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Contact: David Sweet
(301) 254-7351

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SCIENCE AND MATHEMATICS EDUCATION IN AMERICAN HIGH SCHOOLS: RESULTS FROM THE HIGH SCHOOL AND BEYOND STUDY

Introduction

In its report, Educating Americans for the 21st Century,[1] the National Science Board Commission on Precollege Education in Mathmatics, Science and Technology states that "far too many emerge from the Nation's elementary and secondary schools with inadequate grounding in mathematics, science and technology." It also states that "students in our Nation's schools are learning less mathematics, science and technology" than students in other developed countries. A similar concern also is stated in the report, A Nation at Risk, prepared by the National Commission on Excellence in Education (NCEE).

A recent analysis of high school transcript data gives further reason for concern about insufficient coursework in mathematics and science among American high school students. For example, only 46 percent of the graduates in 1982 took 3 or more years of mathematics and only 30 percent took 3 or more years of science.[2] Furthermore, the percentages of students who took high-level courses in either of these fields were generally small--algebra II, 31 percent; advanced algebra, 8 percent; trigonometry, 7 percent; calculus, 6 percent; other advanced mathematics, 13 percent; advanced biology, 8 percent; advanced chemistry, 4 percent; and advanced physics, 1 percent. (See appendix tables.)

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[1] The National Science Board Commission on Precollege Education in Mathematics, Science and Technology, Educating Americans for the 21st Century. Washington D.C.: National Science Foundation, 1983, p. 1.

[2] Throughout this report percentages are rounded in the text but expressed to 1 decimal point in the table. Detailed statistics are presented in subsequent sections.

These and other findings are based on an analysis of over 12,000 transcripts from a sample of 1982 high school graduates.[3] The transcripts were collected as part of High School and Beyond (HS&B), a national longitudinal study of high school sophomores and seniors of 1980, sponsored by the National Center for Education Statistics (NCES). Specifics about the classification of courses, the data base, and the reliability of the estimates are presented in the technical notes at the end of this bulletin. Additional research findings from other studies are also presented where appropriate.

The analysis produced four statistics: the average number of years of science and mathematics; the percentages of students who had taken 3 or more years each of science and mathematics; the percentages of students who had earned credits in specific science and mathematics courses; and student attitudes toward mathematics. All statistics were computed for the total sample of 1982 high school graduates and for subgroups defined by sex, race/ethnicity, high school program, socioeconomic status (SES), school type, educational aspiration, and geographic region. Major findings are summarized and discussed in the text while detailed statistics for subgroups are presented in the appendix. Readers should note that this analysis reviewed only the "quantity" of courses taken in high school; there was no measure of the "quality" of these courses.

Average Number of Years of Science and Mathematics

The 1982 high school graduates on the average took 2.2 years of science and 2.7 years of mathematics during their 4 years of high school.[4] Students in academic programs, as expected, took more years of both science and mathematics than did students in general or vocational programs: 2.9 vs. 2.1 and 1.7 for science, and 3.3 vs. 2.5 and 2.2 for mathematics (figure 1).[5]

The number of years of mathematics and science taken by 1982 high school graduates also varied by student background and other characteristics (table A-1). Students who planned to obtain at least a 4-year college degree had about 1 more year of science and 1 more year of mathematics than did other students. Asian-American and white students took more years of science and mathematics than did black, American Indian or Hispanic students: 2.7 and 2.3 vs. 2.1, 2.0 and 1.9 years of science, and 3.2 and 2.7 vs. 2.6, 2.3 and 2.4 years of mathematics, respectively. Students from higher SES backgrounds also took

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[3]This sample was derived from a national probability sample of the 1980 sophomores who graduated in 1982.

[4]In this report, 1 year of work is equivalent to 1.0 Carnegie credit unit. A Carnegie unit generally requires a minimum of 200 minutes per week for a regular class and 275 minutes per week for a lab class for 36 weeks.

[5]All group classification variables except school type and geographic region are based on student self-reports in 1980. Group differences cited in the text are statistically significant at the 0.05 level on the basis of two-tailed t tests.

more courses than did students of lower SES; 2.7, 2.2 and 1.9 years of science and 3.1, 2.6 and 2.3 years of mathematics, respectively, for high, middle, and low SES. Furthermore, students from Catholic schools took slightly more years of both science and mathematics than did students from public schools.[6] Students in New England and Mid-Atlantic States took more years of science and mathematics than did students in some other regions. Male students overall took slightly more years of mathematics or science than did female students.

Percentage of 1982 Graduates Who Had 3 or More Years of Coursework in Science and Mathematics

American high school students had substantially less coursework in science and mathematics than did students in such highly developed countries as Japan, West Germany, and the U.S.S.R. In those countries, all students took at least one course each in science and mathematics each year in the upper secondary school.[7] In the American high school, however, students were not required to do so. School districts on the average required 1.7 credits in mathematics and 1.6 credits in science for graduation.[8]

As shown in figure 2 and table A-2, only about 30 percent of the 1982 graduates took 3 or more years of science and about 46 percent took 3 or more years of mathematics during their 4 years of high school. Even among the academic program students, only 54 percent met the requirement for 3 years of science recommended by the NCEE, while 73 percent met the recommended 3 years of mathematics. For the general and vocational program students, the percentages were much lower. In science, the percentages were 19 and 9, respectively, for general and vocational students; and in mathematics, the percentages were 32 and 23, respectively (figure 2).

Differences in the amount of coursework taken by students of varying backgrounds are quite evident. Details are shown in table A-2. Students who planned to obtain at least a 4-year college degree and students from high SES families were more likely than other students to have had 3 or more years years each of science and mathematics. Asian Americans were more likely than other racial/ethnic groups to take 3 or more years of science and mathematics (45 percent in science and 68 percent in mathematics), followed by whites (34 percent in science and 50 percent in mathematics). Students from private

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[6]This difference may reflect the fact that proportionally there are more academic program students in private schools than in public schools; 75 vs. 35 percent, respectively, for Catholic and public schools.

[7]The National Science Board Commission on Precollege Education in Mathematics, Science and Technology, Educating Americans for the 21st Century. Washington D.C.: National Science Foundation, 1983.

[8]Wright, D., "School District Survey of Academic Requirements and Achievement," National Center for Education Statistics bulletin NCES 83-210, April 1983.

schools also were more likely to take 3 or more years each in science and mathematics than were students from public schools. Furthermore, students in the New England and the Middle Atlantic regions were more likely than students from other regions to take 3 or more years of science and mathematics.

Percentages of Students Who Earned Credits in Specific Science and Mathematics Courses

Unlike the schools in many other countries, schools in the United States offer a variety of curricula to meet students' individual needs. In an attempt to classify secondary school curricula, NCES identified 47 different mathematics courses, 32 life science courses, 35 physical science courses, and 4 unified science courses from school course catalogs.[9] For simplification, courses were grouped into a few categories in this analysis. These categories and the specific courses in each category are described in the technical notes.

a. Sciences

Percentages of students who earned credits in each specific science course were generally low. Only basic biology enrolled more than 70 percent of the students. Other basic courses such as chemistry I and physics I each enrolled less than one-fourth of the students (24 and 11 percent, respectively). Although unified sciences enrolled about 28 percent of the students and general sciences enrolled 30 percent, these courses are generally considered introductory level courses (figures 3 and 4, and tables A-3 and A-4).

Percentages of students who took advanced science courses were even lower; 8 percent in advanced biology, 4 percent in advanced chemistry, and slightly over 1 percent in advanced physics.

Courses taken in high school, to a large extent, are determined by the type of program in which students are enrolled. Academic program students were more likely than others to have earned credits in basic biology, advanced biology, chemistry I, advanced chemistry, physics I, and advanced physics. General and vocational program students were at least as likely as academic program students to have taken unified sciences, general physical sciences, and geology (figure 5).

This analysis also examined differences among various subgroups with regard to taking specific courses. Detailed results are shown in tables A-3 and A-4. Again it was foumd that high SES students and students with higher educational plans were more likely than others to have taken basic and advanced science

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[9]Evaluation Technologies, Inc., A Classfication of Secondary School Courses. A report prepared for the National Center for Education Statistics under Contract No. 300-81-0312, July 1982.

courses. Male students were more likely than female students to have taken physics, and Asian-American and white students were more likely than black, or Hispanic students to have taken basic physics and chemistry.

b. Mathematics

Except for algebra I, which was taken by 63 percent of the students, mathematics courses generally enrolled only a moderate or small percentage of the students. Geometry was taken by about 48 percent of the students; algebra II by 31 percent; advanced algebra by 8 percent; trigonometry by 7 percent; calculus by 6 percent; and other advanced mathematics by 13 percent. Statistics was taken by only 1 percent of the students (figure 6).

As was true of science courses, the tendency to take mathematics courses was related to high school program. Each of the mathematics courses examined (except general mathematics and pre-algebra) was taken by substantially more academic program students than by students in other programs (table A-5). High SES students and students with high educational aspirations were more likely to have taken advanced courses than students of low SES or low aspirations.

Differences in the tendency to take specific mathematics courses by sex were not clear. Although data show that more males than females took advanced courses, the differences were not statistically significant except for trigonometry (9 vs. 6 percent).

Student Attitudes Toward Mathematics

Student attitudes toward mathematics may partially explain why so little high school mathematics was taken. During the base-year survey in spring 1980, students were asked to indicate whether mathematics was interesting and/or useful to them. Tabulations of their responses are presented in table A-6. (It should be noted that no similar data with respect to sciences were collected.)

Over 59 percent of the students reported that mathematics would be useful to them in the future, but only about 32 percent reported that they found mathematics interesting. There was no significant difference in the percentages of males and females who considered mathematics useful or interesting.

Ratings of usefulness and interest are consistent with the patterns of coursetaking. Specifically, the groups that had more coursework in mathematics were more likely to rate this subject as useful and interesting than were groups with fewer courses. For example, high SES students were more likely than low SES students to rate mathematics as useful and interesting. Similarly, academic program students were more likely to do so than were general and vocational program students.

Technical Notes

Classification of Courses

All courses in each transcript were assigned a 6-digit code based on a Classification of Secondary School Courses (CSSC), developed under a contract with NCES in July 1982. The number of credits earned in each course was expressed in Carnegie units. A Carnegie unit requires a minimum of 200 minutes per week for a regular class and 275 minutes per week for a lab class for 36 weeks. However, some schools may require more time for a unit. In a section of this bulletin, years of coursework were used in the analysis. A year's work is equivalent to 1.0 Carnegie unit.

As mentioned earlier, there were 47 courses in mathematics, 32 courses in life science, 35 courses in physical sciences, and 4 courses in unified sciences identified from school course catalogs. To simplify the presentation of meaningful information, the courses were further grouped into categories as shown on pages 8 and 9.

It should be noted that this analysis used fairly liberal criteria in deciding whether the courses taken by students were in fact mathematics or science courses. Any course that had mathematics or science as its primary course content was included in the analysis. However, it is possible that some courses were excluded that would have been included if a still more liberal interpretation of course content had been made. For example, courses which were primarily vocational and made no mention of mathematics or science in the course title or description were excluded, although portions of such courses might well contain materials relating to mathematics and/or science.

Sample Size

HS&B base-year data were collected in 1980 from over 30,000 sophomores and 28,000 seniors in 1,015 public and private schools across the Nation. As part of the first follow-up survey, transcripts were requested in fall 1982 for a subsample of 18,152 members of the sophomore cohort. A total of 15,941 transcripts were actually obtained. The number of these that were complete and that indicated graduation in 1982 was 12,116, the number used in the analysis reported here. Sample sizes for the specific subgroups used in this bulletin are presented in table A-1.

Examinations of questionnaire information (such as grade point average, SES, and educational aspirations) on the 2,211 students without transcripts suggests that the absence of their transcript data actually makes the percentages of students who took various science and mathematics courses higher than they otherwise would have been. Had their transcripts been available and included, the percentages would be even smaller.

Of the 15,941 transcripts obtained, 1,969 were excluded from this study of high school graduates because the students had dropped out of school before graduation. Of the remaining 13,972 transcripts, 799 were excluded because they were incomplete. Analysis of student background characteristics suggests that, had their transcripts been included in the tabulations, the percentages would again be smaller.

Finally, 1,057 transcripts were excluded either because the student graduated before 1982 (83 cases) or because the transcript failed to indicate either dropout status or graduation (974 cases). Again, background data suggest that the presence of data from these individuals would have lowered the percentages still further.

Standard Errors and Statistical Significance Testing

The approximate standard error of a percentage (p) in this report can be obtained by $s.e.(p) = D(p(100-p)/n)^{1/2}$ where n is the sample size and D is a correction factor estimated to be 2.0. To contrast two subpopulation percentages, $d=p_1 - p_2$, the standard error of the difference, s.e.(d), may be approximated by taking the square root of the sum of the squares of the standard errors for p_1 and p_2; that is, $s.e.(d) = (s.e.(p_1)^2 + s.e.(p_2)^2)^{1/2}$. The approximation will be conservative because of the exclusion of the covariance term for p_1 and p_2 in the estimation formula.

Group differences cited in the text are statistically significant at the 0.05 level on the basis of two-tailed t tests unless otherwise noted.

For More Information

This bulletin was prepared by Samuel S. Peng, Jeffrey A. Owings, and William B. Fetters of the Division of Multilevel Education Statistics. For more information about this bulletin, contact the authors at the National Center for Education Statistics (NCES), 400 Maryland Avenue SW., Washington, D.C. 20202, telephone (202) 254-7351.

Additional information about the High School and Beyond Survey (HS&B) is available from David A. Sweet and C. Dennis Carroll, National Center for Education Statistics (Brown Building, Room 609), 400 Maryland Avenue SW., Washington, D.C. 20202, telephone (202) 254-7230.

Categories of Life Science

Basic biology
Biology,basic; biology, general; biology,college preparatory

Advanced biology
Biology, advanced; genetics; biology seminar

Other general biology
Science 7; biology, other general; field biology; biopsychology

Biochemistry and biophysics
Biochemistry; biochemistry and biophysics

Botany
Botany; botany, other

Zoology
Zoology; zoology,vertebrate; zoology, invertebrate; animal behavior; human physiology; advanced physiology; pathology; zoology, other

Other life sciences
Cell biology; cell and molecular biology, other; microbiology; microbiology, other; ecology; marine biology; marine biology, advanced; anatomy; miscellaneous specialized areas; life science, other

Categories of Physical Sciences

General physical sciences
Science 8; science 9; chemistry and physics laboratory techniques; physical science, applied; general physical sciences, other

Chemistry I
Chemistry I

Chemistry II/advanced chemistry
Chemistry II; organic chemistry; physical chemistry; chemistry, independent study

Other general chemistry
Consumer chemistry; chemistry, other; chemistry, introductory

Geology
Earth science; earth science, college preparatory; geology; mineralogy; geological sciences, other

Physics I
Physics I

Physics II/advanced physics
Physics II; physics II without calculus

Other general physics
Physics, general; electricity and electronics science; acoustics; physics, other

Other physical sciences
Astronomy; astronomy, other; astrophysics, other; meteorology; atmospheric sciences and meteorology, other; oceanography; miscellaneous physical sciences, other; rocketry and space science; planetary science, other; physical sciences, other

Unified sciences
Unified sciences; independent science study; outdoor education; biological and physical sciences, other

Categories of Mathematics

General and applied mathematics
Mathematics 7; mathematics 7, accelerated; mathematics 8; mathematics 8, accelerated; mathematics, basic; mathematics I, general; mathematics II, general; science mathematics; mathematics in the arts; mathematics, vocational; technical mathematics; mathematics review; mathematics tutoring; consumer mathematics; mathematics, other general; actuarial sciences,

other; applied mathematics, other

Pre-algebra

Pre-algebra; mathematics I, unified; pure mathematics, other

Algebra I

Algebra I, part 1; algebra I, part 2; algebra I

Algebra II

Algebra II

Advanced algebra/linear algebra

Algebra III; linear algebra

Geometry

Geometry, plane; geometry, solid; geometry; geometry, informal

Trigonometry

Trigonometry

Calculus

Calculus and analytic geometry; calculus; calculus, advanced placement

Other advanced mathematics

Analytic geometry; trignometry and solid geometry; algebra and trigonometry; algebra and analytic geometry; analysis, introductory; mathematics, independent study

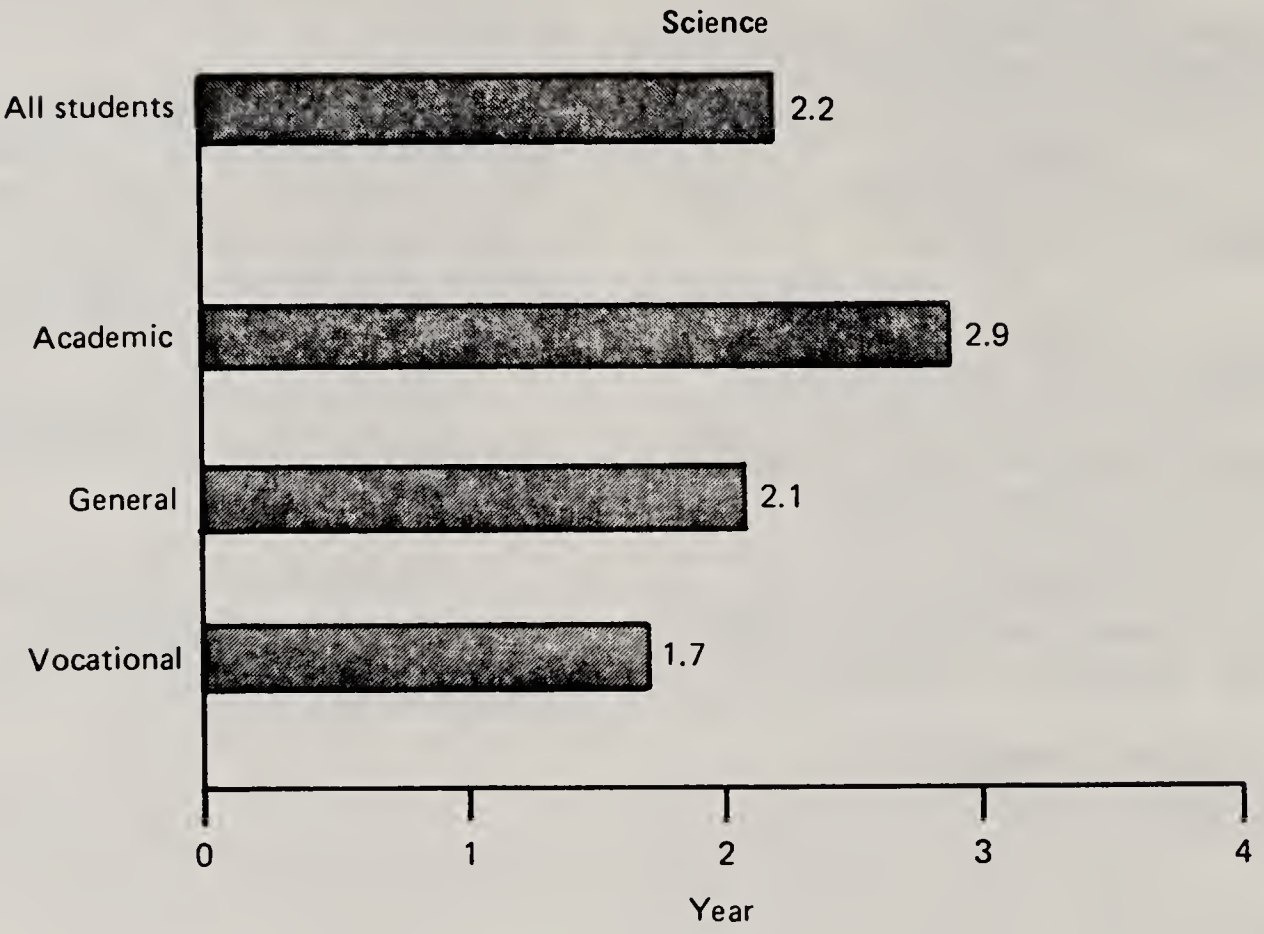
Unified mathematics II & III

Mathematics II, unified; mathematics III, unified

Probability and statistics

Statistics, probability; probability and statistics; statistics, other

Figure 1.— Average number of years of science and mathematics taken by 1980 sophomores who graduated in 1982, by high school program



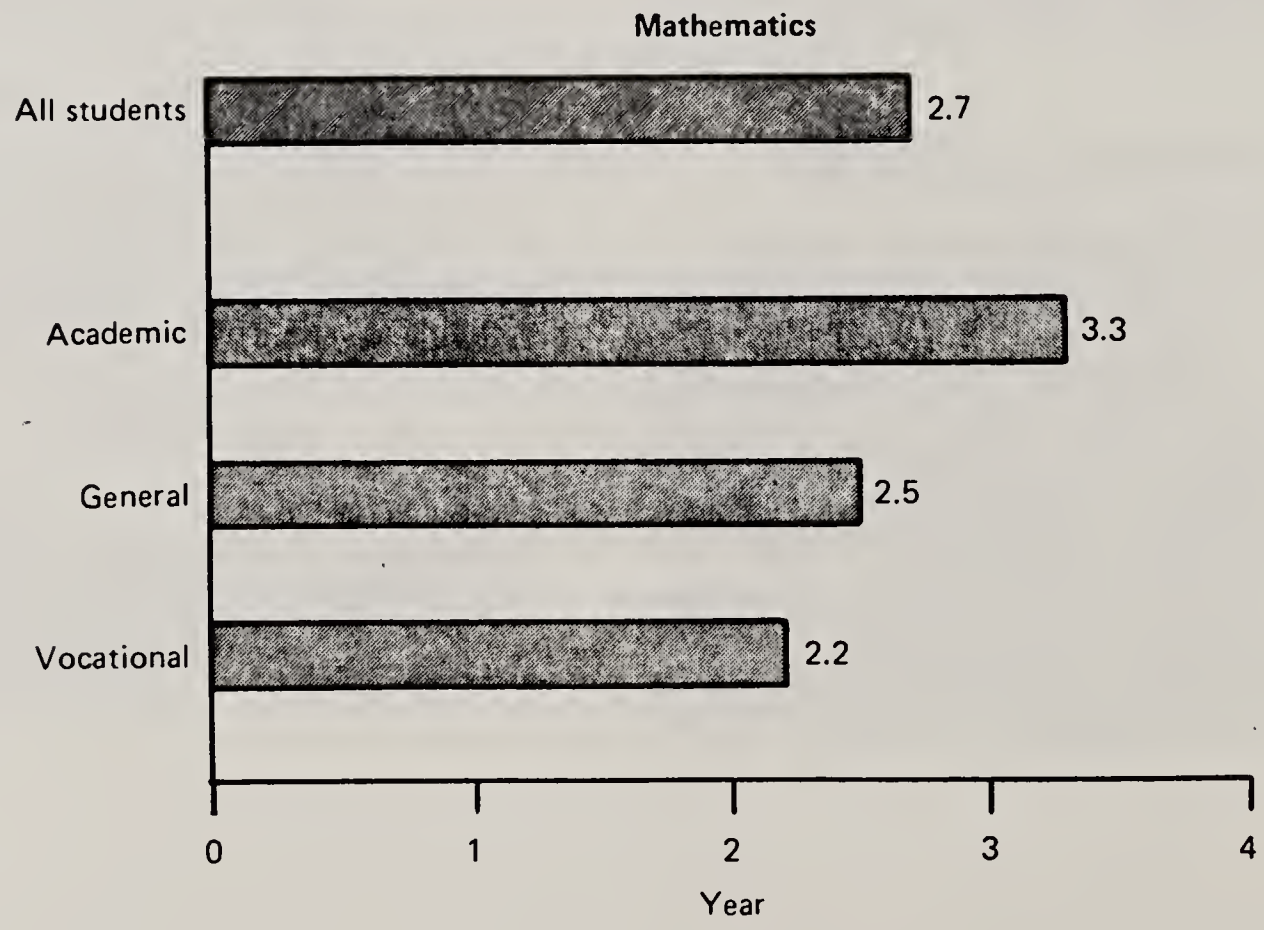
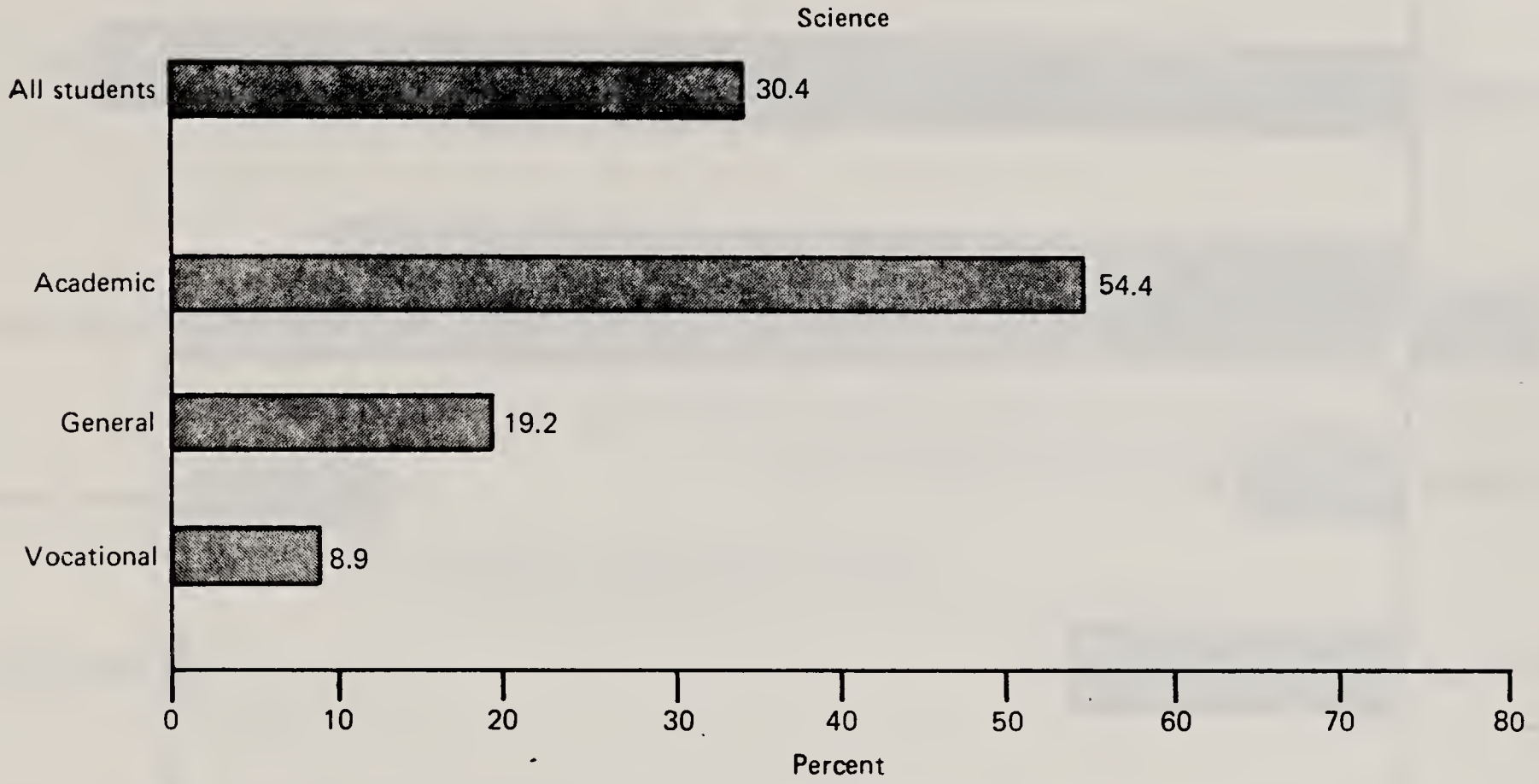


Figure 2.— Percentages of 1980 sophomores graduating in 1982 who took at least 3 years of mathematics and science, by high school program



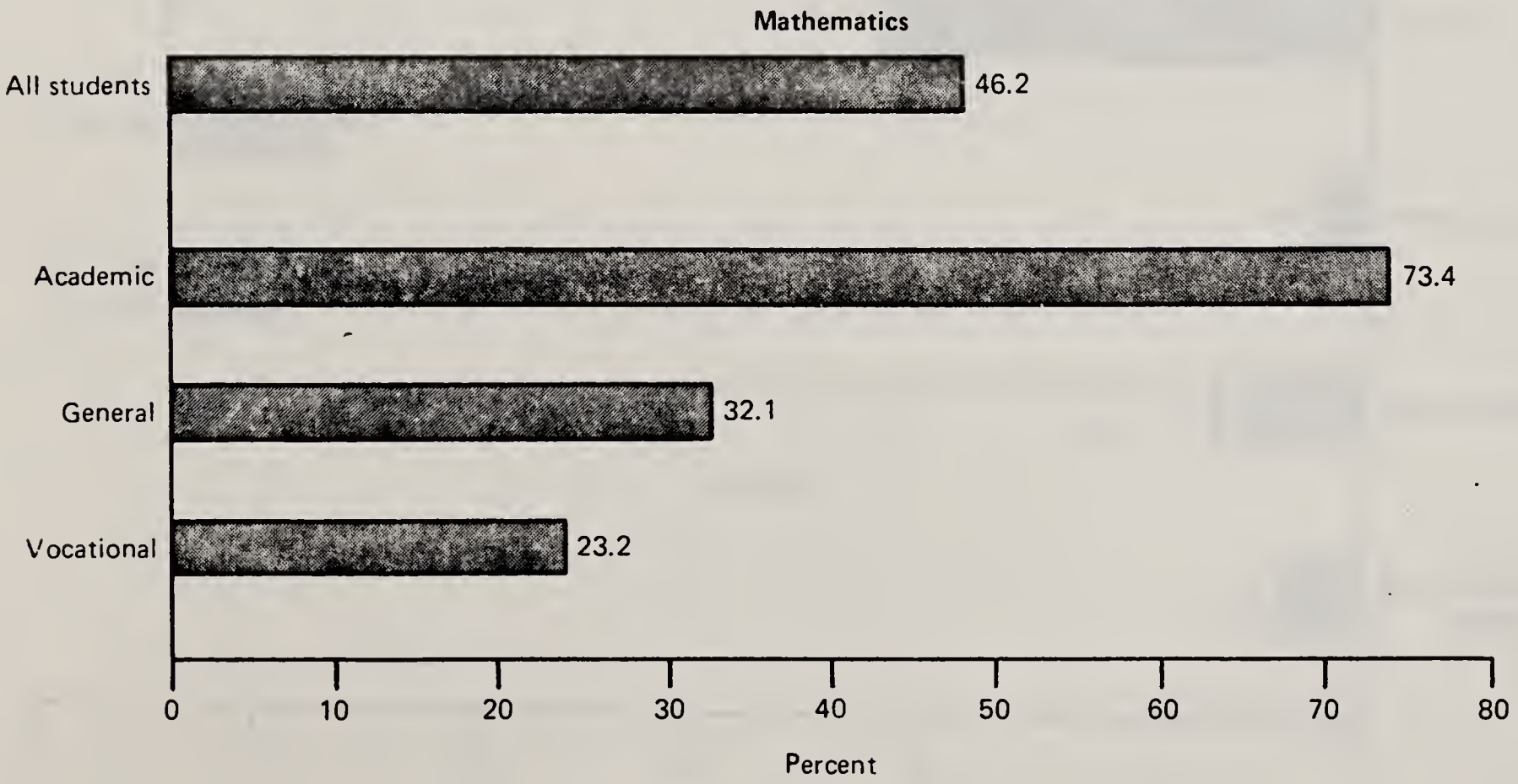


Figure 3.— Percentages of 1980 sophomores graduating in 1982 who took various physical science courses

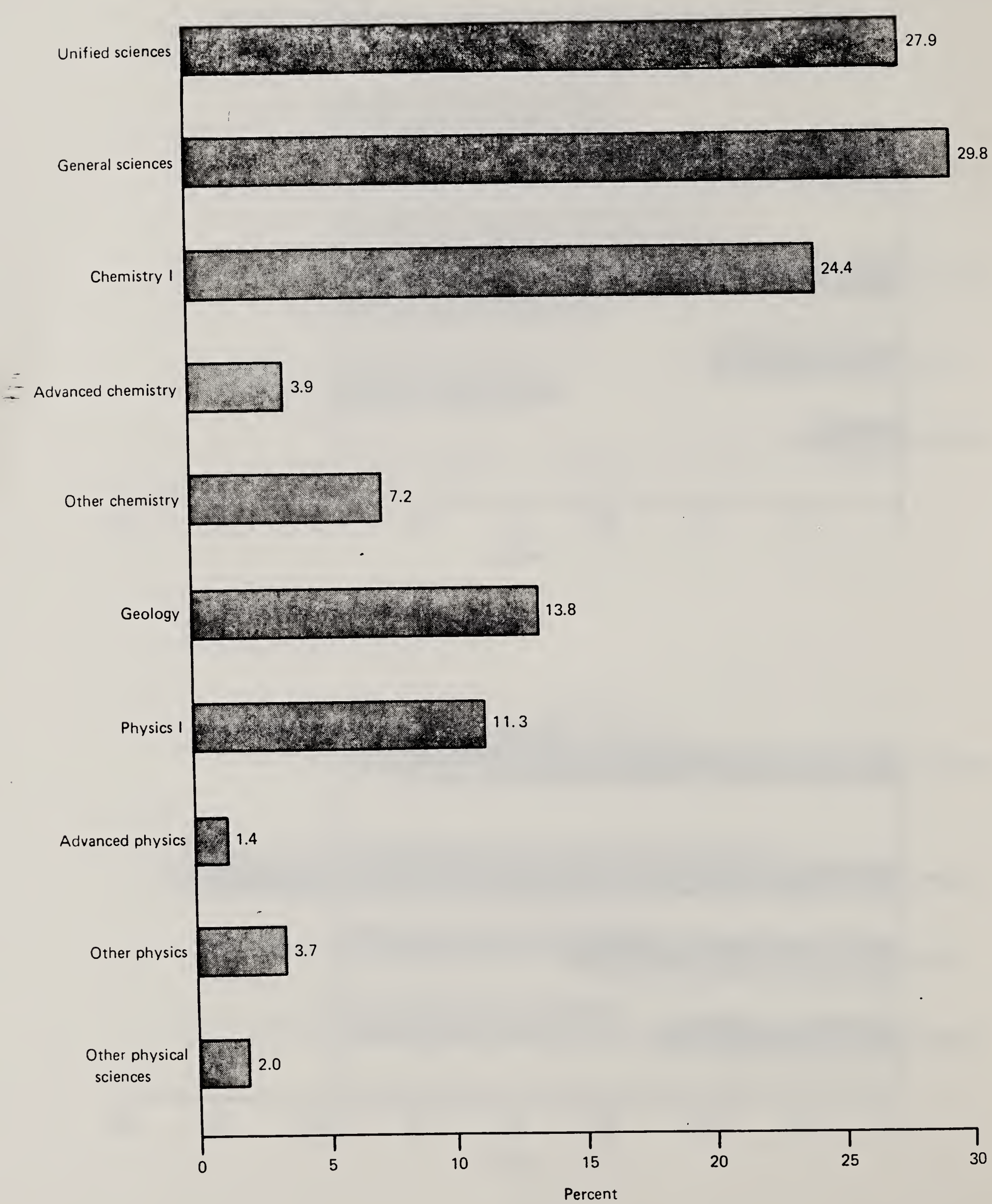


Figure 4.— Percentage of 1980 sophomores graduating in 1982 who took various life science courses

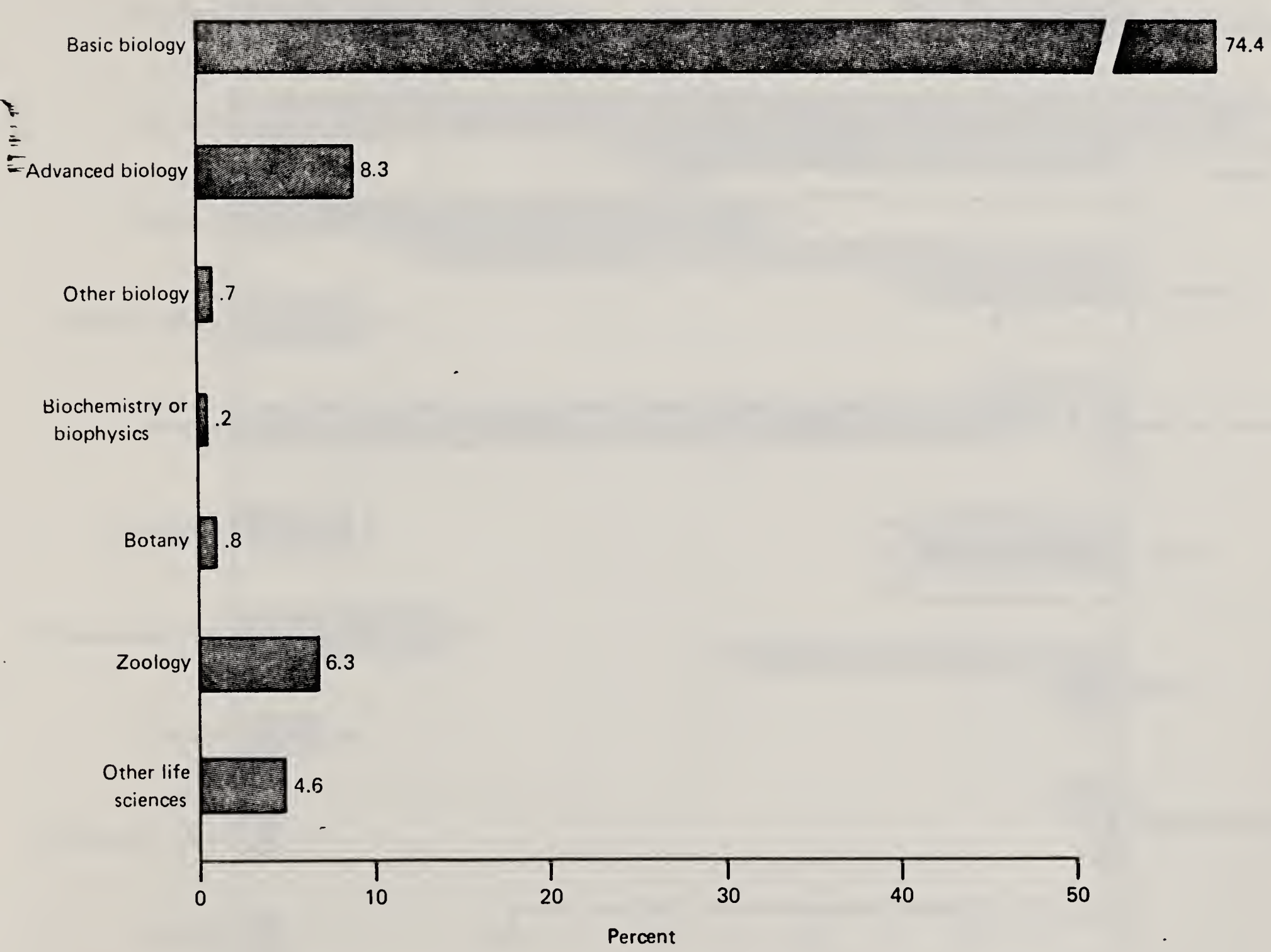


Figure 5.— Percentages of 1980 sophomores graduating in 1982 who took specific science courses, by high school program

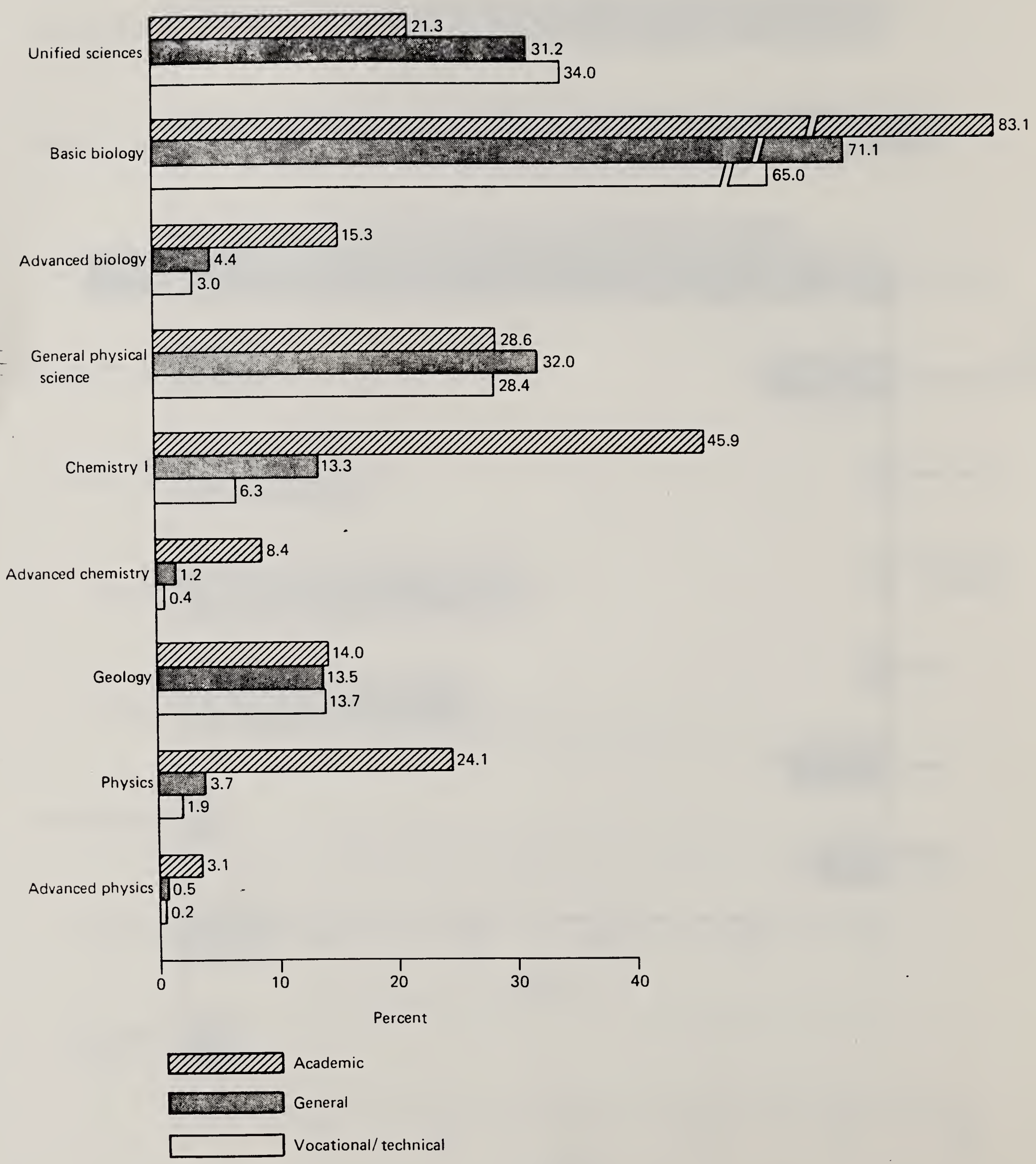


Figure 6.— Percentages of 1980 sophomores graduating in 1982 who took specific mathematics courses

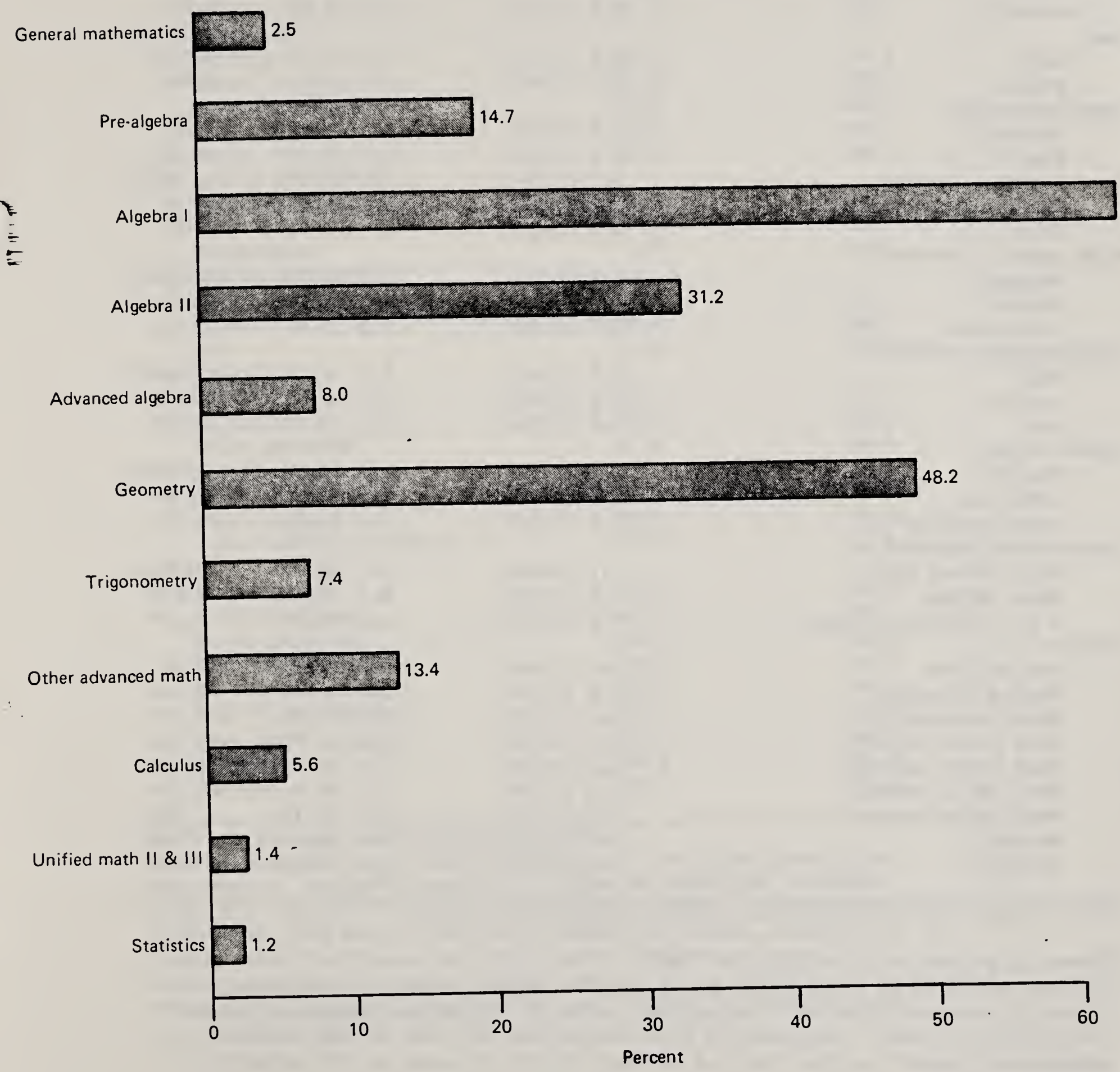


Table A-1.--Average number of years of science and mathematics taken by 1980 sophomores who graduated in 1982, by selected characteristics

Subgroup	Science	Mathematics	Sample size
All students	2.2 (0.02)	2.7 (0.02)	12,116
Sex:			
Male	2.4 (0.04)	2.7 (0.04)	5,914
Female	2.1 (0.02)	2.6 (0.02)	6,202
Race/ethnicity:			
Hispanic	1.9 (0.04)	2.4 (0.04)	2,420
Black	2.1 (0.05)	2.6 (0.05)	1,599
American Indian	2.0 (0.10)	2.3 (0.11)	173
Asian American	2.7 (0.06)	3.2 (0.09)	327
White	2.3 (0.03)	2.7 (0.02)	7,497
High school program:[1]			
Academic	2.9 (0.05)	3.3 (0.04)	5,356
General	2.1 (0.03)	2.5 (0.02)	3,710
Vocational	1.7 (0.04)	2.2 (0.03)	2,744
Socioeconomic status:[2]			
High	2.7 (0.04)	3.1 (0.04)	3,069
Middle	2.2 (0.03)	2.6 (0.03)	5,206
Low	1.9 (0.03)	2.3 (0.02)	2,542
School type:			
Public	2.2 (0.02)	2.6 (0.02)	9,166
Catholic	2.5 (0.07)	3.3 (0.08)	2,197
Other private[3]	2.6 (0.21)	3.1 (0.21)	753
Educational aspiration:			
High school only	1.7 (0.04)	2.1 (0.03)	1,848
Some college	1.9 (0.02)	2.4 (0.02)	4,039
4 yr. college or more	2.8 (0.03)	3.2 (0.04)	5,449
Region:			
New England	2.6 (0.09)	3.0 (0.08)	623
Middle Atlantic	2.6 (0.07)	2.9 (0.06)	2,154
South Atlantic	2.3 (0.05)	2.7 (0.05)	1,673
East South Central	2.2 (0.08)	2.5 (0.04)	562
West South Central	2.3 (0.12)	2.8 (0.12)	1,334
East North Central	2.0 (0.00)	2.5 (0.05)	2,571
West North Central	2.3 (0.13)	2.7 (0.13)	901
Mountain	2.1 (0.05)	2.4 (0.04)	543
Pacific	1.8 (0.06)	2.6 (0.05)	1,755

Note.--Figures in parenthese are standard errors.

[1]Based on student self-reports in 1980.

[2]SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3]Estimates for this type of school are not as accurate as those from other types of schools because of small sample size and a high non-response rate.

Table A-2.--Percentage of 1980 sophomores graduating in 1982 who took at least 3 years of mathematics and science, by selected subgroups

Subgroup	Science	Mathematics
All students	30.4	46.2
Sex:		
Male	33.3	47.5
Female	27.7	45.0
Race/ethnicity:		
Hispanic	16.0	31.4
Black	22.9	38.5
American Indian	16.0	28.6
Asian American	45.2	68.1
White	33.7	49.5
High school program:[1]		
Academic	54.4	73.4
General	19.2	32.1
Vocational	8.9	23.2
Socioeconomic status:[2]		
High	46.1	66.4
Middle	29.2	44.5
Low	17.6	30.2
School type:		
Public	28.7	43.2
Catholic	43.4	73.9
Other private[3]	47.4	66.0
Educational aspiration:		
High school only	12.4	20.3
Some college	19.3	33.2
4 yr. college or more	49.9	71.4
Region:		
New England	45.5	65.3
Middle Atlantic	45.5	55.1
South Atlantic	30.5	48.8
East South Central	26.9	40.8
West South Central	25.4	43.6
East North Central	27.0	40.6
West North Central	29.7	46.2
Mountain	22.2	30.8
Pacific	18.0	41.8

[1]Based on student self-reports in 1980.

[2]SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3]Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

Table A-3.--Percentages of 1980 sophomores graduating in 1982 who took specific physical science courses, by selected background characteristics.

Subgroup	General sciences	Chemistry I	Advanced chemistry	Other chemistry	Geology	Physics I	Advanced physics	Other physics	Other sciences	Unified science
All students	29.8	24.4	3.9	7.2	13.8	11.3	1.4	3.7	2.0	27.9
Sex:										
Male	29.8	24.7	4.6	7.9	15.0	14.5	2.0	5.3	2.3	29.6
Female	29.8	24.0	3.2	6.6	12.8	8.4	0.9	2.1	1.8	26.3
Race/ethnicity:										
Hispanic	34.0	12.9	1.7	3.3	11.9	4.9	0.5	1.2	1.4	30.7
Black	32.8	18.6	2.2	5.7	10.8	5.5	1.1	1.9	2.1	33.8
American Indian	30.4	17.1	2.1	19.8	8.8	7.1	0.0	6.0	0.0	29.9
Asian American	24.0	40.9	7.5	13.8	9.2	26.8	4.9	8.0	2.0	16.7
White	28.9	26.8	4.4	7.8	14.6	12.9	1.6	4.2	2.1	26.8
High school program:[1]										
Academic	28.6	45.9	8.4	11.9	14.0	24.1	3.1	6.5	2.4	21.3
General	32.0	13.3	1.2	5.5	13.5	3.7	0.5	2.4	1.7	31.2
Vocational	28.4	6.3	0.4	2.6	13.7	1.9	0.2	1.1	1.7	34.0
Socioeconomic status:[2]										
High	30.5	40.1	7.5	9.8	13.0	21.4	2.7	5.8	2.3	22.1
Middle	29.2	22.5	3.3	7.3	14.7	9.8	1.3	3.6	2.0	27.1
Low	30.4	13.4	1.5	4.1	12.4	4.0	0.5	1.6	1.7	36.2
School type:										
Public	28.3	23.1	3.5	7.0	14.7	10.5	1.3	3.8	2.2	29.3
Catholic	34.3	36.3	6.8	13.5	6.7	16.4	2.0	4.9	0.5	13.0
Other private[3]	43.2	35.6	9.7	6.3	14.5	24.1	3.7	2.3	2.5	23.5
Educational/aspirations:										
High school only	31.2	7.0	1.0	3.0	14.5	2.4	0.2	1.6	2.1	33.8
Some college	30.5	13.9	1.3	5.8	13.7	4.0	0.6	2.5	1.9	29.2
4 yr college or more	28.6	43.4	7.8	10.7	13.1	22.9	2.8	5.9	2.1	23.7
Region:										
New England	23.3	31.0	9.5	13.6	23.1	18.9	3.0	0.3	1.6	20.3
Middle Atlantic	26.7	29.5	6.5	10.4	22.0	17.7	2.3	0.6	1.7	34.0
South Atlantic	31.2	25.2	3.0	6.2	16.2	8.8	1.2	0.3	5.1	25.9
East South Central	31.1	19.8	1.6	5.4	4.7	8.7	0.1	0.2	0.0	44.7
West South Central	60.0	22.0	1.2	1.4	4.6	6.4	0.4	0.1	0.6	26.3
East North Central	19.4	25.6	4.1	6.3	12.5	11.3	1.4	0.9	1.8	27.0
West North Central	39.3	22.0	2.1	11.5	9.6	10.5	1.7	0.7	0.9	25.7
Mountain	27.5	19.4	4.3	6.8	23.4	7.2	1.6	0.3	3.0	26.7
Pacific	22.5	18.1	2.3	5.9	8.2	9.7	1.0	0.3	1.8	24.1

[1]Based on student self-reports in 1980.

[2]SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3]Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

Table A-4.--Percentages of 1980 sophomores graduating in 1982 who took specific life science courses, by selected background characteristics

Subgroup	Basic biology	Advanced biology	Other biology	Biochemistry, biophysics	Botany	Zoology	Other life sciences
All students	74.4	8.3	0.7	0.2	0.8	6.3	4.6
Sex:							
Male	72.7	7.4	0.7	0.3	0.7	4.9	4.3
Female	76.1	9.2	0.8	0.1	0.9	7.6	4.8
Race/Ethnicity:							
Hispanic	69.1	4.6	0.6	0.1	0.4	4.8	3.2
Black	74.1	5.7	1.2	0.0	0.7	5.8	4.5
American Indian	65.4	6.3	1.0	0.4	0.4	1.3	2.1
Asian American	78.1	12.8	0.8	0.3	0.6	9.6	4.2
White	75.4	9.3	0.7	0.3	0.8	6.6	4.8
High school program:[1]							
Academic	83.1	15.3	1.0	0.5	1.1	9.4	6.0
General	71.7	4.4	0.6	([4])	0.6	4.9	4.1
Vocational/technical	65.0	3.0	0.5	([4])	0.6	3.5	3.3
Socioeconomic status:[2]							
High	80.9	13.2	0.9	0.6	1.1	8.4	5.4
Middle	74.7	7.8	0.7	0.1	0.7	6.4	4.9
Low	70.2	4.7	0.5	0.1	0.6	3.6	3.4
School Type:							
Public	72.5	8.8	0.8	0.2	0.7	6.3	4.1
Catholic	88.4	10.6	0.5	1.3	0.1	8.4	8.2
Other private[3]	89.4	13.9	0.7	0.0	0.5	5.2	3.9
Educational Aspirations:							
High school only	62.6	3.8	0.1	0.0	0.5	3.1	3.0
Some college	72.6	5.0	0.7	([4])	0.8	5.1	4.3
4 yr college or more	82.5	13.6	1.0	0.5	1.0	9.2	5.8
Region:							
New England	74.3	13.4	2.5	0.4	0.2	9.5	5.4
Middle Atlantic	73.1	10.4	0.8	0.3	0.1	3.0	4.6
South Atlantic	81.2	9.3	0.9	0.1	1.4	6.3	6.5
East South Central	71.1	6.6	0.0	0.0	0.3	4.4	3.9
West South Central	83.3	4.9	0.1	0.0	0.3	2.7	2.0
East North Central	67.7	10.1	0.5	0.6	1.4	7.8	4.8
West North Central	74.1	5.4	1.0	0.0	1.0	8.3	5.0
Mountain	74.4	6.2	0.9	0.0	1.4	8.4	3.5
Pacific	73.9	4.7	0.6	([4])	0.2	8.0	4.2

[1]Based on student self-reports in 1980.

[2]SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3]Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

[4] Less than 0.1.

Table A-5.--Percentages of 1980 sophomores graduating in 1982 who took specific mathematics courses, by selected background characteristics

Subgroup	General Math	Pre-Algebra	Algebra I	Algebra II	Advanced algebra	Geometry	Trigo-nometry	Other advanced	Calculus	Unified math II & III	Statistics
All students	2.5	14.7	63.2	31.2	8.0	48.2	7.4	13.4	5.6	1.4	1.2
Sex:											
Male	2.8	14.7	61.0	31.4	8.7	47.1	8.5	14.0	6.1	1.6	1.3
Female	2.2	14.7	65.2	30.9	7.3	49.3	6.3	12.8	5.0	1.2	1.1
Race/ethnicity:											
Hispanic	3.5	15.4	53.7	18.8	3.0	28.4	4.6	7.0	2.4	0.7	0.3
Black	3.0	18.2	53.2	22.2	5.1	33.3	3.6	5.4	2.0	0.7	0.5
American Indian	2.9	17.1	43.9	17.4	1.8	23.9	3.6	4.5	2.0	0.9	0.6
Asian American	5.6	15.3	65.0	44.2	17.0	67.5	15.6	29.5	14.8	1.7	1.8
White	2.2	14.0	66.4	34.4	9.0	53.4	8.3	15.4	6.4	1.5	1.4
High school program:[1]											
Academic	2.5	12.3	73.3	52.0	14.3	74.8	15.3	26.6	12.6	2.5	2.5
General	2.0	16.6	59.4	20.4	4.7	35.7	2.9	6.1	1.0	0.5	0.2
Vocational	3.2	15.7	52.9	13.2	2.0	24.3	1.5	3.1	0.5	0.6	0.3
Socioeconomic status:[2]											
High	2.3	14.9	71.7	44.5	13.7	69.5	12.8	25.1	11.4	2.5	2.0
Middle	2.2	13.5	65.7	31.7	7.4	49.0	6.9	11.8	4.4	1.3	0.9
Low	2.8	15.3	52.3	19.0	3.8	26.7	2.4	4.3	1.5	0.4	0.5
School Type:											
Public	2.5	15.0	60.6	29.3	7.7	44.9	7.0	12.0	4.8	1.5	1.0
Catholic	2.7	12.9	83.2	47.7	10.2	79.5	10.2	27.0	8.5	0.7	2.2
Other private[3]	1.2	11.3	74.7	43.0	17.9	70.9	11.7	23.5	23.9	([4])	3.3
Educational aspirations:											
High school only	2.7	14.5	46.5	12.4	3.0	20.1	1.0	2.2	1.4	0.8	0.3
Some college	2.4	16.6	61.7	22.0	4.4	36.8	3.9	5.6	1.4	0.5	0.6
4 yr college or more	2.4	13.3	73.8	49.6	14.0	73.4	13.9	26.4	11.7	2.5	2.1
Region:											
New England	2.3	10.4	63.3	53.5	6.9	63.8	11.8	19.5	14.7	1.7	3.4
Middle Atlantic	4.5	13.2	50.2	29.4	8.2	40.8	8.6	17.2	11.2	5.9	2.2
South Atlantic	2.3	13.0	60.1	34.7	5.7	44.7	7.9	9.8	3.9	0.6	0.5
East South Central	0.9	5.9	60.8	35.3	8.6	39.6	5.5	6.7	4.4	0.2	0.5
West South Central	0.6	16.0	73.1	34.7	4.7	42.5	9.0	8.1	1.7	([4])	0.1
East North Central	1.5	15.8	66.3	24.4	10.0	52.5	6.3	15.3	4.0	0.7	0.9
West North Central	3.4	12.7	71.9	30.5	11.1	57.7	5.7	14.8	2.3	0.3	2.5
Mountain	1.3	21.5	55.6	26.9	6.4	41.0	5.3	9.6	4.9	0.0	0.9
Pacific	4.0	20.4	68.3	26.6	8.4	51.8	6.1	13.9	4.4	0.2	0.2

[1]Based on student self-reports in 1980.

[2]SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3]Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.

[4]Less than 0.1.

Table A-6.--Attitudes towards mathematics of 1980 sophomores graduating in 1982, by selected background characteristics

Subgroup	Percentage of students judging mathematics to be:	
	Useful	Interesting
All students	59.3	32.4
Sex:		
Male	61.0	31.8
Female	57.7	33.0
Race/ethnicity:		
Hispanic	56.0	30.5
Black	57.0	30.5
American Indian	53.3	32.2
Asian American	66.6	36.1
White	60.2	33.1
High school program:[1]		
Academic	66.3	39.4
General	56.4	30.1
Vocational	56.2	27.1
Socioeconomic status:[2]		
High	64.7	35.8
Middle	59.2	32.3
Low	54.8	29.7
School type:		
Public	59.0	31.7
Catholic	64.2	38.8
Other private[3]	55.8	40.2
Educational aspiration:		
High school only	50.1	28.0
Some college	57.1	29.5
4 yr. college or more	68.3	39.0
Region:		
New England	58.9	34.7
Middle Atlantic	58.0	32.9
South Atlantic	61.5	32.5
East South Central	57.7	30.6
West South Central	56.8	30.6
East North Central	59.2	34.0
West North Central	60.0	33.2
Mountain	60.2	29.2
Pacific	60.3	31.3

[1]Based on student self-reports in 1980.

[2]SES was measured by a composite score of five equally-weighted components: father's education, mother's education, father's occupation, parental income and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted SES distribution.

[3]Estimates for this type of school may not be as accurate as those from other types of schools because of small sample size and a high non-response rate.