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ABSTRACT

This report on the second Census of Secondary School Course Offerings, conducted in 1982, provides data on offering and enrollments in the Illinois public schools grades 7 through 12, and updates the first Census of 1977. Data were collected for 489 junior high schools (82% of the total) and 719 high schools (99% of the total). Discussed in the report are demographic characteristics, including enrollment statistics; the typical mathematics program in junior high schools and in senior high schools, including course offerings; and sex-related information on student enrollment in mathematics, including analyses by course. The summary indicated that a larger proportion of students was enrolled in mathematics courses in 1982 than in 1977. The mathematics curriculum at the high school level continues to follow a traditional pattern, with elementary algebra and plane and solid geometry the most commonly offered courses. Remedial mathematics courses are more likely to be found in large high schools than in small ones. Mathematics enrollment was greater for females than for males between 1977 and 1982. A notable increase was found in Computer Mathematics offerings and enrollment. (MNS)

Illinois
Secondary School
Course Offerings

Illinois
State Board of
Education

Research
and Statistics

Special Report on Mathematics

ILLINOIS SECONDARY SCHOOL COURSE OFFERINGS, 1982

Special Report on Mathematics

June, 1984

DEPARTMENT OF PLANNING, RESEARCH AND EVALUATION
RESEARCH AND STATISTICS SECTION

FOREWORD

In 1977 the Illinois State Board of Education in cooperation with the Illinois Association for Supervision and Curriculum Development conducted a Census of Secondary School Course Offerings. This was the first statewide census of basic curriculum data in Illinois. The Census was designed to produce normative data relative to offerings and enrollments in Illinois public secondary schools and establish a source of information on secondary school curriculum. A second Census was conducted in 1982 to update the original database.

The Census project was directed by Dr. William L. Humm, Research and Statistics Section, Illinois State Board of Education. This special report on mathematics was written by Dr. John Dossey, Mathematics Department, Illinois State University and edited by Dr. Humm. It is based on statistics from the Census project databases for 1977 and 1982.

Observations and conclusions in this report are those of the writer and do not necessarily represent the policies or views of the Illinois State Board of Education or the State Superintendent of Education.

Donald G. Gill
State Superintendent of Education

Special Report on Mathematics

Summary Highlights

A larger proportion of high school students was enrolled in mathematics courses in 1982 than in 1977.

The mathematics curriculum at the high school level, in the main, continues to follow a traditional pattern of courses including: General Mathematics, Algebra I, Geometry, Algebra II and Trigonometry, and Precalculus/Senior Mathematics. Elementary Algebra and Introduction to Plane and Solid Geometry are the two most commonly offered courses.

Courses specifically identified as Remedial Mathematics are more likely to be found in large high schools rather than small high schools. This probably indicates both the ability and need to provide a wider range of offerings to meet student needs in larger schools.

The increase in high school mathematics enrollment from 1977 to 1982 was greater for females than for males (relative increases of 5.6% and 1.2%).

There has been a notable increase in both the number of high schools offering Computer Mathematics and in the enrollment in that course since 1977.

ILLINOIS SECONDARY SCHOOL COURSE OFFERINGS, 1982

Special Report on Mathematics

In 1976-77 the Illinois Board of Education (ISBE) conducted the first Census of Illinois Secondary School Course Offerings. The data gathered by that survey provide a large amount of information concerning the nature of the 7th through 12th grade curricula found in Illinois secondary schools. In particular, they provide a picture of both the course offerings in secondary school mathematics and the enrollment in those courses (ISBE, 1980).

In 1981-82, five years after the original census, the ISBE again conducted a comprehensive census of secondary school offerings within Illinois schools. The present report details the findings of this second census in the area of mathematics. In addition to providing the information on courses offered and the enrollments in them in 1981-82, the changes taking place in these areas since 1976-77 are noted.

THE SCHOOLS IN THE CENSUS: DEMOGRAPHIC CHARACTERISTICS

Census data were collected from 489 public junior high schools and 719 public high schools. The participating schools represent 82 percent of the junior high schools and 99 percent of the high schools in the defined population of the Census.

Schools were classified by grade level composition, by school size, and by community type. Schools classified as junior high schools were typically two-year, grade 7-8 schools (92 percent). Another 6 percent were three-year, grade 7-9 schools. High schools included four-year, grade 9-12 schools (88 percent); three-year, grade 10-12 schools (3 percent); and junior-senior high schools including grades 7-12 (6 percent).

There is a direct relationship between school size and community type, with larger schools located in central cities and smaller schools in rural areas. This relationship is particularly strong for high schools, as indicated in Table 1. Most of the rural high schools (99 percent) had under 1000 students, even when six-year (7-12) schools were included. On the other hand, 61 percent of the urban schools had enrollments over 1000. Table 2 shows the range and quartile data for high schools in the Census.

TABLE 1. ILLINOIS PUBLIC HIGH SCHOOLS INCLUDED IN THE CENSUS OF COURSE OFFERINGS BY SIZE AND COMMUNITY TYPE, 1981-82

Size	Central City		Suburb		Independent City		Rural		All	%
1- 199	4		3		1		181		189	26.3
200- 499	1		19		44		130	99%	194	27.0
500- 999	10		28		36	98%	28		102	14.2
1000-1699	38	88%	57	88%	17		2		114	15.9
1700-2599	36		61		1		0		98	13.6
2600+	6		15		0		1		22	3.1
All	95		183		99		342		719	
%	13.2		25.5		13.8		47.6			

TABLE 2. ENROLLMENT SUMMARY STATISTICS FOR PUBLIC HIGH SCHOOLS INCLUDED IN THE CENSUS OF COURSE OFFERINGS, 1981-82

MEAN	Smallest	10th Percent	25th Percent	MEDIAN	75th Percent	90th Percent	Largest
826	33	119	191	452	1350	2100	4614

Table 3 presents data by school size and community type for junior high schools. Junior high schools generally enrolled over 500 students (93 percent) in central cities, between 200 and 1000 in suburbs (93 percent) and independent cities (80 percent), and under 500 (97 percent) in rural areas. Table 4 gives the range and quartile data for junior high schools in the Census.

TABLE 3. ILLINOIS PUBLIC JUNIOR HIGH SCHOOLS INCLUDED IN THE CENSUS OF COURSE OFFERINGS BY SIZE AND COMMUNITY TYPE, 1981-82.

Size	Central City		Suburb		Independent City		Rural		All	%
1- 199	0		13		15		102		130	26.6
200- 499	2		103		48		39	97%	192	39.3
500- 999	22	93%	115	93%	17	80%	5		159	32.5
1000+	4		3		1		0		8	1.6
All	28		234		81		146		489	
%	5.7		47.9		16.6		29.9			

TABLE 4. ENROLLMENT SUMMARY STATISTICS FOR PUBLIC JUNIOR HIGH SCHOOLS INCLUDED IN THE CENSUS OF COURSE OFFERINGS, 1981-82

MEAN	Smallest	10th Percent	25th Percent	MEDIAN	75th Percent	90th Percent	Largest
403	40	94	180	370	592	757	1198

LIMITATIONS OF THE COURSE OFFERINGS AND ENROLLMENT DATA

The data from the Census consist of school reports of mathematics courses offered and the number of students enrolled in each. Schools reported mathematics courses at both the junior high and senior high levels. The course names in some cases reflect course titles related to "new mathematics" curricula which are no longer commercially available, i.e., UICSM (University of Illinois Curriculum in School Mathematics) and SMSG (School Mathematics Study Group) mathematics. Information from these responses can be treated as strong college preparatory courses, but it creates some concern in the making of fine interpretations from the data base.

The reporting of courses by their titles obscures some of the information which might be drawn from the data. For instance, the senior high school data includes enrollment data on Remedial Mathematics 9-12, Consumer Mathematics/Consumer Education, and Elementary General Mathematics 9-12. These courses may in many cases be copies of one another, but the data would suggest that they are three separate courses. In the listing of Honors Algebra and Intermediate Algebra another problem of interpretation emerges. Honors Algebra could refer to either a 9th grade, or 8th grade, introductory algebra course for advanced students, or, to an advanced course for gifted students enrolled in second year algebra. On the other hand, Intermediate Algebra can either be a second year course in algebra which does not contain any study of trigonometry, a course covering the fundamental concepts of first year algebra, but on a two-year plan, or an algebra course between Prealgebra and Advanced Algebra.

THE TYPICAL MATHEMATICS PROGRAM IN ILLINOIS JUNIOR HIGH SCHOOLS

The data in this section reflect the responses from 484 schools in the Census sample of junior high schools. These schools, enrolling 163,316 students represent 98.9 percent of the schools and 99.1 percent of the student enrollment of the entire sample selected for study in this Census. As the data show, some of these schools contained classes at the ninth grade level, but the percentage of these classes was less than five percent.

Table 5 contains a list of courses reported by the junior high schools as courses offered and the number of students enrolled in each. Table 6 lists those courses which enroll at least 3 percent of the total number of students in the schools responding to the Census. Course enrollment data throughout this report are adjusted to reflect enrollment in terms of year equivalents. This shows that there were 156,116 year equivalent course enrollments in mathematics in the junior high schools during the Census year. In this report, year equivalent course enrollment will be referred to as "number of students enrolled" or "student enrollment."

TABLE 5. MATHEMATICS COURSE OFFERINGS AS REPORTED BY ILLINOIS PUBLIC JUNIOR HIGH SCHOOLS, 1981-82 (N=484)

Course Title	Number of Schools Offering Course	Percent of Total Schools	Percent of State Enrollment
*General Math 7	473	96.7	41.3
*General Math 8	467	95.5	37.5
Prealgebra	43	8.8	1.6
*Elementary Algebra	172	35.2	5.0
Honors Algebra	1	0.2	0.0
Intermediate Algebra	30	6.1	1.2
Advanced Algebra	10	2.0	0.2
Math/Applied/Busn/Tech	1	0.2	0.1
Computer Math/Sci	12	2.5	0.3
Elem. Gen. Math, Grade 9	25	5.1	1.3
Adv. Gen. Math, Grade 9	6	1.2	0.6
Consumer Math/Education	5	1.0	0.1
Geometry, Plane/Intro/Adv	24	4.9	0.4
Plane & Solid Geometry	3	0.6	0.0
Intro. to Analysis	1	0.2	0.0
*Remedial Math, Grades 7-8	87	17.8	2.8
Remedial Math, Grade 9	10	2.0	0.2
UICSM, Grades 7-8	1	0.2	0.0
Independent Study	1	0.2	0.1
Other mathematics	47	9.6	1.9

*Courses reported most frequently by junior high schools.

TABLE 6. MATHEMATICS COURSES WITH 3% OR MORE OF ILLINOIS PUBLIC JUNIOR HIGH SCHOOL STUDENTS ENROLLED, 1981-82

Course Title	Number of Students Enrolled in Course	Percent of State Enrollment
General Math 7	68,053	41.3
General Math 8	61,844	37.5
Elementary Algebra	8,262	5.0

A study of the data in Table 5 shows that four junior high level courses that are taught in more than 10 percent of the schools are General Mathematics 7, General Mathematics 8, Elementary Algebra, and Remedial Mathematics 7-8. The course with the highest percentage of offering, but excluded from this list was Prealgebra which was taught in 43 schools (9 percent). The only other specific courses being taught in over five percent of the schools were Intermediate Algebra in 30 schools (6 percent) and Elementary General Mathematics 9-12 in 25 schools (5 percent).

This pattern of courses offered in at least 10 percent of the schools is similar to that found in the first Census. If the courses contained in Table 5 are collapsed into the categories commonly used to refer to the

courses, the percentage of schools offering the various courses would appear as: General Mathematics 7 (97 percent), General Mathematics 8 (96 percent), Algebra (36 percent), Remedial Mathematics Grades 7-8 (18 percent), Prealgebra (9 percent), Intermediate Algebra (6 percent), and Computer Mathematics (2 percent). The remaining courses reflect the curriculum of the grades 9-12 or deal with courses clustered under the titles of independent study and other.

These percentages are quite similar to those found in the earlier Census. There, the reports showed 98 percent of the schools were offering General Mathematics 7, 97 percent were offering General Mathematics 8, 39 percent were offering Algebra, and 21 percent were offering Remedial Mathematics Grades 7-8. Thus, there appears to be little change in the offering of coursework at the junior high school level. It was noted that 2.45 percent of the schools (12 schools) were offering coursework in computer mathematics. Only two schools reported such a course in the 1977 Census. This is potentially a course offering trend that will show additional increase before the next Census.

Table 6 shows that there were only three courses that were taken by at least three percent of the students enrolled in the schools. These courses were General Mathematics 7, with 68,053 students (41 percent); General Mathematics 8, with 61,844 students (38 percent); and Algebra, with 8,262 students (5 percent). These percentages were very similar to those found in the first Census. There the corresponding percentages were 42, 40, and 6 percent respecti- vely. These minor differences do not indicate any significant changes in student enrollment patterns.

Tables 7 and 8 show the data dealing with junior high school mathematics course offerings and enrollment by community type. The data reflect the offering of courses in each community type where a course was offered in at least three percent of the schools in any one of the community types. The data in Table 7 suggest that the percent of schools offering the different courses varies with community type. In General Mathematics 7 and 8, the offering of the courses is almost universal in schools in the suburban and rural subsamples, but drops off a little in schools in the central city and independent city subsamples. An examination of the data for these latter two categories suggests that they do not offer more courses, but that the students enrolling in the courses are distributed more thinly. Remedial Mathematics, Grades 7-8, is taught more often in central city schools, as are Prealgebra and Algebra classes. In all three of these courses the percentages of schools offering them decreases monotonically across the community types as one moves from central city to suburban to independent city to rural schools. In Table 8 we can see the percentage of students enrolled in each of the courses in the schools of each community type. These data parallel the story told in Table 7, with one exception. The student enrollment in Algebra in the central city, suburban, and independent city schools is more constant than the reported percentage of schools offering Algebra for these same community categories.

TABLE 7. MATHEMATICS COURSES OFFERED BY COMMUNITY TYPE FOR COURSES HAVING AT LEAST 3% OF ILLINOIS JUNIOR HIGH SCHOOL MATHEMATICS STUDENTS ENROLLED (Percent of number of schools by community type)

Course Title (N of schools)	Central City (28)	Suburb (231)	Independent City (81)	Rural (144)
General Math 7	86	99	95	99
General Math 8	89	98	91	99
Remedial Math 7-8	43	23	11	10
Prealgebra	25	12	9	1
Elementary Algebra	86	49	28	8

TABLE 8. MATHEMATICS COURSE ENROLLMENT BY COMMUNITY TYPE FOR COURSES HAVING AT LEAST 3% OF ILLINOIS JUNIOR HIGH SCHOOL MATHEMATICS STUDENTS ENROLLED (Percent of number of type of community mathematics students enrolled)

Course Title (Enrollment)	Central City (18,666)	Suburb (96,243)	Independent City (22,412)	Rural (18,794)
General Math 7	33	44	45	49
General Math 8	32	40	41	45
Remedial Math 7-8	5	3	1	1
Prealgebra	3	2	1	0
Elementary Algebra	6	6	5	2

The final sets of data reporting on course offerings and enrollments in junior high school mathematics appear in Tables 9 and 10. Table 9 shows the percentage of schools teaching the courses enrolled in by at least three percent of the junior high school population. The data in Table 9 consider the distribution of junior high courses within each of four size classifications for Illinois public junior high schools. The data giving the percent of schools in each of the classifications of school size indicate that General Mathematics 7 and 8 are offered at the same rate in each of the categories. The remaining courses, Remedial Mathematics 7-8, Prealgebra, and Algebra are all offered with increasing frequency as one moves through the four classifications of school size.

While data in Table 10 suggest a somewhat similar picture, one notices the declining enrollments in General Mathematics 7 and 8 as one moves to increasingly larger school sizes. Here the slack is picked up by the larger schools through increased enrollments in both Remedial Mathematics 7-8 and in Prealgebra and Algebra. This pattern reflects the same pattern as was seen in the percent of schools in each size category offering the remedial and advanced courses.

TABLE 9. MATHEMATICS COURSES OFFERED BY SIZE OF SCHOOL FOR COURSES HAVING AT LEAST 3% OF ILLINOIS JUNIOR HIGH SCHOOL MATHEMATICS STUDENTS ENROLLED (Percent of number of schools by school size category)

Course Title (N of schools)	1-199 (128)	200-499 (190)	500-999 (158)	1000+ (8)
General Math 7	100	97	96	100
General Math 8	98	95	97	100
Prealgebra	0	7	16	38
Elementary Algebra	5	31	65	88
Remedial Math, Grades 7-8	9	16	27	38

TABLE 10. MATHEMATICS COURSES HAVING AT LEAST 3% OF ILLINOIS PUBLIC JUNIOR HIGH SCHOOL STUDENTS ENROLLED BY SIZE OF SCHOOL (Percent of number of mathematics students enrolled in school size category)

Course Title (Enrollment)	1-199 (12,935)	200-499 (48,744)	500-999 (85,844)	1000+ (8,592)
General Math 7	51	46	42	36
General Math 8	47	43	37	35
Prealgebra	0	1	2	3
Elementary Algebra	1	3	7	7
Remedial Math, Grades 7-8	1	2	3	6

A comparison of the data shown in Tables 7 through 10 with the data from the 1976-1977 Census shows some minor changes in course enrollment patterns among Illinois public junior high school students. In the case of community types, the data show that there are increases in the range of 4 to 5 percent in student enrollment in General Mathematics 7 in rural and independent city schools, while at the same time these same areas are experiencing about 3 percent declines in the number of students enrolled in Algebra. These changes may reflect a dropping of enrichment or gifted programs in these areas and the return of students to the more traditional curriculum.

A comparison of the data concerning enrollment by school sizes shows two possible areas of enrollment changes. The first of these occurs in the schools of size less than 200. Here, there was a very slight decrease of students enrolled in Elementary Algebra and Remedial Mathematics 7-8 and an increase of about 3 percent in General Mathematics 7. This again may reflect the lessening of curriculum choices and the meeting of individual student's needs within the traditional General Mathematics curriculum. The other area showing some minor changes was the large school category where schools had enrollments of more than 1000 students. Here there was an increase of about 3 percent in enrollment in Remedial Mathematics 7-8 accompanied by a similar drop in enrollment in Algebra. This again may reflect the dropping of algebra courses in some of these schools or the nationwide problem of increasing demand for remediation in mathematics across the curriculum.

THE TYPICAL MATHEMATICS PROGRAM IN ILLINOIS SENIOR HIGH SCHOOLS

The data in this section reflect the responses from 715 high schools in the identified population for the Census. These schools, enrolling 591,981 students, represent 99.4 percent of the schools and 99.7 percent of the students enrolled in the sample reported for the Census study. As the data show, some of these schools contained grades 7 and 8, but the percentage of such schools was six percent or less.

Table 11 contains a list of courses reported offered by the senior high schools responding to the Census questionnaire. In addition, it shows the percent of schools teaching each of the courses and the percent of the state's student year-equivalent enrollment for those courses in 1981-82. Table 12 reports the same data in a slightly different fashion, in that the areas separated by spaces in Table 11 have been collapsed into more general categories reflecting a more generic nature of the senior high school mathematics curriculum. This table also provides the enrollment for each of the course categories, the percent that enrollment is of the total sample student population, and the percent that enrollment is of the total sample mathematics year-equivalent student enrollment.

An examination of these data suggests that there is a great variety of course offerings in mathematics for Illinois senior high school students. However, a closer look indicates that the width of offerings is much narrower than the listing indicates. When one combines the general and remedial mathematics courses, collapses the intermediate algebra across the elementary and advanced algebra offerings, and joins the levels of geometry and the levels of senior mathematics offerings, the curriculum begins to look much like the traditional curriculum: General Mathematics, Algebra I, Geometry, Algebra II and Trigonometry, and Precalculus/Senior Mathematics. Comparison of this information with the responses collected in the 1976-77 Census suggests that the only major difference in the overall offerings over the period of five years was the increase in the percentage of schools teaching courses involving computers. This percentage has increased from 20.7 percent to 33.5 percent of the schools in the respective samples. In the other areas, the overall percentages of students enrolled in the respective classes has changed little. The present study suggests that 57.9 percent of the students in the sample schools were enrolled in mathematics, while 56.0 percent were enrolled in the 1976-77 Census. This indicates a slightly larger proportion of students enrolling in mathematics at the present in comparison with the earlier study period. It may indicate a trend worthy of further investigation in later Census studies.

The data in Table 12 also provide a look at the percentages of students who might be taking a given number of years of mathematics. While this type of extrapolation is somewhat dangerous with the data available, one might argue that at least 30 percent of the students are completing Algebra I, 20 percent of the students are completing Geometry, 15 percent are completing the equivalent of Algebra II and Trigonometry, and 7 percent are completing a fourth year of mathematics.

TABLE 11. MATHEMATICS COURSE OFFERINGS AS REPORTED BY ILLINOIS PUBLIC SENIOR HIGH SCHOOLS, 1981-82 (N=715)

Course Title	Number of Schools Offering Course	Percent of Total Schools	Percent of State Enrollment
Career Math/Occupational	6	0.8	0.0
Math, Appl/Busi/Tech	126	17.5	1.0
Consumer Math/Education	78	10.8	0.4
Elem. Gen. Math Gr. 9-12	412	57.3	3.5
Adv. Gen. Math Gr. 9-12	161	22.4	1.8
Remedial Math Gr. 9-12	213	29.6	2.9
Prealgebra	129	17.9	3.3
Elementary Algebra	556	77.3	12.4
Honors Algebra	67	9.3	0.4
SMSG Algebra	37	5.1	0.3
UICSM Grade 8/9	2	0.3	0.0
Geometry Intro/Plan/Adv	524	72.9	8.7
Plane & Solid Geometry	206	28.7	2.8
SMSG Geometry	31	4.3	0.1
Intermediate Algebra	467	65.0	7.0
Advanced Algebra	423	58.8	4.3
Algebra and Trigonometry	201	28.0	2.2
SMSG 3 & 4	36	5.0	0.2
UICSM Grade 10/11/12	3	0.4	0.0
Algebra and Anal. Geom.	43	6.0	0.3
Trigonometry	217	30.2	0.9
Precalculus	8	1.1	0.0
College Level Mathematics	170	23.6	0.6
Analytic Geometry	92	12.8	0.3
Elementary Functions	16	2.2	0.0
Solid Geometry/Trig.	27	3.8	0.3
Intro. to Analysis	64	8.9	0.4
SMSG (Trig & Math Analysis)	95	13.2	0.2
Calculus/Adv. Placement	148	20.6	0.6
Calculus/Anal. Geom.	64	8.9	0.2
Calculus-SMSG	20	2.8	0.1
Computer Math./Sci.	241	33.5	1.8
Programming I/Spec. Lang.	2	0.3	0.0
Programming II/Spec. Lang.	1	0.1	0.0
Programming III/Spec. Lang.	1	0.1	0.0
Probability & Statistics	35	4.9	0.1
General Math, Grade 7	42	5.8	0.2
General Math, Grade 8	42	5.8	0.2
Remedial Math, Grade 7-8	11	1.5	0.1
Independent Study	20	2.8	0.0
Other Mathematics	47	6.5	0.3

TABLE 12. MATHEMATICS COURSE OFFERINGS AND ENROLLMENTS AS REPORTED BY ILLINOIS PUBLIC SENIOR HIGH SCHOOLS COLLAPSED BY COMMON COURSE CATEGORIES, 1981-82

Course Type	Number of Students Enrolled	Percent of State Total	Percent of Total Course Enrollment
General/Remedial	56,955	9.6	16.6
Prealgebra	19,658	3.3	5.7
Algebra	77,747	13.1	22.6
Geometry	68,865	11.6	20.0
Intermediate Algebra	41,320	7.0	12.0
Advanced Algebra	39,588	6.7	11.5
Precalculus/Sen. Level	17,940	3.0	5.2
Calculus	5,018	0.8	1.5
Probability & Statistics	397	0.1	0.1
Computer Mathematics	10,713	1.8	3.1
Other Mathematics	2,047	0.3	0.6
Junior High Level Work	3,325	0.6	1.0

Table 13 lists the courses which were offered in at least 10 percent of the senior high schools in the Census survey. Eighteen separate courses make this listing, with Elementary Algebra being the course most commonly identified as being offered (77.3 percent of the schools) with Introduction to Plane and Solid Geometry coming in second (72.9 percent of the schools). Honors Algebra (9.3 percent of the schools) was the course with the highest percentage of school offerings not being included in Table 13.

At the high school level it is not possible to collapse the number of schools teaching the various courses into the more general categories, for the data suggest that some schools are teaching more than one of the courses in one or more of the general categories. Thus, collapsing the data would inflate the percentages of schools potentially offering the various types of courses. However, the data in Table 14 provide a way in which a direct comparison can be made with the data from the 1976-77 survey. This table presents the listing of courses having more than three percent of the state

senior high school students enrolled during the 1981-82 school year. This identifies a set of seven types of courses. Here the data from Introduction to Plane Geometry and Plane and Solid Geometry have been combined. In a like fashion, the data from Advanced Algebra and Algebra and Trigonometry have been combined. These combinations were made in accordance with the common manner in which these topics are taught in the public school curricula. No attempt was made to further collapse the categories for comparative purposes.

The comparison of the 1976-77 data with the 1981-82 data suggests that there is no significant difference in the enrollment patterns based on the reported percentages. The same categories of courses make up the listings in both Census reports. In all cases the course level percentages for the two Census studies differed by less than two percentage points.

TABLE 13. MATHEMATICS COURSES OFFERED IN AT LEAST 10% OF ILLINOIS PUBLIC SENIOR HIGH SCHOOLS, 1981-82 (N=715)

Course Title	Number of Schools Offering Course	Percent of Total Schools	Percent of State Enrollment
Math, Appl/Busi/Tech	126	17.5	1.0
Consumer Math/Education	78	10.8	0.4
Elem. Gen. Math Gr. 9-12	412	57.3	3.5
Adv. Gen. Math Gr. 9-12	161	22.4	1.7
Remedial Math Gr. 9-12	213	29.6	2.9
Prealgebra	129	17.9	3.3
Elementary Algebra	556	77.3	12.4
Geometry Intro/Plane/Adv	524	72.9	8.7
Plane & Solid Geometry	206	28.7	2.8
Intermediate Algebra	467	65.0	7.0
Advanced Algebra	423	58.8	4.3
Algebra and Trigonometry	201	28.0	2.2
Trigonometry	217	30.2	0.9
Analytic Geometry	92	12.8	0.3
SMSG (Algebra 3 & 4)	95	13.2	0.2
College Level Mathematics	170	23.6	0.6
Calculus/1st/2nd/A.P.	148	20.6	0.6
Computer Math/Science	241	33.5	1.8

TABLE 14. MATHEMATICS COURSES WITH 3% OR MORE OF ILLINOIS PUBLIC SENIOR HIGH SCHOOL STUDENTS ENROLLED, 1981-82

Course Title	Number of Students Enrolled in Course	Percent of State Enrollment
Elem. Gen. Math (9-12)	20,909	3.5
Remedial Math (9-12)	17,392	2.9
Prealgebra	19,658	3.3
Elementary Algebra	73,829	12.4
Geometry Plane/Solid*	68,120	11.5
Intermediate Algebra	41,320	7.0
Advanced Algebra**	38,503	6.5

*Combination of Geometry, Plane/Intro/Adv and Plane and Solid Geometry
**Combination of Advanced Algebra and Algebra and Trigonometry

Tables 15 and 16 present the data resulting from the separation of the senior high school data by the type of community in which the school is located. Table 15 presents the data resulting from the analysis of the offering of the courses selected by at least 3 percent of the students across schools in the sample and their offering by the schools in each of the community types. These data indicate that there is considerable variety in the names given by the schools in the different community types for courses in their mathematics curricula. For example, consider the offering of Elementary Algebra. Its offering varies from a high of 96 percent of the schools in the central cities to a low of 69 percent in the schools of the rural portion of the Census sample.

The data on percent of student enrollment by community type in Table 17 presents a more stable picture of mathematics teaching and learning in different locales. These data suggest that perhaps a larger portion of central city students are enrolled in the Elementary General Mathematics, Remedial Mathematics and Prealgebra programs than in any of the other areas. Further, the data suggest that there are relatively similar enrollment patterns across the community types for first year programs in Algebra and Geometry, but that greater percentages of suburban, independent city, and rural students take intermediate Algebra and Advanced Algebra work than do students in central city communities.

TABLE 15. MATHEMATICS COURSES OFFERED BY COMMUNITY TYPE FOR COURSES HAVING AT LEAST 3% OF ILLINOIS SENIOR HIGH SCHOOL MATHEMATICS ENROLLED, 1981-82 (Percent of schools by community type)

Course Title (N of schools)	Central City (94)	Suburb (183)	Independent City (98)	Rural (340)
Elem. Gen. Math (9-12)	26	61	20	62
Remedial Math (9-12)	72	40	21	15
Prealgebra	68	17	6	8
Elementary Algebra	96	89	71	69
Geom. Intro/Plane/Adv.	88	80	74	65
Geom. Plane & Solid	19	42	30	24
Intermediate Algebra	36	78	77	64
Advanced Algebra	28	76	73	55
Algebra & Trigonometry	73	38	21	12

TABLE 16. MATHEMATICS COURSES ENROLLMENT BY COMMUNITY TYPE FOR COURSES HAVING AT LEAST 3% OF ILLINOIS SENIOR HIGH SCHOOL MATHEMATICS STUDENTS ENROLLED, 1981-82 (Percent of mathematics students enrolled)

Course Title (School Enrollment)	Central City (158,341)	Suburb (274,234)	Independent City (66,975)	Rural (86,921)
Elem. Gen. Math (9-12)	2	4	5	5
Remedial Math (9-12)	7	1	1	1
Prealgebra	9	1	1	1
Elementary Algebra	13	13	10	10
Geom. Intro/Plane/Adv.	8	10	8	7
Geom. Plane & Solid	1	4	3	3
Intermediate Algebra	2	9	8	8
Advanced Algebra	1	6	5	4
Algebra & Trigonometry	3	2	1	1

The final two tables for the senior high school curriculum data, Tables 17 and 18 present the information dealing with the offering of courses by school size for Illinois senior high schools. For these analyses, the variable of school size has been split into six intervals as indicated in the horizontal headings for both tables. Table 17 presents the analysis of the percentage of schools in each of the size categories offering each of the courses identified as having an enrollment of at least three percent of the students in the Census schools.

In the area of General and Remedial Mathematics, the results suggest that for schools of 500 students or less the curriculum usually only offers one of the two courses. In this case, the odds are about 4 to 1 that the course provided for students is an elementary General Mathematics course. When school sizes climb above 500 students, the pattern changes with Remedial Mathematics course offerings rising to meet, and sometimes exceed, the percent of offerings of General Mathematics. This probably indicates both the ability and need to provide a wider range of curricular offerings to meet student needs in larger schools. In the case of schools having enrollments of 1000 or more, it is clear from the data that both Remedial Mathematics and General Mathematics are being offered in several schools.

In the area of Prealgebra, a similar pattern of course availability emerges. In the smaller senior high schools, Prealgebra is taught infrequently. This is perhaps due once again to the inability of the small high school to offer as wide a range of coursework both in terms of student need and staff load. However, once the size of the school approaches 1000 students, Prealgebra becomes available in about one-third of the high schools.

The offering of Elementary Algebra and topics in Advanced Algebra and Trigonometry are common across the various school size ranges. The data for Elementary Algebra suggest that schools of size 1000 or less tend to name their first year algebra courses by a name other than Elementary Algebra. The results for the high schools in these size ranges indicated that only 67 to 75 percent of the schools offered such a course. However, an examination of all of the data showed that schools were slightly more likely to have offered a first year algebra course under the heading of SMSG Algebra. In schools of size 1000 or greater, the percent of schools offering Elementary Algebra is perhaps as universal as for any course reported.

The survey results indicate that Intermediate Algebra is offered in two-thirds to three-fourths of the schools across the various size ranges. Some portion of these offerings may be equivalent to Elementary Algebra courses in nature, while others may be variants of the Advanced Algebra course. The availability of Advanced Algebra and Algebra and Trigonometry shows a general increase across the different size categories. In the smaller schools, the combined percentages account for only about 50 percent of the schools; but by the time one reads across the chart to the data from the larger high schools, it becomes obvious that several schools are offering both of these courses for their students. In some cases, the Algebra and Trigonometry may be included in the curriculum as a twelfth grade offering following Advanced Algebra at the eleventh grade. In other settings, it may be the advanced college preparatory class for accelerated junior level students.

The final area of curricular offerings attracting at least three percent of the students involves coursework in geometry. Here we see the content offered in two reported forms. In schools of size 500 or larger, it is clear that some of the schools are offering both of the forms. Introduction to Plane Geometry is the course most often offered at each of the school size levels. It is provided in approximately 2/3 of the small schools and in about 9/10 of the large schools as a course for student selection. The course, Geometry-Plane and Solid, appears to be a slightly more advanced course, perhaps covering the material at a faster pace with more integration of the solid geometry material into the course. This offering is found in about 20 percent of the small schools and about 35 percent of the larger high schools.

While the names that courses are offered under varies across the different categories of high schools, the percentages of students selecting the courses across the categories remains much more stable. A comparison of the data presented here with that observed in the 1976-77 Census of Secondary School Offerings in Mathematics suggests that the enrollment patterns by school size have remained fairly constant for courses attracting at least three percent of the students across the entire senior high school sample. In most cases the changes observed were two percent or less, and in no case did the change of enrollment percent exceed three percent. The three percent changes were only found for two of the entries, and these were for two different course and school size categories.

TABLE 17. MATHEMATICS COURSES OFFERED BY SIZE OF SCHOOLS FOR COURSES HAVING AT LEAST 3% OF ILLINOIS SENIOR HIGH SCHOOL MATHEMATICS STUDENT ENROLLMENT, 1981-82 (Percent of schools by school size category)

Course Title (N of schools)	1-199 (188)	200-499 (192)	500-999 (101)	1000-1699 (114)	1700-2599 (98)	2600+ (22)
Elem. Gen. Math (9-12)	65	62	52	53	46	59
Remedial Math (9-12)	13	16	31	50	60	50
Prealgebra	6	10	17	31	40	36
Elementary Algebra	67	72	75	89	96	95
Geom. Intro/Plane/Adv.	62	66	74	84	93	86
Geom. Plane & Solid	19	29	30	40	32	36
Intermediate Algebra	60	63	72	71	64	77
Advanced Algebra	44	64	68	66	58	73
Algebra & Trigonometry	11	15	21	48	60	73

TABLE 18. MATHEMATICS ENROLLMENT BY SIZE OF SCHOOLS FOR COURSES HAVING AT LEAST 3% OF ILLINOIS SENIOR HIGH SCHOOL MATHEMATICS STUDENT ENROLLMENT, 1981-82 (Percent of students by school size category)

Course Title (School Enrollment)	1-199 (25,578)	200-499 (62,232)	500-999 (74,138)	1000-1699 (155,612)	1700-2599 (205,490)	2600+ (68,931)
Elem. Gen. Math (9-12)	7	6	4	4	3	2
Remedial Math (9-12)	1	1	2	3	4	3
Prealgebra	1	1	2	4	5	4
Elementary Algebra	10	11	11	12	14	14
Geom. Intro/Plane/Adv.	7	7	7	8	10	10
Geom. Plane & Solid	2	3	3	3	2	3
Intermediate Algebra	7	7	8	7	6	8
Advanced Algebra	3	4	5	4	4	5
Algebra & Trigonometry	1	1	1	2	3	3

SEX RELATED INFORMATION ON STUDENT ENROLLMENT IN MATHEMATICS

One of the major efforts in mathematics education over the past ten years has been the recruitment and retainment of female mathematics students at the secondary school level. This effort has had positive results nationwide. The data from the 1981-82 Census also indicate that the effort has resulted in gains in female mathematics enrollment in Illinois.

While the topic of increasing female enrollment in mathematics has little meaning at the junior high school level due to the required enrollment in mathematics, the question has vast importance at the senior high school level. The data on total student enrollment in mathematics at the senior high school level during the five year period between the two Census studies is shown in Table 19. The relative gain of 3.4 percent in year-equivalent enrollment over the five year period indicates that one more student out of twenty-nine was enrolled in mathematics in 1982 than was enrolled in 1977. TabTe 20 shows that the gain in percent of year-equivalent enrollments was much more dramatic for senior high school female students than it was for male students.

These data indicate that the relative percentage change for female student enrollments over the five year period was 5.6 percent, while the growth for male students was only 1.2 percent. The comparison of the sources of this differential growth indicates that female enrollments grew the most in absolute terms in the areas of Elementary Algebra through Advanced Algebra. Percentagewise, the most dramatic gains for both sexes occurred in the area of Algebra and Trigonometry and in Computer Mathematics.

It is interesting to note the drop in both male and female enrollments in the area of General Mathematics and Remedial Mathematics. These are offset by gains in areas of more advanced mathematics. This indicates that the overall trend to more requirements, and more enrollment, in mathematics may already be taking place. An alternate interpretation for the decline in General Mathematics enrollment and the increase in more advanced enrollment may be a reduction in standards in advanced courses.

TABLE 19. CHANGE IN YEAR-EQUIVALENT ENROLLMENT IN SENIOR HIGH SCHOOL MATHEMATICS AS A PERCENTAGE OF THE STATE HIGH SCHOOL ENROLLMENT, 1976-77 TO 1981-82

Percent of Mathematics Year-Equivalent Total Enrollment 1976-77	Percent of Mathematics Year-Equivalent Total Enrollment 1981-82	Percent Absolute Change	Percent Relative Change
56.0	57.9	+1.9	+3.4

TABLE 20. COMPARISON OF PERCENT OF MALE AND FEMALE YEAR-EQUIVALENT ENROLLMENT IN THE MOST POPULAR HIGH SCHOOL MATHEMATICS COURSES RELATIVE TO STATE HIGH SCHOOL ENROLLMENT, 1976-77 and 1981-82

Course Title	Male Percent		Female Percent		Percent of Relative Change	
	1977	1982	1977	1982	Male	Female
General Mathematics	4.9	3.9	4.0	3.2	-20.4	-20.0
Remedial Mathematics	4.4	3.2	3.5	2.6	-27.3	-25.7
Prealgebra	3.3	3.3	3.1	3.3	--	+6.5
Elementary Algebra	11.9	12.3	12.0	12.6	+3.4	+5.0
Geometry/Int/Plane/Adv	7.6	8.6	7.4	8.8	+13.2	+18.9
Geometry/Plane and Solid	3.1	2.7	3.2	2.8	-12.9	-12.5
Intermediate Algebra	6.5	6.9	6.3	7.1	+6.2	+12.7
Advanced Algebra	3.8	4.5	3.2	4.1	+18.4	+28.1
Algebra & Trigonometry	1.7	2.2	1.4	2.1	+29.4	+50.0
Computer Mathematics	0.9	2.1	0.7	1.5	+144.4	+114.3
All Secondary Mathematics Courses	58.6	59.3	53.3	56.3	+1.2	+5.6

Tables 21 through 24 illustrate the relative percentages of male and female students enrolled in various courses at the junior and senior high school levels broken down by size of school and type of community. Table 21 shows the analysis of male/female course enrollment patterns for junior high school courses by size of school. The majority of the ratios show that the courses are fairly equally selected by male and female students. However, when one reaches the Algebra level, female students start to show some dominance in the enrollment patterns with the exception of schools having less than 200 students. The opposite pattern seems to hold true for the enrollment data for Remedial Mathematics at the junior high school level. Here more males than females tend to be found in the courses. The data for the two levels of the Computer Mathematics course are presented as baseline data for later Census studies.

Table 22 shows the relative percentages for male/female course enrollment patterns in junior high school courses by community type. These data show fairly even distributions of male and female students in General Mathematics 7 and 8, but in the Prealgebra and Elementary Algebra courses the female students are in the majority in the enrollment figures. As in the school size data, the male students are in the majority in Remedial Mathematics.

TABLE 21. MALE/FEMALE PERCENTAGE ANALYSIS OF JUNIOR HIGH SCHOOL ENROLLMENT BY COURSE BY SCHOOL SIZE (Male/Female percent of mathematics enrollment by school size)

Course Title (Overall Percents)	1-199 (51/49)	200-499 (51/49)	500-999 (51/49)	1000+ (50/50)
General Math 7	51/49	51/49	51/49	49/51
General Math 8	50/50	51/49	51/49	50/50
Prealgebra	*	49/51	49/51	45/55
Elementary Algebra	56/44	46/54	48/52	45/55
Remedial Topics 7-8	49/51	56/44	58/42	57/43
Computer Topics	*	56/44	52/48	*

*No course, or enrollment too low for reliable statistics.

TABLE 22. MALE/FEMALE PERCENTAGE ANALYSIS OF JUNIOR HIGH SCHOOL ENROLLMENT BY COMMUNITY TYPE (Male/Female percent of mathematics enrollment by community type)

Course Title (Overall Percents)	Central City (51/49)	Suburb (51/49)	Independent City (52/48)	Rural (52/48)
General Math 7	51/49	50/50	51/49	51/49
General Math 8	50/50	51/49	51/49	51/49
Prealgebra	45/55	49/51	52/48	41/59
Elementary Algebra	48/52	47/53	48/52	48/52
Remedial Topics 7-8	56/44	57/43	55/45	60/40
Computer Topics	*	53/47	*	*

*Enrollment too low for reliable statistics.

Table 23 illustrates similar information to that contained in Table 21 for the male/female enrollment patterns in senior high school courses by community type. These data show a general male majority in mathematics enrollment patterns for secondary school courses. The overall ratios of male/female enrollment by community type are given at the top of the columns and the overall percent of a given sex enrolled in a mathematics course is given at the bottom of the columns. In central city schools females establish 51 percent to 49 percent majorities in Elementary Algebra and Geometry. They also establish a like majority in enrollment patterns in Advanced Algebra in rural schools. Most of the male/female ratios are in line with the overall ratios until the third year of high school mathematics. Starting with Advanced Algebra and moving through Calculus and Computer Mathematics, the male enrollments establish firm control of the enrollment ratios. These majorities reach highs of 60/40 dominance in the area of Calculus in suburban and independent city schools. In a manner like that observed at the junior high school level, the male enrollments take over the enrollment ratios for Elementary General Mathematics, with the ratios averaging about a 57/43 split across the various community types.

Table 24 presents the related information for male/female enrollment patterns for senior high school mathematics broken out by size of school. Again the data indicate most of the course level enrollments having more male than female students across school sizes. The only exceptions fall in the courses of Prealgebra, Elementary Algebra, Geometry, and Intermediate Algebra. Here, as with the community type data, the facts suggest that females, while gaining in percentage of enrollments, are perhaps still not being guided into taking advanced mathematics courses on a level commensurate with their numbers in school. The differences between male and female enrollments grow more marked as the level of the courses increases beyond Intermediate Algebra. The ratios are especially unfavorable to females in the areas of Precalculus, Calculus, and Computer Mathematics.

TABLE 23. MALE/FEMALE PERCENTAGE ANALYSIS OF SENIOR HIGH SCHOOL MATHEMATICS ENROLLMENT BY COMMUNITY TYPE (Male/Female percent of mathematics enrollment by community type)

Course Title (Overall Percents)	Central City (51/49)	Suburb (53/47)	Independent City (53/47)	Rural (52/48)
Elementary Gen. Math	55/45	56/44	57/43	58/42
Prealgebra	51/49	50/50	51/49	51/49
Elementary Algebra	49/51	51/49	51/49	50/50
Geometry	49/51	51/49	51/49	50/50
Intermediate Algebra	51/49	51/49	50/50	49/51
Advanced Algebra	52/48	54/46	54/46	52/48
Precalculus	52/48	56/44	58/42	57/43
Calculus	58/42	62/38	60/40	58/42
Computer Mathematics	55/45	64/36	61/39	57/43
Percent of Sexes Enrolled in Math	55/54	66/61	53/50	53/51

TABLE 24. MALE/FEMALE PERCENTAGE ANALYSIS OF SENIOR HIGH SCHOOL MATHEMATICS ENROLLMENT BY SCHOOL SIZE (Male/Female percent of mathematics enrollment by school size)

Course Title (Overall Percents)	1-199 (52/48)	200-499 (53/47)	500-999 (52/48)	1000-1699 (53/47)	1700-2599 (52/48)	2600+ (53/47)
Elementary Gen. Math	59/41	56/44	56/44	54/46	56/44	55/45
Prealgebra	56/44	50/50	44/56	51/49	51/49	52/48
Elementary Algebra	50/50	51/49	49/51	50/50	49/51	51/49
Geometry	48/52	51/49	50/50	50/50	50/50	51/49
Intermediate Algebra	47/53	50/50	50/50	50/50	51/49	51/49
Advanced Algebra	50/50	52/48	53/47	54/46	53/47	54/46
Precalculus	59/41	57/43	58/42	56/44	54/46	58/42
Calculus	59/41	55/45	60/40	60/40	62/38	61/39
Computer Mathematics	51/49	58/42	56/44	62/38	60/40	60/40
Percent of Sexes Enrolled in Math	50/50	53/51	59/55	60/57	61/58	63/60

These analyses of course enrollments by sex of students at the junior and senior high school levels indicate that there have been advances in encouraging more females to enroll in mathematics over the five year period between the 1976-77 Census and the present Census. However, the data in Tables 23 and 24 suggest that there is still much to be done to bring female enrollment in upper division secondary mathematics and computer courses to a level commensurate with the proportion of female secondary school students.

SUMMARY AND IMPLICATIONS

The previous sections of this report have examined the nature of the 1981-82 Census of Secondary School Offerings sample, the typical junior high school program in mathematics, the typical senior high school program in mathematics, and the data relating to the male/female enrollment ratios in mathematics across the 7-12 grade mathematics curriculum. These data have provided a rich picture of the current status of secondary mathematics course offerings and course enrollments as of the 1981-82 school year. In addition, the comparison of the 1981-82 Census data with that gathered in the 1976-77 Census has provided a look at the dynamic nature of the secondary school mathematics curriculum in Illinois over the intervening five years.

An examination of the course offerings at both the junior and senior high school levels shows little movement away from the traditional General Mathematics 7 and 8, General Mathematics 9, Prealgebra, Elementary Algebra,

Geometry, Advanced Algebra and Trigonometry, and Senior Mathematics sequence of course offerings. Further, while Computer Mathematics has made great inroads into the curriculum over the five year period observed, there is still a long way to go before a sizeable percentage of students have any real knowledge of computer programming and or operation.

In addition, the data on the offering of Probability and Statistics at the high school level is rather discouraging. In 1976-77, 5.53 percent of the senior high schools reported teaching a course in Probability and Statistics, accounting for 0.06 percent of the senior high school year-equivalent enrollment. The 1981-82 Census indicates that Probability and Statistics was being taught in only 4.86 percent of the senior high schools in the sample, accounting for 0.07 percent of the senior high school year-equivalent enrollment. This slight drop in the number of schools offering coursework in Probability and Statistics is surprising given the increased role that the subject plays in the myriad areas of collegiate mathematics and business applications. Future Census studies should monitor the development of coursework in this area.

The data on General Mathematics/Remedial programs at the junior and senior high school levels did not indicate that substantial growth had taken place in the offerings at these levels over the five year period either. It was encouraging to see that there were slight drops in enrollment in these courses covered by larger increases in upper level coursework in mathematics. However, the secondary schools of Illinois must look to revamping this portion of the mathematics curriculum to serve the needs of nontraditional mathematics students required to take a second year of senior high school mathematics as part of their secondary school graduation requirements. This is an area that future Census studies will have to monitor.

A fourth point of note was the lack of widespread offerings in specific computer science languages. This particular offering will probably show a large increase in offerings and enrollment over the next five years as the Advanced Placement test in Computer Science becomes better established and both BASIC and PASCAL are taught on a regular basis in senior high schools. It is also quite possible that a much larger number of computer courses will be taught in the junior high school level.

A final curricular area that bears watching is the teaching of Elementary Algebra at the junior high school level. At the present the year-equivalent percentage of students completing algebra at the junior high school level is rather low. However, several groups have made suggestions in the past year that this practice should be increased in the Illinois junior high school mathematics programs. The Census provides a natural vehicle for monitoring such a change.

The overall picture presented by the results is encouraging for Illinois mathematics educators. Enrollment in remedial courses is down somewhat since 1976-77 and this drop has been more than offset by increased enrollment in Geometry and Advanced Algebra courses. The percentage of females electing to take mathematics has seen a relative increase of six percent compared to the male increase of a little more than one percent.

The health of mathematics education seems to be in good shape at the present in Illinois classrooms spanning the spectrum from seventh grade to twelfth grade. However, much of that health might be the residue of strong programs developed in the 1960's. Illinois schools will have to examine the changing trends in mathematics, the uses of mathematics, and the demands of computer science if these programs are to maintain their viability through the coming decades. The recent decline in school enrollments seem to have had little effect on the mathematics programs, as the course offerings have grown in recent years. Future Census studies will be able to report on the continued health of the Illinois secondary mathematics offerings and enrollments.

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