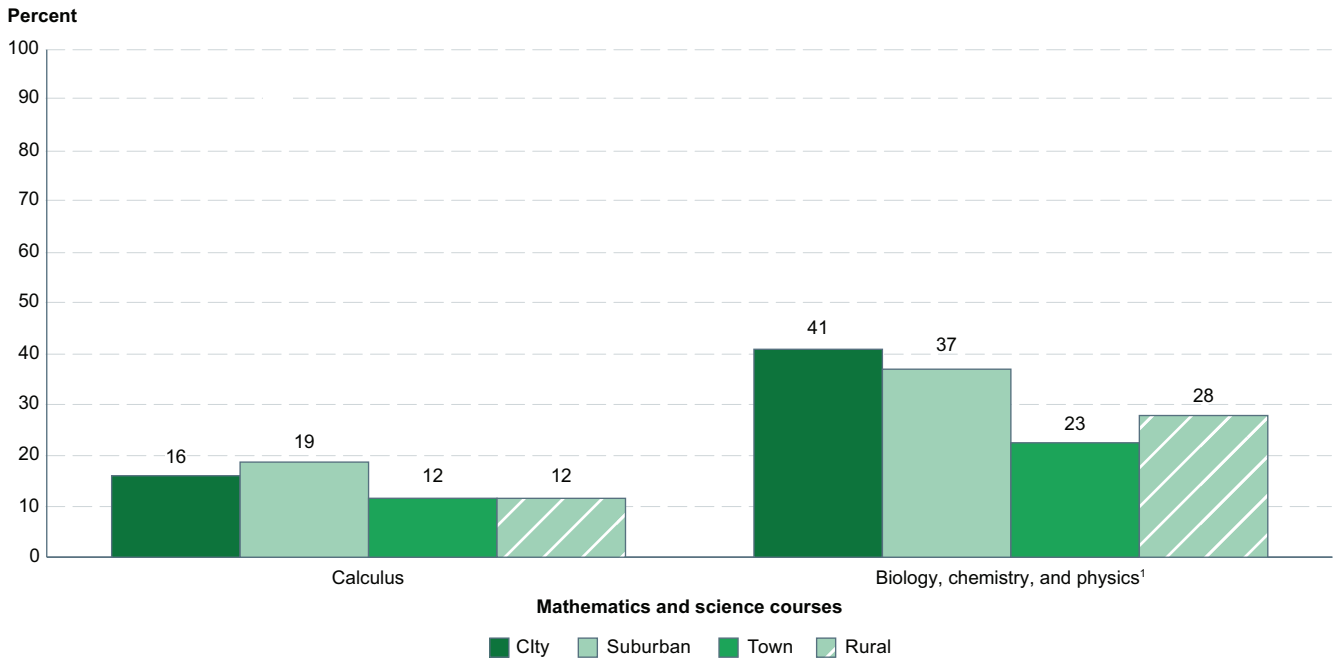


¹ Indicates graduate completed all three subjects of biology, chemistry, and physics.
NOTE: Completion of a mathematics or science course means that the graduate earned credits in a course within the category. It differs from graduates who took a course but did not pass or complete the course. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate's transcript contained 16 or more Carnegie credits, and (5) the graduate's transcript contained at least 1 Carnegie credit in English courses. Although rounded numbers are displayed, the figures are based on unrounded data.
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, tables 225.40 and 225.45.

In 2019, completion rates in the more advanced mathematics and science courses were generally higher for high school graduates from lower poverty schools than for those from higher poverty schools. Some 25 percent of graduates from schools where 25 percent or less of the students were eligible for free or reduced-price lunch (FRPL) had completed calculus, whereas this completion rate ranged from 9 to 15 percent among graduates from

schools where more students were eligible for FRPL. The same pattern was observed for the completion rate in biology, chemistry, and physics. Some 42 percent of graduates from schools where 25 percent or less of the students were eligible for FRPL had completed biology, chemistry, and physics, whereas this completion rate ranged from 25 to 33 percent among graduates from schools where more students were eligible for FRPL.

Figure 6. Percentage of public and private high school graduates who completed selected mathematics and science courses in high school, by school locale: 2019

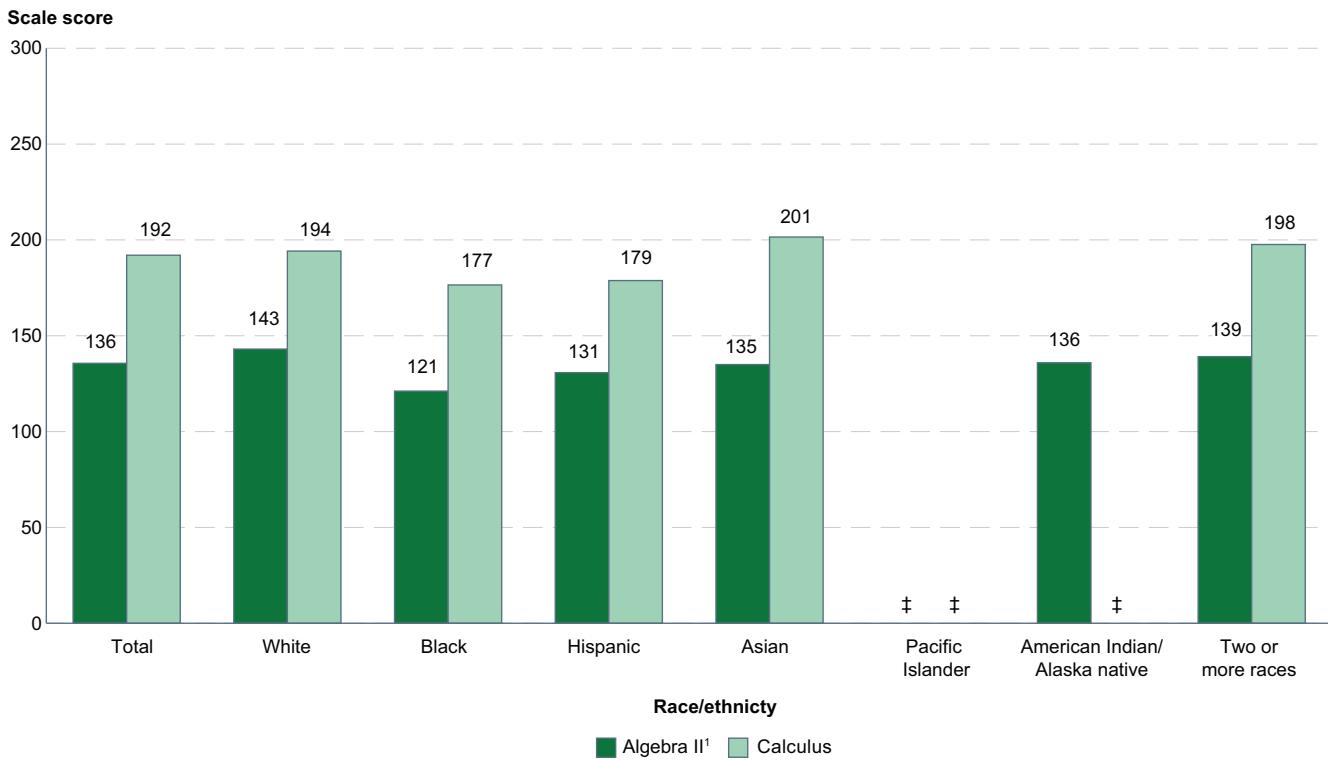


¹ Indicates graduate completed all three subjects of biology, chemistry, and physics.
 NOTE: Completion of a mathematics or science course means that the graduate earned credits in a course within the category. It differs from graduates who took a course but did not pass or complete the course. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate’s transcript contained 16 or more Carnegie credits, and (5) the graduate’s transcript contained at least 1 Carnegie credit in English courses. Although rounded numbers are displayed, the figures are based on unrounded data.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, tables 225.40 and 225.45.

In 2019, high school graduates from schools in cities and suburban areas generally had higher completion rates in the more advanced math and science courses, compared with their peers from schools in towns and rural areas. For example, the percentage of graduates who had completed calculus was highest for those from schools in suburban areas (19 percent), followed by those from schools in

cities (16 percent). The completion rate in calculus was lower for graduates from schools in towns and rural areas (both 12 percent). The percentage of graduates who had completed biology, chemistry, and physics was highest for those from schools in cities (41 percent), followed by those from schools in suburban areas (37 percent), rural areas (28 percent), and towns (23 percent).

Figure 7. Average National Assessment of Educational Progress (NAEP) mathematics scale score of high school graduates at grade 12, by race/ethnicity and selected highest mathematics course completed in high school: 2019



‡ Reporting standards not met (too few cases for a reliable estimate).

¹ Includes courses that taught both algebra II and trigonometry.

NOTE: Completion of a mathematics course means that the graduate earned credits in a mathematics course within the category. It differs from graduates who took a course but did not pass or complete the course. The National Assessment of Educational Progress (NAEP) mathematics assessment scale score ranges from 0 to 300. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate's transcript contained 16 or more Carnegie credits, and (5) the graduate's transcript contained at least 1 Carnegie credit in English courses. Race categories exclude persons of Hispanic ethnicity. Although rounded numbers are displayed, the figures are based on unrounded data.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, table 222.40.

In 2019, high school graduates who had completed higher levels of mathematics courses also had higher average scale scores on the NAEP 12th-grade mathematics assessment. For example, graduates who had completed only algebra I or below had an average scale score of 112 (on a scale of 0-300), compared with a score of 136 among those whose highest mathematics course completed was algebra II and a score of 192 among those whose highest mathematics course completed was calculus. These patterns held across all racial/ethnic groups with available data.

In 2019, there were gaps in achievement on the NAEP 12th-grade assessments across demographic subgroups. These gaps differed when considering only graduates who

completed the same level of mathematics coursework. For example, for graduates who had completed calculus, the average scale score was higher for males than for females (196 vs. 187). This gender gap for graduates who had completed calculus (9 points) was larger than the average gap for all 12th-grade students (3 points).⁷ In contrast, racial/ethnic gaps in NAEP scores were smaller for graduates who had completed calculus than for all 12th-grade students. Average scale scores for those who had completed calculus were higher for Asian graduates (201), graduates of Two or more races (198), and White graduates (194) than for Hispanic and Black graduates (179 and 177, respectively). The range of scores across these groups was about 25 points, compared with 46 points when considering all 12th-grade students.

Endnotes:

¹ For a high school graduate to be included in the analyses of this indicator, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the NAEP and HSTS assessment year, (4) the graduate's transcript contained 16 or more Carnegie credits, and (5) the graduate's transcript contained at least 1 Carnegie credit in English courses.

² Completion of a course means that the graduate earned credits in a course within the category. It differs from graduates who took a course but did not pass or complete it.

³ Includes courses that are generally taken before or with algebra I. Occupational and technical mathematics courses may cover basic elements of algebra and geometry.

⁴ Includes courses such as discrete and finite mathematics.

⁵ Includes astronomy, geology, and marine science courses.

⁶ Includes general life science and physical science courses.

⁷ Data on the achievement gap for all 12th-grade students include all 12th-grade students who participated in the National Assessment of Educational Progress (NAEP). The High School Transcript Study (HSTS) was conducted in conjunction with NAEP, but only a subset of NAEP participants were included in the HSTS. For instance, only 12th-grade students who graduated in the year of the study were included in the HSTS. Thus, data on the achievement gap for graduates who had completed a certain level of mathematics coursework only include those who participated in both NAEP and HSTS. Readers are encouraged to keep these differences between the NAEP and HSTS samples in mind when interpreting the current paragraph.

Reference tables: *Digest of Education Statistics 2021*, tables 222.40, 225.40, and 225.45; *Digest of Education Statistics 2020*, table 222.10

Related indicators and resources: [A Closer Look at High School Students in the United States Over the Last 20 Years](#) [*The Condition of Education 2012 Spotlight*]

Glossary: Free or reduced-price lunch; Locale codes; Private school; Public school or institution; Racial/ethnic group