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ABSTRACT

The purpose of this study was to examine patterns with regard to six advanced high school mathematics courses 12th-grade students who took the American College Testing (ACT) assessment had taken between 1987 and 1997. Differences in performance on the ACT mathematics test were studied with respect to mathematics courses taken, gender, race/ethnicity, and family income. Also studied was how mathematics achievement varied by the number of mathematics courses taken. Five separate 10% systematic samples of ACT-tested 12th graders were selected in graduating classes as follows: (1) 1987, 50,779 students; (2) 1990, 52,076 students; (3) 1993, 56,749 students; (4) 1996, 57,775 students; and (5) 1997, 61,610 students. The evidence suggests that, overall, college-bound 12th graders are increasing mathematics course taking, and that the more mathematics courses students take, the higher their ACT mathematics scores. Students with higher course-taking averages tend to have higher ACT mathematics scores. Not all groups are increasing their mathematics course-taking at the same rate. Females, Blacks, Mexican Americans, and American Indian/Alaskan Natives made greater gains than others between 1987 and 1996. Students from families in the lower income level made some gains in the number of advanced mathematics courses taken, but such gains were more modest than the gains of those in the middle and higher groups. Mathematics course-taking accounted for most of the explained variance in students' achievement on the ACT mathematics test, regardless of the subgroup studied. (Contains 8 tables and 11 references.) (SLD)

Trends in High School Mathematics Course Taking and Achievement by Gender, Race/Ethnicity, and Class 1987-1997

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In 1996, a Newsweek article began, "In math, Americans finish way out of the money." (Wingert, December 2, 1996, p. 96). That depressing note added to the general litany of public despair over the performance in mathematics of U.S. youth—especially females, racial/ethnic minorities, and students from low income families—that despair, in varying degrees, has persisted at least since A Nation at Risk, 1983. The Council of Chief State School Officers' most recent study of state trends in science and mathematics education found that only 62% of 1996 high school graduates had taken the third year of high school mathematics (Blank & Langesen, 1997). While it may be true that achievement in mathematics has never been better, some say, there is ample room for improvement, especially for those students who are female, of selected racial/ethnic minority (i.e., Blacks, Hispanics, and American Indian/Alaskan Natives), or in a low family income level. income students (conversation with H.D. Hoover, Director, Iowa Testing Programs, spring 1997).

According to National Goal 5 (National Education Goals Report, 1995a), "By the year 2000, United States' students will be first in the world in mathematics and science achievement" (p. 12). Women and selected racial/ethnic minorities (Blacks, Hispanics, and American Indian/Alaskan Natives) are specifically mentioned in the various Goals reports in the context of the objective, "The number of United States undergraduate and graduate students, especially women and minorities, who complete degrees in mathematics, science, and engineering will increase significantly" (National Education Goals Panel, 1995b). Not explicitly mentioned in the Goals Report are children of low income families, but they are mentioned by the Children's Defense Fund and the National Coalition of Advocates for Students (Ekstrom, Goertz, & Rock, 1988). Children living in poverty have less access to educational activities and to learning materials (Oaken, 1990; National Science Foundation, 1996). These recent educational reform efforts have combined with a renewed interest in equity issues to increase mathematics course taking.

At the secondary school level, mathematics course taking is, in fact, increasing among females and underrepresented minorities (U.S. Department of Education, 1996). Intuitively, one expects an increase in mathematics course taking to parallel greater mathematics achievement. Among college-bound students, there are studies that support this trend (Noble, Crouse, Sawyer, & Gillespie, 1992; McLure, Sun, & Valiga, 1997; McLure, 1998). However, this study and others similar to it are necessary if we are to more fully understand the relationship between the taking of advanced high school mathematics courses and the pursuit of occupational choices and college degrees in fields requiring an emphasis in mathematics.

Purpose

The purpose of this study was to examine course taking patterns with regard to six advanced high school mathematics courses ACT-tested 12th grade students had taken between 1987 and 1997. Specifically, we examined the following questions.

- 1. How did 12th-grade ACT-tested students differ in their performance on the ACT Mathematics subtest of the ACT Assessment with respect to the average number of mathematics courses taken between 1987 and 1997? How did such changes vary throughout the decade and by gender, race/ethnicity, and family income?
- 2. How did students who took fewer than four of six advanced high school mathematics courses differ from those who took four or more? How did this vary by gender, race/ethnicity, and family income?
- 3. How did mathematics achievement vary by the number of mathematics courses taken? By gender? By race/ethnicity? By family income?

Method

Data

To examine these questions, we used five separate 10% systematic samples of ACT-tested 12th grade students in the graduating classes of 1987 (N=50,779), 1990 (N=52,076), 1993 (N=56,749), 1996 (N=57,775), and 1997 (N=61,610).

Instrument

The ACT Mathematics test is one of the four tests included in the ACT Assessment, for which scores are accepted by virtually all colleges and universities in the country; nevertheless, the population of ACT-tested students does not represent all high schools or all students in the country. The ACT consists of four tests — *English*, *Mathematics*, *Reading*, and *Science Reasoning*. The ACT Composite score is a simple average of the four test scores. The possible range of scores for each test and for the ACT Composite is 1-36.

In addition to the four achievement tests, the ACT Assessment contains three noncognitive components—the *Student Profile Section* (SPS), the ACT *Interest Inventory* (or *UNIACT*), and the *High School Course/Grade Information Section* (C/GI). The C/GI was added to the ACT Assessment *National Registration Folder* in 1986 to collect information about 30 high school courses that form the basis of a college preparatory curriculum. Students check one of the following three options in response to each course: (1) "have taken or am taking," (2) "have not taken but will," and (3) "have not taken and will not." Students are encouraged, but not required, to complete the C/GI, and they are urged to do so accurately.

The ACT Assessment is an achievement test based on high school curriculum. The more relevant the high school courses are to a given test, the stronger the likelihood of a higher ACT score on that test. In other words, the more mathematics courses a student has taken, the greater the likelihood of a higher ACT Mathematics score.

Procedures and Definitions

For the analysis we used means, percentages, and multiple regression to study the relationship between high school mathematics course taking and achievement as measured on the ACT Mathematics test. For the various gender, racial/ethnic, and family income subgroups, we used means for the ACT Mathematics test scores, the number of mathematics courses taken, and high school grade point averages. For these same subgroups, we calculated percentages to describe the sample and to indicate the proportions of each who were in Low and High MCT groups. We conducted nine multiple regressions models to learn to study the impact on ACT Mathematics scores of students' mathematics course taking, gender, race/ethnicity, and family income level.

Refining the Samples

To define groups for analysis, we first screened the sample for nonresponders to the C/GI. Because the study depended on students' responses to items in the C/GI, students who did not make at least two marks (i.e., selections) in the C/GI were eliminated from the study. Whether or not the two marks were for mathematics courses, students were included, even though a small percentage of students did not select any of the six mathematics courses.

Determining the Number of Courses Taken by Each Student

Because the study centered around the number of mathematics courses taken in high school, we created a mathematics course counter variable to add up the number of the six courses each student had checked. If the student had not checked "have taken or am taking" for a given course, but instead indicated a grade for that course in the Grade section of the C/GI, we counted the course as taken.

A small percentage of students checked only one, two, or three courses, with one or more of those courses being a higher level course—Trigonometry, Calculus, or OAM. In such cases, we assumed that the student had also

taken the courses that usually come earlier in the mathematics sequence—Algebra I, Algebra II, and Geometry, in which case we set the student's mathematics course counter to four mathematics courses. By this recoding procedure, all students who had taken Trigonometry, Calculus, and OAM were assumed to have taken at least four of the six courses.

Table 1 presents the percentages of 1997 students identified with each number of courses taken. Table 1 also includes 2,898 students who either had taken none of the six mathematics courses or who failed to check any mathematics courses or grades in the C/GI. (Note that these students did not skip the C/GI entirely or they would have been eliminated in the initial screening process.)

Defining Mathematics Course Taking

In some aspects of this study, mathematics course taking focused on how many of the six mathematics courses (or course areas) students reported having taken or taking; courses planned but not yet taken were not included. The six mathematics courses listed in the ACT Assessment's C/GI were: Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics (OAM). A seventh mathematics course listed in the C/GI was Computer Math/Computer Science. Because of our uncertainty about the way in which students might classify their computer-related courses relative to the mathematics course category, we did not include responses to this category in the analyses.

Defining Low and High Mathematics Course Taking Groups

To examine course-taking patterns in greater depth, we divided the sample into two groups, the Low Math Course Taking (MCT) group and the High MCT group. Information stored in the recoded counter variables was used to form those groups. The division into the two groups was based solely on whether or not the student had taken any mathematics beyond Algebra I, II, and Geometry. Students who had not done so were placed in the Low MCT group; if they had done so, they were assigned to the High MCT group. In the left hand column of

Table 1 are the divisions of the 1997 sample into these two groups. Samples for other years were handled in the same way. Table 1 contains the numbers and percentages of students falling into these two groups. In 1997, the size of the Low MCT group was slightly smaller than that of the High MCT group (28,567 and 33,043, respectively). To summarize, the two course taking groups are briefly defined as follows.

- **Low Mathematics Course Taking Group** (Low MCT): those who reported having taken or taking either no advanced mathematics courses or no more than Algebra I, Algebra II, Geometry, or none of these or those who reported taking no advanced high school mathematics courses beyond Algebra II
- **High Mathematics Course Taking Group** (High MCT): those who reported having taken or currently taking advanced high school mathematics courses beyond Algebra II (e.g., Trigonometry, Calculus, or OAM)

Defining Racial/Ethnic Groups

The racial/ethnic groups used in this study are listed below. In the right-hand column are the names as they appear in the ACT SPS; in the left-hand column are the abbreviated names used in this paper.

• **American Indians**	American Indians/Alaskan Natives
• **Asians**	Asian-Americans/Pacific Islanders
• **Blacks**	African-Americans/Black
• **Mexican Americans**	Mexican Americans/Chicanos
• **Other Hispanics**	Puerto Ricans/Cubans/Other Hispanics
• **Whites**	Caucasian Americans/Whites
• **Others**	Others, prefer not to respond, blank
• **Others**	Multi-racial (in 1996 and 1997)

Defining Family Income Level Groups

We used family income as reported by students in the ACT SPS as both a continuous and dichotomous variable in this study. Family income was divided, for the years indicated, into the following three comparable categories.

	1987, 1990, 1993	1996, 1997
	Family Income Ranges	Family Income Ranges
• **Lower**	$ 0 - 23,999	$ 0 - 30,000
• **Middle**	24,000 - 41,999	30,001 - 50,000
• **Higher**	42,000 - and over	50,001 - and over

For the regression analyses, the 10 specific ranges of family income were used. Those ranges varied by year and are explained in Table 8.

Results

Results in Table 1

Table 1 illustrates the composition of Low and High MCT groups for the most recent of the years studied. No students who had taken Trigonometry, Calculus, or OAM were included in the Low MTC group. Any who checked fewer than four courses and at the same time checked one of these more advanced courses were assumed to have taken at least four courses and were reassigned to that number-of-courses-taken level.

Results in Table 2

As shown in Table 2, students in the 1997 sample took an average of 3.49 of the 6 advanced high school mathematics courses. By comparison, students in the 1987 sample had taken an average of 3.02 of these courses. By 1990, females moved ahead of males on average and were still there in 1997. In 1987, males

averaged 3.07 courses and females averaged 2.79 courses. By 1997, females had increased their MCT average by 0.56 courses.

Three of the seven racial/ethnic subgroups increased their MCT average by even more than that of the female increase. American Indians were taking just over two of the six courses in 1987 and by the end of the decade were taking 3.05 courses, an increase of 0.96 courses. The Others group increased by a similar amount. Mexican Americans and Blacks increased by an average of half a course during the decade. Not surprisingly, the lowest average increase was made by the highest performing group whose scores were already far above all other groups—Asians (note that their average in 1987 was 3.89; in 1997, 4.15). (See Table 2.)

Family income groups increased more uniformly than the gender and racial/ethnic groups. Despite increases by each of the three income groups, the Higher income group continued to outpace the Lower income group by approximately half a course (compare 3.84 to 3.32, respectively, for the 1997 sample.)

Results in Table 3

Presented in Table 3 are percentages of ACT-tested students in the High MCT group by gender, racial/ethnic group, and family income level for each year studied and for the 1987 to 1997 change in percentage. In every subgroup, the percentage of the total sample represented in the High MTC group increased by 4.0 to 17.0 percentage points.

In 1983, 1990, and 1993, less than half of either males or females in the sample were in the High MCT group. By 1996 and 1997, more than half of both genders were in the High MCT group. This 1987-to-1997 trend toward more mathematics course taking occurred more often among females than males. Females increased their numbers in the High MCT group by 15.5 percentage points over the 10 year period, while males increased theirs by 8.0 percentage points. In 1987, a smaller percentage of females than males were in the High MCT group

(38.8% of females compared to 44.7% of males). By 1997, a larger percentage of females than males were in the group (54.3% of females compared to 52.7% of males).

Among the racial/ethnic groups, the percentages in the High MCT group were even more varied from year to year. In 1987, the percentages in the High MCT group ranged from a low of 22.1% for American Indians to a high of 68.5% for Asian Americans. By 1997, American Indians continued to be the least represented of the seven racial/ethnic groups in the High MCT group, even though their gain of 17.0 percentage points was greater than that of any other identified group. Mexican Americans made an almost equally noticeable gain of 16.3 percentage points.

More than two thirds of Asian Americans were in the High MCT group in 1987 and more than three quarters of them were there by 1997—a pattern not rivaled by any other racial/ethnic group. In 1997, Whites were the only other group with more than half of its members in the High MCT group; even so, the percentage of Whites was well under that achieved by the Asian group a decade earlier (compare 56.6% for Whites in 1997 to 68.5% for Asian Americans ten years earlier). By 1997, close to half of each of the Blacks, Mexican Americans, and Other Hispanics groups were reporting having taken four or more of the six advanced mathematics courses.

With regard to family income level, more gains occurred in the Higher income range (a 14.0 percentage point gain between 1987 and 1997) than in the Middle income range (a 10.4 percentage point gain) or the Lower income range (a 9.7 percentage point gain). In 1997, close to two-thirds (64.2%) of the Higher income group was in the High MCT group, but less than half (46.0%) of the Lower income group was in the High MCT group.

Results in Table 4

Presented in Table 4 are the average ACT Mathematics scores for both the low MCT group and the High MCT group by gender, racial/ethnic group, and family income level for each of the years studied. The Low MCT group averaged a gain of 0.39 points on the ACT Mathematics test.

The average 10-year gain on the ACT Mathematics test was greater for females (0.54 points) than for males (0.16 points). In the Low MCT group, the average gains for American Indians (1.35 points), Blacks (1.04 points), and Mexican Americans (0.93 points) were well above the overall average gain for the sample. Less variation occurred among family income levels. In all, the higher the income, the greater the 1987 to 1997 gain in the Low MCT group.

Overall, the ACT Mathematics test score for the High MCT group remained throughout the decade essentially on a plateau (compare 22.56 in 1997 to 22.57 in 1987). However, males' ACT Mathematics test average declined by 0.04 and the females' average increased by 0.22.

Among the racial/ethnic groups, American Indians and the Others group ACT Mathematics score gains of 0.90 points—more than the gain of any other subgroup studied. Asians (with a gain of 0.60 points) and Blacks (with a gain of 0.52 points) were the only others in the High MCT group with gains.

Results in Table 5

ACT Mathematics scores by gender, race/ethnicity, and family income are presented in Table 5 for 1997 in relation to high school mathematics grade point averages and overall high school grade point averages. Whereas Table 4 presented changes over the decade <u>within</u> the Low MCT and High MCT groups, Table 5 indicated differences for 1997 <u>between</u> the Low MCT and High MCT groups by the same gender, race/ethnicity, and family income variables.

Overall, there was a 5.12 point difference in the average ACT Mathematics scores for these two groups. The Mathematics score difference was larger for males than for females and larger for some racial/ethnic groups than for others. For example, Asians in the High MCT group had ACT Mathematics scores that were 6.59 points higher than that of Asians in the Low MCT Group (compare 24.54 to 17.95, respectively). On the other hand, the average Mathematics score for Blacks in the High MCT Group was only 3.19 points higher than that of Blacks in the Low MCT Group. For the family income groups, the ACT Mathematics scores increased as the income levels increased. Average high school mathematics grade point averages and overall high school grade point averages parallelled rises in the ACT Mathematics scores. Low MCT groups had lower grade point averages than High MCT groups. Furthermore, grade point averages increased as family income rose—whether in the Low MCT group or in the High MCT group.

Results in Tables 6 and 7

For the final stage of the analyses, we conducted several multiple regressions to examine the amount of variance accounted for on the ACT Mathematics test using selected independent variables. A stepwise selection criterion was used for all of the regression analyses. The independent variables were the number of mathematics courses taken, gender, racial/ethnic groups, and family income level. As appropriate, racial/ethnic groups and gender were coded as dummy variables.

The overall regression model accounted for 42.6% of the explained variance in students' mathematics performance on the ACT Assessment. The number of mathematics courses taken accounted for the majority (34.5%) of the variance in the overall regression model.

Separate regressions were performed for the several racial/ethnic groups and gender. The number of mathematics courses taken accounted for the largest percentage of the explained variance in all of these regression models (see Tables 6 and 7). Among females, the number of mathematics courses taken accounted

for 33.9% of the variance; among males, 36.7%. Among Blacks and among Hispanics, the number of mathematics courses taken accounted for less of the variance (24.5% and 26.4%, respectively) than for other groups studied; among Whites, the number of mathematics courses taken accounted for more (37.6%) than for any other group.

The percentage of the variance accounted for by the other variables varied and was very small, ranging from 7.5 percent to 3.1%. Family income accounted for more than 1%, but less than 5% of the variance in these regression models.

Educational Relevance

The evidence suggests that, overall, college-bound 12th grade students are increasing their mathematics course taking and that the more mathematics courses students take, the higher their ACT mathematics scores. Students with higher course-taking averages tend to have higher ACT Mathematics scores. Not all groups are increasing their mathematics course taking at the same rate. Females, Blacks, Mexican Americans, and American Indian/Alaskan Natives made greater gains than others between 1987 and 1996. Students from families in the Lower income level made some gains in the number of more advanced mathematics courses taken, but such gains were more modest than the gains of those in the Middle and Higher income groups. Mathematics course taking accounts for most of the explained variance in students' achievement on the ACT Mathematics test, regardless of the subgroup studied.

Conclusion

The results of this study provide some partial answers to persistent concerns about course taking in mathematics by college-bound American youth. In the regression models, we have suggested that mathematics course taking generally contributes to higher ACT Mathematics scores. We provide strong evidence that increased course taking is associated with higher ACT mathematics scores, especially among subgroups that heretofore have

lagged behind—females, American Indians, Blacks, and Mexican Americans and lower income students.

Questions for Future Studies

This study has revealed differences among high school seniors in high school mathematics course taking and in mathematics achievement by gender, race/ethnicity, and family income. More studies are needed in this area regarding socioeconomic class and of race/ethnicity by gender.

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Table 1
Percentage of ACT-Tested 12th Grade Students Taking[a] Each of Six Mathematics Courses: 1997
N=61,610

Subgroup	# Taken	N	Algebra I	Algebra II	Geometry	Trigonometry	Calculus	Other Advanced Math
Low MCT Group	0	2,898						
	1	2,338	87.2	3.3	9.6			
	2	5,670	97.7	26.4	75.9			
	3	17,661	100.0	100.0	100.0			
Total		28,567						
High MCT Group	4	19,330	93.1	93.1	94.7	54.3	5.1	45.7
	5	11,050	99.7	99.7	99.6	93.5	40.2	67.8
	6	2,663	100.0	100.0	100.0	100.0	100.0	100.0
Total		33,043						

Note. Course taking percentages were based on a systematic 10% sample of ACT-tested 12th grade students in the 1997 high school graduating class. "Taking" refers to courses completed or being taken at the time of taking the ACT Assessment. Courses only planned prior to graduation were not included. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics.

How to read: In the 1997 high school graduating class, 87.2% of the 2,338 ACT-tested 12th grade students who had taken only one of the 6 advanced high school mathematics courses indicated their one course was Algebra I; 3.3% indicated their one course was Algebra II, and 9.6% indicated their one course was Geometry. Anyone who indicated taking Trigonometry, Calculus, or Other Advanced Mathematics were assumed to have taken at least four mathematics courses and were placed into that category for this study.

Table 2
Average Number of Six Advanced High School Mathematics Courses Taken[a]: 1987-1997

Subgroup	1987	1990	1993	1996	1997	1987 to 1997 Difference
Total	3.02	3.08	3.23	3.46	3.49	0.47
Gender						
Male	3.07	3.07	3.22	3.43	3.44	0.37
Female	2.97	3.08	3.24	3.49	3.53	0.56
Racial Ethnic Group						
American Indian	2.08	2.66	2.84	3.09	3.05	0.97
Asian	3.89	3.91	4.07	4.09	4.15	0.26
Black	2.76	2.99	3.17	3.29	3.32	0.56
Mexican American	2.77	3.08	3.31	3.43	3.45	0.68
Other Hispanic	3.07	3.14	3.42	3.47	3.46	0.39
White	3.17	3.26	3.45	3.59	3.63	0.46
Other	1.87	1.79	1.93	2.79	2.83	0.96
Family Income						
Lower third	2.84	2.97	3.15	3.29	3.32	0.48
Middle third	3.19	3.22	3.39	3.55	3.59	0.40
Higher third	3.41	3.52	3.67	3.81	3.84	0.43

Note: Course taking averages were based on a systematic 10% sample of ACT-tested 12th grade students in the 1997 high school graduating class. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus and Other Advanced Mathematics.

[a] "Taken" refers to courses completed or being taken by the time of taking the ACT Assessment.

How to read: In 1997, Blacks reported taking an average of 3.32 of the six advanced high school mathematics courses, an increase of 0.56 courses since 1987.

Table 3
Percentages of ACT-Tested 12th Graders in the High[a] Mathematics Course Taking[b] Groups
by High School Graduating Class: 1987-1997

Subgroup	1987 N=50,779 %	1990 N=52,076 %	1993 N=56,749 %	1996 N=57,775 %	1997 N=61,610 %	1987 to 1997 Difference Percentage Points Change
Total	41.5	43.2	48.1	52.5	53.6	12.1
Gender						
Males	44.7	44.6	48.7	51.6	52.7	8.0
Females	38.8	42.0	47.5	53.1	54.3	15.5
Race/Ethnicity						
American Indian	22.1	33.5	33.9	41.2	39.1	17.0
Asian	68.5	68.5	74.2	74.4	76.1	7.6
Black	36.1	40.1	44.0	44.9	46.0	9.9
Mexican American	32.5	38.3	45.8	49.0	48.8	16.3
Other Hispanic	45.7	46.3	53.6	51.2	49.7	4.0
White	43.8	45.6	51.4	54.9	56.6	12.8
Other	25.6	26.3	29.4	42.3	43.3	17.7
Family Income						
Lower third	36.3	38.0	42.8	45.2	46.0	9.7
Middle third	44.5	45.0	48.9	53.3	54.9	10.4
Higher third	50.2	53.2	59.0	63.1	64.2	14.0
No Response	29.2	28.3	30.8	42.8	44.2	15.0

Note. Course taking percentages were based on a systematic 10% sample of ACT-tested 12th grade students, by high school graduating class. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics.
[a]High MCT Group=Those who had taken 4 or more of the 6 mathematics courses had taken Trigonometry, Calculus, or Other Advanced Mathematics beyond Algebra II.
[b]"Taking" refers to courses completed or being taken at the time of taking that ACT Assessment.

How to read: In 1997, 54.3% of females had taken 4 or more of the 6 advanced high school mathematics classes. This was a 15.5 percentage point increase between 1987 and 1997.

Table 4
ACT Mathematics Score Point Averages
for ACT-Tested 12th Graders Taking Low[a] Vs High[b] Numbers of Mathematics Courses
by High School Graduating Class: 1987-1997

	Low MCT Group: Algebra I, II, Geometry I, or none (no more than 3 lower level courses)						High MCT Group: Advanced Mathematics Course Taking (4 or more courses)					
Subgroup	1987	1990	1993	1996	1997	1987 to 1997 Low Group Difference	1987	1990	1993	1996	1997	1987 to 1997 High Group Difference
Total	17.05	17.04	17.29	17.10	17.44	0.39	22.57	21.82	21.99	21.86	22.56	-0.01
Gender												
Males	17.69	17.40	17.65	17.49	17.85	0.16	23.47	22.56	22.69	22.74	23.43	-0.04
Females	16.58	16.76	16.99	16.80	17.12	0.54	21.72	21.18	21.40	21.19	21.94	0.22
Race/Ethnicity												
American Indian	15.26	15.88	16.22	16.22	16.61	1.35	20.23	19.92	20.53	20.44	21.13	0.90
Asian	17.63	17.46	17.95	17.76	17.95	0.32	23.94	23.67	24.00	23.61	24.54	0.60
Black	14.35	15.22	15.35	15.31	15.39	1.04	18.06	18.20	18.41	18.24	18.58	0.52
Mexican American	15.75	16.19	16.39	16.36	16.68	0.93	20.65	20.58	20.27	20.37	20.65	0.00
Other Hispanic	16.44	16.66	16.67	16.40	16.59	0.15	20.98	20.82	20.84	20.27	20.93	-0.05
White	17.41	17.15	17.28	17.43	17.83	0.42	23.14	22.32	22.48	22.43	23.15	0.01
Other	18.03	18.40	19.02	17.75	18.11	0.08	21.83	21.71	22.30	21.78	22.73	0.90
Family Income												
Lower third	16.31	16.28	16.38	16.47	16.62	0.31	21.48	20.68	20.62	20.49	20.91	-0.57
Middle third	17.17	16.92	17.05	17.13	17.54	0.37	22.83	21.81	21.92	21.88	22.46	-0.37
Higher third	17.72	17.45	17.47	17.65	18.11	0.39	23.47	22.74	22.86	22.80	23.70	0.23

Note. The ACT score scales range from 1 to 36 score points. ACT scores for each year were based on a systematic 10% sample of ACT-tested 12th grade students by high school graduating class. Scores prior to October 1989 have been converted to the Enhanced ACT score scale. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics. Computer Math/Computer Science was excluded from this study.

[a]Low MCT Group=Those who had taken fewer than 4 of the 6 mathematics courses and had not taken Trigonometry, Calculus, or Other Advanced Mathematics.

[b]High MCT Group=Those who had taken 4 or more of the 6 mathematics courses or who had taken Trigonometry, Calculus, or Other Advanced Mathematics beyond Algebra II.

How to read: In 1997, the average ACT Mathematics score for females in the Low MCT Group was 17.12, higher by 0.54 score points than in 1987. The average Mathematics score for females in the High MCT Group was higher by 0.22 score points in 1997 than in 1987.

Table 5
Comparison of the Low and High Mathematics Course Taking Groups by Average ACT Mathematics Scores
High School Mathematics and GPAs for 1997

Subgroup	Average ACT Math Score			Average H.S. Mathematics GPA			Average H.S. Total GPA		
	Low MCT Group[a]	High MCT Group[b]	Score Point Difference	Low MCT Group[a]	High MCT Group[b]	Score Point Difference	Low MCT Group[a]	High MCT Group[b]	Score Point Difference
Total	17.44	22.56	5.12	2.52	3.22	0.70	2.85	3.36	0.51
Gender									
Male	17.85	23.43	5.58	2.46	3.17	0.71	2.73	3.27	0.54
Female	17.12	21.94	4.82	2.56	3.25	0.79	2.94	3.42	0.48
Race									
American Indian	16.61	21.13	4.52	2.44	3.17	0.73	2.79	3.33	0.54
Asian	17.95	24.54	6.59	2.65	3.34	0.69	2.95	3.43	0.48
Black	15.39	18.58	3.19	2.32	2.83	0.51	2.65	3.04	0.39
Mexican American	16.68	20.65	3.97	2.51	3.10	0.59	2.87	3.26	0.39
Other Hispanic	16.59	20.93	4.34	2.58	3.11	0.53	2.89	3.27	0.38
White	17.83	23.15	5.32	2.55	3.28	0.73	2.89	3.41	0.52
Other/No Response	18.11	22.73	4.62	2.56	3.19	0.63	2.85	3.32	0.47
Family Income									
Lower third	16.62	20.91	4.29	2.47	3.12	0.65	2.80	3.26	0.46
Middle third	17.54	22.46	4.92	2.52	3.23	0.71	2.88	3.37	0.49
Higher third	18.11	23.70	5.59	2.55	3.29	0.74	2.90	3.42	0.52

Note. ACT scores for each year were based on a systematic 10% sample of ACT-tested 12th grade students by high school graduating class. Scores prior to October 1989 have been converted to the Enhanced ACT score scale. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics. Computer Math/Computer Science was excluded from this study.

[a]Low MCT Group=Those who had taken fewer than 4 of the 6 mathematics courses and had not taken Trigonometry, Calculus, Other Advanced Mathematics.

[b]High MCT Group=Those who had taken 4 or more of the 6 mathematics courses or who had taken Trigonometry, Calculus, or Other Advanced Mathematics beyond Algebra II.

How to read: In 1997, Asians int he High MCT Group had an average ACT Math score of 24.54; Asians in the Low MCT Group had an average ACT Math score of 17.95, lower by 6.59 score points than that for the High MCT Group.

Table 6
Regression Analysis of the ACT Mathematics Score and Number of Mathematics Courses Taken[a]
1997 Graduating Class

ALL Races	**N=55,254**
Independent Variables	
Number of Math Courses Taken	.345
Blacks	.046
Family Income Groups	.016
Females	.013
Total Variance Explained by Model	42.6%
Average # of the 6 Mathematics Courses Taken	3.49
Females of All Races	**N=29,971**
Independent Variables	
Number of Math Courses Taken	.339
Blacks	.047
Family Income Groups	.021
Hispanics	.005
Asians	.002
American Indians	.000
Total Variance Explained by Model	41.3%
Average # of the 6 Mathematics Courses Taken	3.53
Males of All Races	**N=22,282**
Independent Variables	
Number of Math Courses Taken	.367
Blacks	.044
Family Income Groups	.011
Hispanics	.004
Asians	.001
American Indians	.001
Total Variance Explained by Model	42.7%
Average # of the 6 Mathematics Courses Taken	3.44
Whites	**N=36,577**
Independent Variables	
Number of Math Courses Taken	.376
Females	.015
Family Income Groups	.008
Total Variance Explained by Model	39.9%
Average # of the 6 Mathematics Courses Taken	3.63

Notes. Percentages were based on a systematic 10% sample of ACT-tested 12th grade students with valid ACT scores in the 1997 high school graduating class. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics.

How to read: Among females, the number of advanced high school mathematics courses taken accounted for 33.9% of the variance in ACT Mathematics scores. The entire Female Model explained 41.3% of the variation in ACT Mathematics scores. On average, females reported taking 3.53 of the 6 courses.

Table 7
Regression Analysis of the ACT Mathematics Scores of 12th Graders in the 1997 Graduating Class by Racial/Ethnic Group

Independent Variables	Blacks N=6,615	Hispanics N=3,161	American Indian N=755	Asians N=1,660	Others N=3,479
Number of Math Courses Taken	.245	.264	.303	.318	.288
Family Income	.028	.036	.027	.053	.048
Females	.004	.016	.007	.005	.014
Total Variance explained by model	27.7%	31.6%	33.7%	37.6%	35.0%
Average Number of the 6 Mathematics Courses Taken[a]	3.32	3.45	3.05	4.15	2.83

Notes. Based on the 12th graders in a systematic 10% sample of ACT-tested high school students with valid ACT scores in the 1997 high school graduating class. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics.

How to read: Among Blacks, the number of advanced high school mathematics courses taken accounted for nearly 24% of the variance in ACT Mathematics scores, and Family Income accounted for another 2.8%. The overall regression model for Black explained 27.7% of the variation in ACT Mathematics scores. On average, Blacks reported taking 3.32 of the 6 courses.

Table 8
Percentage of Respondents[a] in Lower, Middle, and Higher Thirds of by Family Income Categories by Year

Subgroup	1987	1990	1993	1996	1997
Family Income Groups					
Lower third	33.4	29.6	26.5	29.4	28.2
Middle third	33.2	30.8	28.1	26.9	25.9
Higher third	23.1	27.4	31.8	30.2	30.8
Missing	10.3	12.2	13.6	13.5	15.2
% Closest to One Third of Responding Group	29.9	28.8	28.8	28.8	28.3

Note. "Percentages were based on systematic 10% samples of ACT-tested 12th grade students in each high school graduating class. Courses only planned prior to graduation were not included. The 6 mathematics courses listed in the C/GI of the ACT Assessment were Algebra I, Algebra II, Geometry, Trigonometry, Calculus, and Other Advanced Mathematics. In 1987, 1990, and 1993, the categories of family income before taxes listed in SPS Item 59 were as follows:

Less than $6,000
$6,000 to 11,999
$12,000 to $17,999
$18,000 to $23,999
$24,000 to $29,999
$30,000 to $35,999
$36,000 to $41,999
$42,000 to $49,999
$50,000 to $59,999
$60,000 and over

In 1996 and 1997, the categories of combined income of parents before taxes were as follows:

Less than $18,000
About $18,000 to $24,000
About $24,000 to $30,000
About $30,000 to $36,000
About $36,000 to $42,000
About $42,000 to $50,000
About $50,000 to $60,000
About $60,000 to $80,000
About $80,000 to $100,000
More than $100,000

[a]Respondents to the ACT SPS Item 59 were grouped into categories representing the closest possible approximations of lower, middle, and higher thirds of the income ranges presented. For example, in 1987, after nonresponders were omitted, one third of the responding sample would have been 29.9%. However, the closest possible approximations to this percentage were 33.4% for the lowest one third, 32.2% for the middle one third, and 23.1% for the highest one third of the students responding to this item.

How to read: In 1997, approximately 28.2% of the 12th grade ACT-tested students were in the Lower Third of the Family Income groups; 15.2% of 12th grade ACT-tested students did not respond to the Family Income item.

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