Chapter 6

Enrollment, Course Offerings, and Instructional Practices in Mathematics Programs at Two-Year Colleges

This chapter reports enrollment and instructional practices in fall 2005 in mathematics and statistics courses at public two-year colleges in the United States. Also included are total enrollment for these two-year colleges, average mathematics class size, trends in availability of mathematics courses, enrollment in mathematics courses offered outside of the mathematics programs, and services available to mathematics students. Many tables contain data from previous CBMS surveys (1975, 1980, 1985, 1990, 1995, and 2000) and hence allow for historical comparisons. Further analysis of many of the items discussed in this chapter can be found in Chapter 1, where they are discussed from a comprehensive point of view in comparison to similar data for four-year colleges and universities.

In the 1990 and earlier CBMS surveys, computer courses taught outside the mathematics department, and the faculty who taught them, were considered part of the "mathematics program." By 1995, computer science and data processing programs at two-year colleges for the most part were organized separately from the mathematics program. Hence, in 1995, 2000, and again in this 2005 report, such outside computer science courses and their faculty are not included in mathematics program data. In 1995 and 2000, enrollment data were collected about computer courses taught within the mathematics program and can be found in those reports. Because such courses had become rare, the 2005 survey contains no specific data about even these "inside mathematics program" computer courses, though some, no doubt, were reported by mathematics programs under the Other Courses category. Furthermore, the enrollment tables that follow have been adjusted to eliminate all specific computer science enrollments that appeared in previous CBMS reports. (See, for example, TYE.3 and TYE.4.) This adjustment allows for a more accurate comparison of mathematics program enrollments over time.

Because of the small number of non-public two-year colleges, in contrast to previous surveys, CBMS2005 included only public two-year colleges. Historically, impact on two-year data by non-public colleges has been small. As regards enrollment comparisons with previous surveys, see the explanatory text accompanying Table S.1 in Chapter 1. The two-year college data in this report were projected from a stratified random sample of 241 such institutions chosen from a sample frame of 975 colleges. Survey forms were returned by 130 colleges (54% of the sample). The return rate for all institutions, two-year and four-year, in CBMS2005 was 58% (345 of 600). For comparison purposes, we note that in 2000 the survey return rate for two-year colleges was 60% (179 of 300 colleges), and in 1995 the return rate was 65% (163 of 250). All three two-year rates (1995, 2000, and 2005) are dramatically higher than two-year college return rates had been prior to 1995, reflecting a decade in which two-year college mathematics faculty greatly broadened their professional involvement and in which more intense follow-up efforts were exerted in collecting survey data. For more information on the sampling and projection procedures used in this survey, see Appendix II. A copy of the two-year college survey questionnaire for CBMS2005 may be found in Appendix V.

The terms "permanent full-time" and "temporary full-time" faculty occasionally are used in this chapter. For a detailed explanation of what these terms mean, see the introductory notes in Chapter 7.

The Table display code in this chapter is TYE, for "two-year enrollment," since the chapter deals mostly with issues related to enrollment.

Highlights of Chapter 6

- When all students were counted, including dual-enrollment students at local high schools, in fall 2005 enrollment in mathematics and statistics courses in mathematics programs at public two-year colleges reached an historic high of 1,739,014 students. When about 42,000 dual-enrolled students were omitted, the number is about 1,697,000, still an historic high. See Table S.1 in Chapter 1, Table SP.16 in Chapter 2, and Table TYE.2.
- Using the 1,697,000 figure above, in fall 2005 two-year colleges enrolled about 48% of all undergraduate mathematics students in U.S. colleges and universities. Two-year colleges accounted for about 44% of all collegiate undergraduate enrollments.
- Depending on what comparison is made, the enrollment growth in two-year college mathematics programs from 2000 to 2005 was between 27%

and 30%. For details, see the discussion before Table TYE.2.

- The mathematics and statistics enrollment increase from 2000 to 2005 described above more than doubled the 12% overall enrollment increase at public two-year colleges in the same period. For details, see the discussion before and after Table TYE.1.
- Two-year college enrollment growth in mathematics from 2000 to 2005 was in dramatic contrast to what occurred in the nation's four-year colleges and universities, where for the same time period, enrollment in mathematics declined slightly and lagged far behind total enrollment growth. See Table S.1 in Chapter 1.
- About 57% of the two-year college mathematics and statistics enrollment in fall 2005 was in precollege (formerly called remedial) courses. This was almost identically the percentage in 2000. See Table TYE.4.
- The total number of precollege (remedial) enrollments in mathematics programs at two-year colleges dropped by 5% from 1995 to 2000 but jumped 26% from 2000 to 2005 to end the decade 21% higher than 1995, a pattern very similar to that for overall mathematics program enrollment. This contrasts with four-year colleges (see Table S.2) in which precollege enrollments dropped by 8% between 2000 and 2005. See Table TYE.4.
- Within the cohort of precollege courses, Arithmetic/Basic Skills showed a 15% drop in enrollment even though the whole precollege group had a 26% enrollment increase. The movement was toward pre-algebra courses, which experienced a 57% increase in enrollment. See Table TYE.3.
- Enrollment in the precalculus course group grew about 17% from 2000 to 2005, generally reflecting the large overall increase in mathematics enrollment. See Tables TYE.3 and TYE.4.
- Enrollment in calculus-level courses, which made up 9% of overall enrollment in 1995 and 8% of enrollment in 2000, continued to slide with only 6% of enrollment in 2005 and showed only a slight total headcount increase from 2000, in spite of the large overall mathematics enrollment increase. However, there was a 31% surge in Non-mainstream Calculus I, perhaps reflecting a growth in calculus enrollment by biology and life-science majors. See Tables TYE.3 and TYE.4.
- Enrollment was level or up for every course type except Arithmetic and Basic Mathematics, combined College Algebra/Trigonometry, Mainstream Calculus I and II, Differential Equations, Discrete Mathematics, and calculus-based Technical Mathematics. See Table TYE.3.
- Among the usual college-level, transferable mathematics and statistics courses, the largest enrollment increases in percentage order were as follows: Mathematics for Elementary School Teachers (11,000 increase; 61%), Elementary Statistics (40,000 increase; 56%), Mathematics for Liberal Arts (16,000 increase; 37%), and College Algebra (33,000 increase; 19%). See Table TYE.3.
- The fall 2005 survey indicated the following reductions (in comparison to fall 2000) in the percentage of colleges offering various advanced courses over a two-year window: Mainstream Calculus I, down 7 percentage points to 87%; Mainstream Calculus II, down 10 percentage points to 78%; Differential Equations, down 1 percentage point to 58%. See Table TYE.5.
- Compared directly to fall 2000, fall 2005 saw the following notable increases in the percentage of two-year colleges offering various courses required for baccalaureate degrees: Mathematics for Liberal Arts, up 6 percentage points to 56% and Mathematics for Elementary School Teachers, up 10 percentage points to 59%. See Table TYE.6.
- In fall 2005, average size of on-campus classes decreased by about two students to 23, with only 21% of class sections above 30, the class size recommended by the Mathematical Association of America (MAA). See Tables TYE.7 and TYE.8. For comparable four-year data, see Tables E.13 and E.14 in Chapter 3.
- The percentage of class sections taught by part-time faculty in fall 2005 was 44%, a two-percentage-point drop from 2000, reversing the direction of the eight-percentage-point increase that had occurred from 1995 to 2000. Once again, the percentage of sections taught by part-time faculty varied significantly by course type, with part-time faculty teaching 56% of precollege courses but only 12% of mainstream calculus courses. See Table TYE.9.
- For easy reference concerning part-time faculty, we note here that part-time faculty (including those paid by third parties such as school districts) constituted about 68% of the total faculty in mathematics programs at public two-year colleges in fall 2005, up two points from 2000. If 1,915 part-time faculty members paid by a third party are excluded, in 2005 the part-time percentage of the total faculty was 66%. In 2000, the comparable figure was 65%. Information on faculty size is given in Table TFY.1 in Chapter 7.
- The predominant instructional modality continued to be the standard lecture method, with this reported as the preferred methodology for all but two courses by percentages that ranged as high as 93%. In Mainstream Calculus I, the use of writing,

computer assignments, and group projects dropped 10 to 15 percentage points. For details, see Tables TYE.10, TYE.11 and the surrounding discussion.

- Perhaps surprisingly, the use of on-line resource systems for homework, tutoring, and testing was low, at 14% and 11% of course sections for Arithmetic and each of Elementary/Intermediate Algebra, and 10% for statistics. Use was half this percentage in most other courses. Data about on-line resource use were collected for the first time in CBMS2005, replacing a question about weekly use of computer labs. See Table TYE.10.
- About 5% of mathematics program enrollment at two-year colleges in fall 2005 was in distance learning, defined as an instructional format in which at least half the students received the majority of instruction using methods where the instructor is not physically present. Most courses showed less than 5% enrollment in this format. Some courses, such as Geometry, Mathematics for Elementary School Teachers, and Elementary Statistics, however, had distance enrollment near or over 10%. See Table TYE.12.
- Virtually all two-year college mathematics programs made diagnostic or placement testing available, with 97% requiring placement testing of first-time enrollees. Discussion of scores with advisors was required by 90% of colleges, and 88% of colleges used placement tests as part of mandatory placement. See Table SP.11 in Chapter 2.
- About 95% of two-year colleges had a mathematics lab or tutorial center. There was about a ten-percentage-point increase in the number of colleges whose students participated in mathematics contests and a similar increase in the number of colleges with special programs to encourage minority students in mathematics. See Table TYE.13.
- After a 42% decline in 2000, the collection of precollege (remedial) courses taught "outside" the mathematics program (e.g., in developmental studies divisions) experienced an 89% rise in 2005, almost triple the enrollment increase within mathematics programs. These "outside" enrollments, offered at 31% of colleges, are not included in Table TYE. 1. If they were, total mathematics enrollment in fall 2005 at public two-year colleges would exceed 1,900,000. See the discussion before Tables TYE.3 and TYE.5 and especially the discussion before Tables TYE.15 and TYE.16.

Enrollment, Class Size, and Course Offerings In Mathematics Programs

Number of two-year-college students

About 6,389,000 students were enrolled in public two-year colleges in fall 2005. This estimate is based on a mid-range overall 2005 enrollment projection for public two-year colleges by the National Center for Educational Statistics (NCES). Enrollment in two-year colleges in fall 2005 constituted about 44% of the total undergraduate enrollment in the United States. See Table S.1 in Chapter 1.

In CBMS surveys prior to 2005, mathematics enrollment was collected from both public and private two-year colleges. The reader should note that, in contrast to Table S.1, the data in Table TYE.1 include actual (not projected) overall NCES enrollment for both public and private two-year colleges, with 2004 being the last year for which the actual NCES data is available. The data in TYE.1 allows readers to compare mathematics enrollment to overall enrollment for years 2000 and earlier. See Table S.1 for 2005 data on public colleges only.

TABLE TYE.1 Total enrollment (all disciplines) and percentage of part-time enrollments in public and private two-year colleges, in fall 1975, 1980, 1985, 1990, 1995, 2000, and 2004.

	1975	1980	1985	1990	1995	2000	2004
Number of students	3,970,119	4,526,287	4,531,077	5,240,083	5,492,529	5,948,431	6,545,863
Percentage part-time	56	61	63	64	64	63	59

Sources: Table 177, National Center for Educational Statistics, 2005 and NCES IPEDS Table 1. In Table 177, 2004 was the latest year for which data, rather than projections, were available.

Note: Table TYE.1 differs from Table S.1 of Chapter 1 because Table S.1 includes public two-year colleges only.

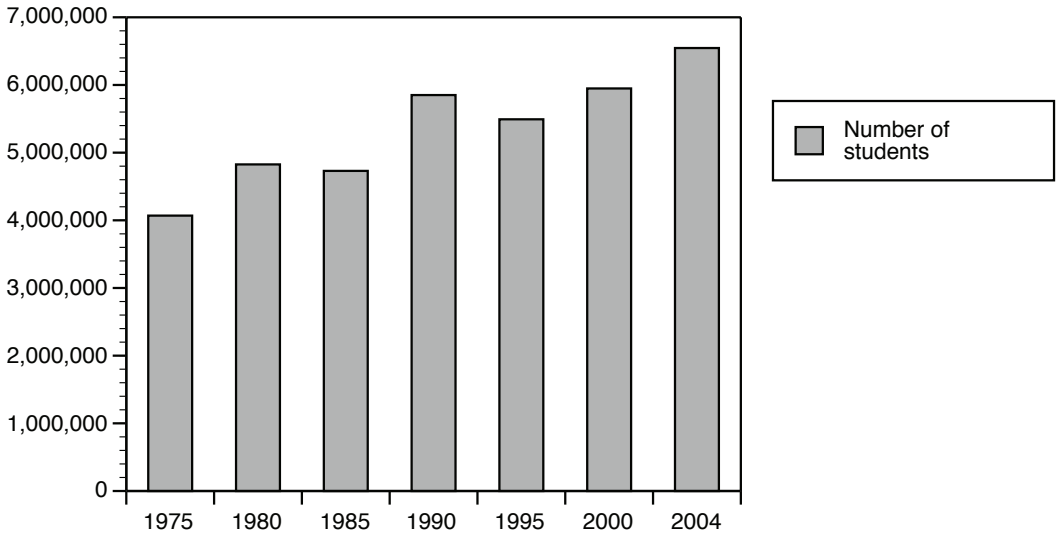

FIGURE TYE.1.1 Total enrollments (all disciplines) in public and private two-year colleges in fall 1975, 1980, 1985, 1990, 1995, 2000, and 2004, from NCES data.

Enrollment trends in mathematics programs

As in CBMS1995 and 2000, Table TYE.2 for 2005 does not include any computer science enrollments. Moreover, enrollment totals in Table TYE.2 reported from CBMS surveys prior to CBMS1995 have been adjusted to remove all computer science enrollments. For more detail on this reporting issue, see the second paragraph above at the start of this chapter.

When dual-enrollment students are included—about 42,000 high school students who took courses taught by high school teachers on a high school campus and received course credit at both the high school and at the two-year college—fall 2005 enrollment in mathematics and statistics courses in mathematics programs at public two-year colleges reached an all-time high of 1,739,014 students. In comparison to 2000, this was an enrollment increase of at least 29%. It sharply reversed the 7.5% decrease in mathematics program enrollment that had occurred between 1995 and 2000. See Tables SP.16 in Chapter 2 as well as Table TYE.2 below.

However, in fall 2005, the growth at public two-year colleges actually was slightly larger than 29%. The 2000 entry in Table TYE.2, the base for comparison, includes private two-year college enrollments. Data from the National Center for Educational Statistics (NCES) indicated about 99% of overall two-year college enrollment in 2002 was at public institutions. Assuming the 99% was valid in 2000 also, the enrollment growth in mathematics programs at public colleges from 2000 to 2005 exceeded 30%.

Dual-enrollment students, numbering about 42,000, were one reason for the mathematics program growth that appeared in 2005, but they accounted for only about 3% of the growth. When these students are excluded, mathematics programs at public two-year colleges still had an historically high enrollment of 1,697,000. Again using the 99% adjustment described in the previous paragraph, without dual enrollments the increase from 2000 to 2005 was 27%. See Table TYE.2 below as well as Table S.1 in Chapter 1 and Table SP.16 in Chapter 2.

A 29% enrollment increase in mathematics and statistics courses from 2000 to 2005 more than doubled the 12% overall enrollment increase at public two-year colleges in the same period. The overall enrollment increase is reported in Table S.1 and above in Table TYE.1. The percentage is based on a mid-range NCES overall enrollment projection of 6,389,000 students at public two-year colleges in 2005. The reader is reminded that the data in Table TYE.1 includes actual (not projected) enrollment for both public and private two-year colleges for the years indicated, with 2004 the last year for which actual NCES data is available.

Two-year college mathematics growth from 2000 to 2005 also contrasted sharply with the pattern in the nation's four-year colleges and universities. During the same time period, at four-year institutions, mathematics enrollment declined slightly and lagged far behind total enrollment growth. See Table S.1 in Chapter 1. This decline created yet another alternation in an interesting interlocking of collegiate mathematics enrollment patterns that first emerged over the decade from 1990 to 2000. Both two-year and four-year colleges came to the millennium with mathematics enrollment at about the same level each had reported in 1990, but they had followed very different

paths in reaching that point. Four-year enrollments fell from 1990 to 1995 and rebounded in 2000 to earlier levels. By contrast, two-year enrollments rose sharply from 1990 to 1995 but by 2000 had fallen to 1990 levels. In 2005, when two-year enrollments were exploding, the enrollment in mathematics at four-year institutions declined slightly.

In addition to the tables that follow, the reader should consult Chapter 1 of the current report. Chapter 1 contains a detailed analysis of mathematics department enrollments at both two-year and four-year colleges over the decade 1995 to 2005 and also contains additional enrollment comparisons between two-year and four-year colleges.

The 2005 survey confirmed that the typical two-year college mathematics program principally offered courses for remedial or general education and in support of disciplinary majors other than mathematics. This observation is consistent with past CBMS surveys that have suggested few two-year college students intended to transfer to a four-year college or university to study mathematics as a major.

TABLE TYE.2 Enrollments in mathematics and statistics (no computer science) courses in mathematics programs at two-year colleges in fall 1975, 1980, 1985, 1990, 1995, 2000, and 2005. (Total for fall 2005 includes only public two-year colleges, and includes dual enrollments.)

	1975	1980	1985	1990	1995	2000	2005
Mathematics & Statistics enrollments in TYCs	864,000	953,000	936,000	1,295,000	1,456,000	1,347,000	1,739,000 [1]

[1] Data for 2005 include only public two-year colleges and include 42,000 dual enrollments from Table SP.16.

Note: Data for 1990, 1995, and 2000 in Table TYE.2 differ from corresponding data in Table S.1 of Chapter 1 because the totals in TYE.2 do not include any computer science courses, while the totals in S.1 do.

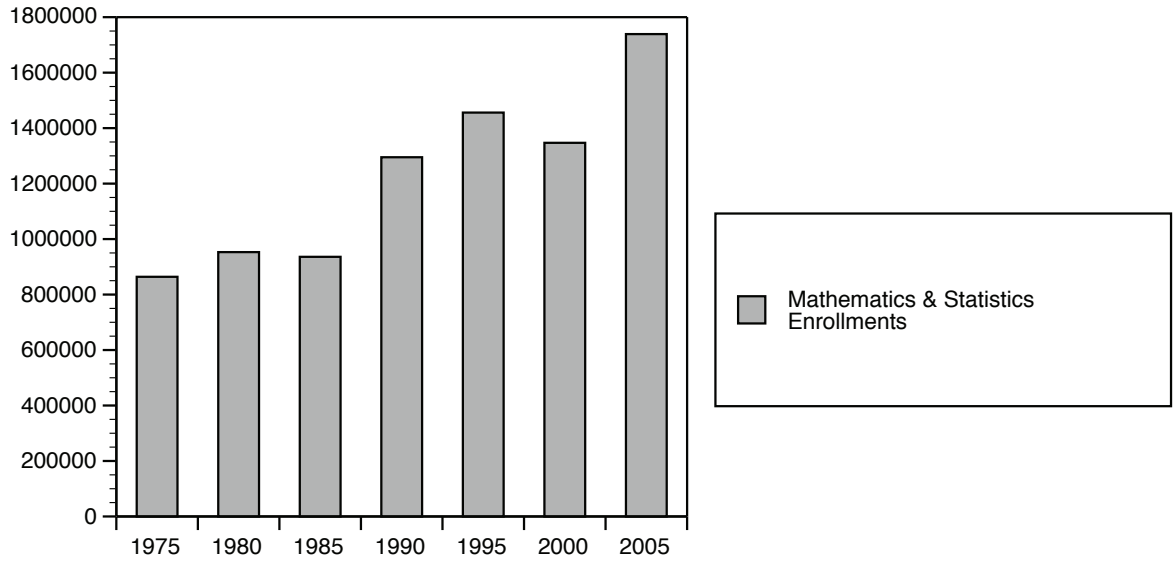

FIGURE TYE.2.1 Enrollments in mathematics and statistics courses (no computer science) in mathematics programs in two-year colleges in fall 1975, 1980, 1985, 1990, 1995, 2000, and 2005. (Data for 2005 include only public two-year colleges and include dual enrollments from Table SP.16.)

Enrollment trends in course groups and in specific courses

Table TYE.3 reports enrollment in individual mathematics courses. Table TYE.4 reports enrollment for categories of courses. Table TYE.4 is constructed from Table TYE.3 and reports headcounts and percentages from 1990 through 2005 for the following course groupings: precollege, precalculus, calculus, and statistics. Each category consists of five or more specific courses from Table TYE.3. Percentages in Table TYE.4 will differ slightly from the corresponding percentages in the CBMS2000 report because of the computer science enrollment adjustment discussed in the introduction to this chapter.

In fall 2005, precollege courses (formerly called remedial) comprised over half (57%) of mathematics program enrollment. The percentage of precollege enrollments in the overall mathematics program enrollment also was 57% in fall 2000. In fact, this percentage has been essentially stable at 57% since 1990, a very long run without significant change.

The total size of the precollege course enrollment has varied over time as follows: down by 5% from 1995 to 2000 but up 26% from 2000 to 2005, to end the decade in 2005 at 21% higher than 1995. Interestingly, these swings in the number of precollege enrollments have almost exactly paralleled the rises and falls in the total mathematics program enrollment at two-year colleges during these years: down 7% from 1995 to 2000 but up 29% from 2000 to 2005, for a decade-long change of plus 19%. These percentages are calculated from Table TYE.4, which does not include 42,000 dual enrollments used in other calculations.

Additionally, more than 30% of two-year colleges conducted all or part of their precollege (remedial) mathematics program outside of the mathematics program in an alternate structure like a developmental studies division or learning laboratory. These enrollments are not included in Tables TYE.3 and TYE.4. These "outside" precollege enrollments also grew substantially from 2000 to 2005 (by 89%), reflecting a continued difference in strategy at two-year colleges about how best to supervise precollege mathematics students. For more information on these "outside" precollege courses, see the discussion for Tables TYE.15 and TYE.16 later in this chapter.

Precalculus-level courses accounted for 19% of 2005 enrollment, almost identical to the 20% reported in 2000. Together with precollege courses, these two categories of preparatory courses below calculus accounted for 76% of mathematics and statistics enrollment at public two-year colleges in fall 2005.

Calculus-level courses continued a ten-year decline in which they progressively accounted for smaller proportions of the overall mathematics program enrollment. They made up 9% of overall mathematics program enrollment in 1995 and 8% of enrollment in 2000 but only 6% of enrollment in 2005. The total headcount in calculus-level courses in 2005 was only very slightly larger than the headcount in these courses in 2000, in spite of the very large increase in overall mathematics program enrollment in 2005. However, there was a 31% enrollment increase in the special non-mainstream calculus course. The distinction between "mainstream" and "non-mainstream" calculus is discussed below.

In contrast to what happened from 1995 to 2000, between fall 2000 and fall 2005 enrollments increased in every major mathematics course category. See Table TYE.4. The increases within these course categories were precollege (remedial) 26%; precalculus 17%; calculus 1%; and statistics 59%.

Refer to Table TYE.3 for enrollment in individual courses. In dramatic contrast to the five-year period 1995–2000, 21 of the 28 courses surveyed remained level or increased in enrollment between 2000 and 2005. The seven exceptions were Arithmetic and Basic Mathematics, combined College Algebra/Trigonometry, Mainstream Calculus I and II, Differential Equations, Discrete Mathematics, and calculus-based Technical Mathematics. From 1995 to 2000, the only courses that had shown enrollment gain were Elementary Statistics (3%), Mathematics for Elementary School Teachers (12.5%), and Mathematics for Liberal Arts (13%). These three courses once again led the enrollment gain from 2000 to 2005 with increases respectively of 56%, 61%, and 37%.

As reported in Table TYE.3, business mathematics enrollment increased 73% from 2000 to 2005, thereby returning to its 1995 level, but this enrollment number is an amalgam of transferable and non-transferable courses. The fact that in fall 2005 there was an eight-point increase in the number of colleges offering the non-transferable business mathematics course at least once during a two-year cycle and a decrease in the number of programs offering the transferable course suggests that the 73% enrollment increase was skewed toward lower-level business courses.

In reading the enrollment tables, the reader is reminded that mainstream calculus consists of those calculus courses that lead to more advanced mathematics courses and usually is required of majors in mathematics, the physical sciences, and engineering. Non-mainstream calculus includes the calculus courses most often taught for biology, behavioral science, and business majors. Additionally, refer to the comments at the start of this chapter about adjustments made in the tables because of computer science enrollments that were included in previous CBMS surveys. Finally, note that additional enrollment data and analysis can be found in Chapter 1.

TABLE TYE.3 Enrollment in thousands in mathematics and statistics courses (not including dual enrollments) in mathematics programs at two-year colleges in fall 1990, 1995, 2000, and 2005. (This table does not include any computer science enrollments appearing in previous CBMS reports. Also, 2005 data include only public two-year colleges.)

Course Number	**Type of course**	1990	1995	2000	2005
	Precollege level				
1	Arithmetic & Basic Mathematics	147	134	122	104
2	Pre-algebra	45	91	87	137
3	Elementary Algebra (HS level)	262	304	292	380
4	Intermediate Algebra (HS level)	261	263	255	336
5	Geometry (HS level)	9	7	7	7
	Precalculus level				
6	College Algebra (above Intermed Algebra)	153	186	173	206
7	Trigonometry	39	43	30	36
8	College Algebra & Trig (combined)	18	17	16	14
9	Intro to Mathematical Modeling	na	na	7	7
10	Precalc/ Elem Fnctns/ Analyt Geom	35	50	48	58
	Calculus level[1]				
11	Mainstream Calculus I	53	58	53	51
12	Mainstream Calculus II	23	23	20	19
13	Mainstream Calculus III	14	14	11	11
14	Non-mainstream Calculus I	31	26	16	21
15	Non-mainstream Calculus II	3	1	1	1
16	Differential Equations	4	6	5	4
	Other mathematics courses				
17	Linear Algebra	3	5	3	3
18	Discrete Mathematics	1	3	3	2
19	Elem Statistics (with or w/o Probability)	47	69	71	111
20	Probability (with or w/o Statistics)	7	3	3	7
21	Finite Mathematics	29	24	19	22
22	Mathematics for Liberal Arts	35	38	43	59
23	Math for Elementary School Teachers	9	16	18	29
24 & 25	Business Mathematics	26	25	15	26
26	Technical Math (non-calculus)	17	17	13	16
27	Technical Math (calculus-based)	1	2	2	1
28	Other mathematics courses	0	0	14	28
	Total all TYC math courses	1272	1425	1347	1696

Note: 0 means fewer than 500 enrollments and na means not available. Round-off may make column sums seem inaccurate.

[1] Mainstream calculus is for mathematics, physics, science & engineering. Non-mainstream calculus is for biological, social, and management sciences.

TABLE TYE.4 Enrollment in 1000s (not including dual enrollments) and percentages of total enrollment in mathematics and statistics courses by type of course in mathematics programs at two-year colleges, in fall 1990, 1995, 2000, and 2005. (This table does not include any computer science enrollments appearing in previous CBMS reports. Also, 2005 data include only public two-year colleges.)

Course numbers	Type of course	1990	1995	2000	2005
1–5	Precollege	724	800	763	964
		(57%)	(56%)	(57%)	(57%)
6–10	Precalculus	245	295	274	321
		(19%)	(21%)	(20%)	(19%)
11–16	Calculus	128	129	106	107
		(10%)	(9%)	(8%)	(6%)
19–20	Statistics	54	72	74	118
		(4%)	(5%)	(5%)	(7%)
17,18, & 21–28	Other	121	130	130	186
		(10%)	(9%)	(10%)	(11%)
1–28	Total all courses	1272	1426	1347	1696
		(100%)	(100%)	(100%)	(100%)

Note: This table was constructed using Table TYR.3. Notice that the breakdown into type of course is different from that in Chapter 1 Table S.2 and Appendix I for four-year colleges and universities. Data from CBMS reports before 2005 have been modified to remove all computer science enrollments.

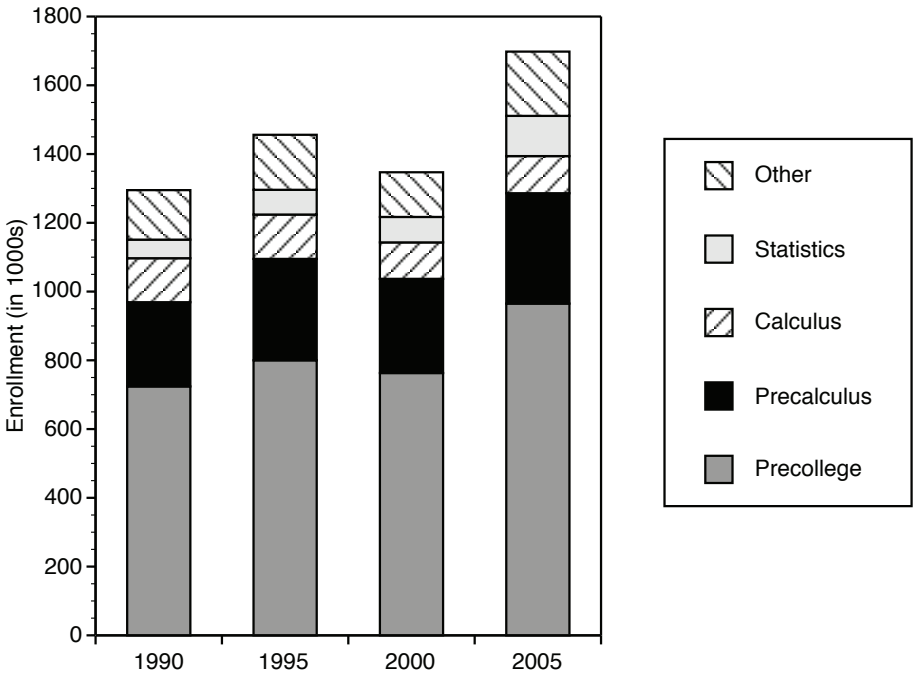

FIGURE TYE.4.1 Enrollment in 1000s (not including dual enrollments) in mathematics and statistics courses by type of course in mathematics programs at two-year colleges in fall 1990, 1995, 2000, and 2005. Totals do not include any computer science enrollments and data for 2005 include only public two-year colleges.

Trends in availability of courses in mathematics programs

Tables TYE.5 and TYE.6 should be considered together. The first shows the percentage of public two-year colleges offering a course within the mathematics program at least once in a two-year academic period. The second shows the percentage of colleges offering certain courses specifically during fall 2005. The availability of some of these courses (such as differential equations and linear algebra) over a two-year period is considerably higher than availability during a single fall semester.

The reader should also note that 31% of two-year colleges in fall 2005 reported that some or all of the precollege (remedial) mathematics courses at the college were organized separately from the mathematics department. This was up slightly from the 29% reported in both 1995 and 2000. See Table TYE.17. These "outside" courses are not included below in Tables TYE.5 and TYE.6 in reporting the availability of particular courses. The "outside" headcount enrollment is estimated in Tables TYE.15 and TYE.16. Also see the last highlight bullet at the start of this chapter.

Table TYE.5 reports that the percentage of two-year college mathematics programs offering a separately titled arithmetic/basic mathematics course continued a steep decline from 70% in 1995 to 56% in 2000 and finally to 48% in 2005. This does not mean that arithmetic material was not part of the department's or the college's overall curriculum, only that a stand-alone course called "arithmetic" continued to become less available within the mathematics program. At the same time, from 2000 to 2005, the percentage of mathematics programs offering a pre-algebra course, which almost certainly included arithmetic skills, rose six percentage points to 47% (Table TYE.5), and enrollment in these pre-algebra courses rose 57% (TYE.3). Also simultaneously, combined arithmetic/pre-algebra enrollment grew by 39% (Table TYE.15) in courses outside the mathematics program.

Intermediate Algebra, which is roughly equivalent to the second year of high school algebra, was offered in 88% of colleges in fall 2005, down slightly since 2000. Historically, Intermediate Algebra has been the bridge between a developmental studies division and a mathematics program. Within a mathematics program, Intermediate Algebra often is the preparatory course for transferable college-credit mathematics. The wide availability of the course in fall 2005 suggests Intermediate Algebra continued to play these roles. The availability of Elementary Algebra within mathematics programs grew in 2005 to 80%. The discussion below about mathematics courses taught "outside" the mathematics program also is relevant here. Table TYE.17 suggests that, historically, two to three times as many two-year colleges find a home for Elementary Algebra outside the mathematics program as those who do the same for Intermediate Algebra.

A surprising result in CBMS2005 was the sharp increase from 14% in fall 2000 to 24% in fall 2005 in the percentage of two-year colleges offering high-school-level geometry courses, though the overall geometry enrollment remained constant.

Here is availability data for courses directly preparatory for calculus, using a two-year window and compared to 2000. See Table TYE.5. The percentage of colleges that offered a separate College Algebra course decreased by four points to 79% and returned to its 1995 level. The percentage of colleges offering a separate Trigonometry course also dropped slightly, by 3 points to 63%. It had been 71% in 1995. The combined course College Algebra/Trigonometry had seen a sharp rise in availability from 1995 to 2000 but in 2005 had an identical drop in availability. Precalculus/Elementary Functions, which had a 19-percentage-point increase in availability from 1995 to 2000, dropped off five points to 60% in 2005.

When considered over the same two-year window, the percentage of colleges offering the first semester of mainstream calculus fell back to 87%. This number had been 94% in 2000 and 83% in 1995. In fall 2005 alone (Table TYE.6), 82% of colleges offered Mainstream Calculus I, and enrollment was down slightly from 2000 (Table TYE.3). The availability of Mainstream Calculus II over a two-year period was down 10 percentage points, but that of Non-mainstream Calculus I was up six points to 46%, moving back toward its 1995 level of 52%. One explanation for the rise in the latter percentage in 2005 might be an increase in the number of students pursuing transferable biology-oriented degrees in which some calculus, but not mainstream, is required. The percentage of colleges offering the second semester non-mainstream calculus remained constant at 6%.

Introductory Mathematical Modeling was a new course first surveyed in 2000. In that year, 12% of colleges reported offering the course. In 2005, this percentage had dropped to 7%. The drop may be explained in part by the fact that curriculum reform within the traditional College Algebra course was very active between 2000 and 2005, lessening the demand for newly-created modeling courses.

The CBMS1995 survey noted that many students at two-year colleges could not complete lower-division mathematics requirements in certain majors because essential courses such as Linear Algebra, Mathematics for Liberal Arts, and Mathematics for Elementary School Teachers were offered at fewer than half of two-year college mathematics programs, even over a two-year window. Using this window (Table TYE.5), CBMS2000 noted an important increase in availability for all three of these baccalaureate-essential courses. In 2005, the availability of all three jumped again.

Using data from CBMS2000, the pattern of these gains in availability (using a two-year window) over the ten-year period 1995 to 2005 is as follows: Linear Algebra, 30% to 39% to 41%; Liberal Arts, 46% to 50% to 65%; and Elementary Education, 43% to 49% to 66%. The same decade-long pattern for Differential Equations is 53% to 59% to 58%. For Mainstream Calculus I, it is 83% to 94% to 87%, and for Mainstream Calculus II, it is 79% to 88% to 78%.

Availability of other courses important to baccalaureate degrees in science, technology, engineering, mathematics, and computer science—such as Differential Equations, Discrete Mathematics, Elementary Statistics, and Finite Mathematics—had small gains or losses in 2005 but overall remained nearly constant from 2000. Overall, the continued availability of baccalaureate-transfer courses in what the National Science Foundation calls STEM degrees (science, technology, engineering, and mathematics) indicates that two-year college mathematics programs continue to support the important national effort to have more students pass through two-year college mathematics programs on their way to STEM baccalaureate degrees, though declines in availability or in the rate of enrollment growth in these courses need continual monitoring.

TABLE TYE.5 Percentage of two-year college mathematics programs teaching selected mathematics courses at least once in either 1999–2000 or 2000–2001, and at least once in either 2004-2005 or 2005–2006. (Data for 2005 include only public two-year colleges.)

Course number	Type of course	2000	2005
1	Arithmetic/Basic Mathematics	56	48
2	Pre-algebra	41	47
3	Elementary Algebra (HS level)	78	80
4	Intermediate Algebra (HS level)	90	88
5	Geometry	14	24
6	College Algebra	83	79
7	Trigonometry	66	63
8	College Algebra & Trigonometry	32	17
9	Introductory Mathematical Modeling	12	7
10	Precalculus/ Elem Functions/ Analytic Geometry	65	60
11	Mainstream Calculus I	94	87
12	Mainstream Calculus II	88	78
13	Mainstream Calculus III	67	70
14	Non-mainstream Calculus I	40	46
15	Non-mainstream Calculus II	6	6
16	Differential Equations	59	58
17	Linear Algebra	39	41
18	Discrete Mathematics	19	22
19	Elementary Statistics	83	80
20	Probability	4	8
21	Finite Mathematics	32	35
22	Mathematics for Liberal Arts	50	65
23	Mathematics for Elementary School Teachers	49	66
24	Business Mathematics (not transferable) [1]	14	22
25	Business Mathematics (transferable) [2]	19	17
26	Technical Mathematics (non-calculus)	36	36
27	Technical Mathematics (calculus-based)	9	7

[1] Not transferable for credit toward a bachelors degree.
[2] Transferable for credit toward a bachelors degree.

TABLE TYE.6 Percentage of two-year college mathematics programs teaching selected mathematics courses in the fall term of 1990, 1995, 2000, and 2005. (Data for 2005 include only public two-year colleges.)

Course number	Type of course	Percentage of two-year colleges teaching course			
		1990	1995	2000	2005
11	Mainstream Calculus I	na	83	94	82
16	Differential Equations	53	53	59	25
17	Linear Algebra	34	30	39	19
18	Discrete Mathematics	21	12	19	12
19	Elementary Statistics	69	80	83	78
21	Finite Mathematics	46	31	32	28
22	Mathematics for Liberal Arts	35	46	50	56
23	Mathematics for Elementary School Teachers	32	43	49	59
26	Technical Mathematics (non-calculus based)	36	33	36	35
27	Technical Mathematics (calculus based)	6	11	9	5

Trends in average section size

In fall 2005, the average number of students per class section in two-year college mathematics courses continued a downward trend begun in 1990. As the footnote in Table TYE.7 explains, when computer science classes taught in the mathematics department are excluded, the average class size in fall 2000 was 24.8 students. In fall 2005, this size was 23 students. Refer to the general comments at the beginning of this chapter for more detail on the exclusion of computer science courses.

The precollege (remedial) and precalculus course strata each had average class size almost exactly 23, the average for all courses. Calculus classes were about 3 persons below the average while statistics classes were a little above the average of all classes.

For a closer examination of individual course average section sizes, see Table TYE.8. As one would expect, except for some specialized courses, the smallest class sizes were among advanced courses at the two-year college such as Mainstream Calculus III, Differential Equations, and Linear Algebra.

Table TYE.7 reports that 21% of all class sections in fall 2005 had size greater than 30. There is no comparable figure for 2000 since in CBMS2000 the comparison size for two-year colleges was 35 students per class section. In 2000, 10% of class sections were over 35 students.

In 2005, the lower cut-off of 30 students per class was chosen to make data for two-year colleges directly comparable to that collected for four-year institutions and to coincide with the recommendation from the Mathematical Association of America that undergraduate class size not exceed 30 students. At two-year colleges, 79% of all class sections in fall 2005 met the MAA goal. At four-year institutions, the average class size for freshman/sophomore-level courses through calculus ranged from 28 students to 33 students, depending on course type. At Ph.D.-granting institutions, these numbers ranged from 40 to 48. See Tables E.13 and E.14 in Chapter 3 for four-year institutional data.

TABLE TYE.7 Average on-campus-section size by type of course in mathematics programs at two-year colleges, in fall 2000 and 2005. Also percentage of sections with enrollment above 30 in fall 2005. (Data for 2005 include only public two-year colleges.)

Course number [1]	Type of course	2000 average section size	2005 average section size	Percentage of 2005 sections with size > 30
1–5	Precollege	24.5	23.9	21%
6–10	Precalculus	24.8	23.6	23%
11–16	Calculus	20.8	20.0	16%
19–20	Statistics	25.2	25.9	33%
1–28	Total all courses	24.8 [2]	23.0	21%

[1] For names of specific courses see Table TYR.3.

[2] The average section size of 23.7 reported in CBMS2000 included computer science courses taught in mathematics programs. Combining data from Tables TYR.4 and TYR.9 of CBMS2000 gives an estimate of 24.8 for the average section size of non-computer-science courses (numbered 1-28) in fall 2000.

TABLE TYE.8 Average on-campus section size for public two-year college mathematics program courses, in fall 2005.

Course number	Type of course	Average section size	Course number	Type of course	Average section size
1	Arithmetic & Basic Math	22.7	16	Differential Equations	14.2
2	Pre-algebra	22.3	17	Linear Algebra	16.3
3	Elem Algebra (HS level)	24	18	Discrete Mathematics	14.3
4	Intermed Algebra (HS level)	25.1	19	Elementary Statistics	26.1
5	Geometry (HS level)	17.8	20	Probability	22.6
6	College Algebra	24.7	21	Finite Mathematics	25.3
7	Trigonometry	22.5	22	Math for Liberal Arts	24
8	College Alg & Trig. (combined)	21.7	23	Math for Elem Teachers	15.4
9	Intro to Math Modeling	24.6	24	Business Math (not transferable)	21.1
10	Precalculus [1]	21.2	25	Business Math (transferable)	8.6
11	Mainstream Calculus I	21.9	26	Technical Math (non-calculus)	18.7
12	Mainstream Calculus II	18.2	27	Technical Math (calculus-based)	18.1
13	Mainstream Calculus III	15.6	28	Other mathematics	22
14	Non-mainstream Calculus I	22.9			
15	Non-mainstream Calculus II	20.8			

[1] Includes Precalculus, Elementary Functions, and Analytic Geometry.

Trends in the use of part-time faculty

In fall 2005, part-time faculty made up a slightly larger part of the overall mathematics faculty at two-year colleges than they did in 2000. However, this statement requires some explanation. The relevant issue, as the faculty data in Table TYF.1 in Chapter 7 reflect, is who is included in the various categories. When faculty of every sort are included, such as part-time faculty paid by third parties and also temporary full-time faculty, part-time faculty in fall 2005 made up about 68% of the total faculty. The comparable figure in 2000 was 66%. If the 1,915 third-party-payee part-time faculty members are excluded, in fall 2005 about 66% of the faculty had part-time status. The comparable figure for 2000 was 65%.

Though making up about two-thirds of the faculty by headcount, part-time faculty taught only about 44% of mathematics program class sections in fall 2005. This occurred because most institutions impose a limit on the maximum number of credits a part-time faculty member can teach in comparison to the 15 contact hours weekly most full-time faculty teach. Again, see Chapter 7 for details. In fall 2000, 46% of class sections were taught by part-time faculty. In fall 1995, this figure was 38%.

Concerning the important instructional issue of which types of courses are taught most often by part-time faculty, the pattern in fall 2005 did not change from fall 2000. Once again in fall 2005, it was more likely that a part-time faculty member was teaching a course below calculus than a calculus course. It was most likely of all that the part-time faculty member was teaching a precollege (remedial) course. Table TYE.9 contains the relevant percentages.

TABLE TYE.9 Number of sections and number and percentage of sections taught by part-time faculty in mathematics programs at public two-year colleges by type of course, in fall 2005.

Course number[1]	Type of course	Number of sections	Number of sections taught by part-time faculty	Percentage of sections taught by part-time faculty
1–5	Precollege level	38814	21696	56%
6–10	Precalculus level	12898	3914	30%
11–13	Mainstream Calculus	3973	493	12%
14–15	Non-mainstream Calculus	923	254	28%
16–18	Advanced level	617	58	9%
19–20	Statistics	4142	1452	35%
21–25	Service courses	6710	1913	29%
26–27	Technical mathematics	927	339	37%
28	Other mathematics	1193	552	46%
1–28	Total all courses	70197	30671	44%

[1] For names of specific courses see Table TYR.3.

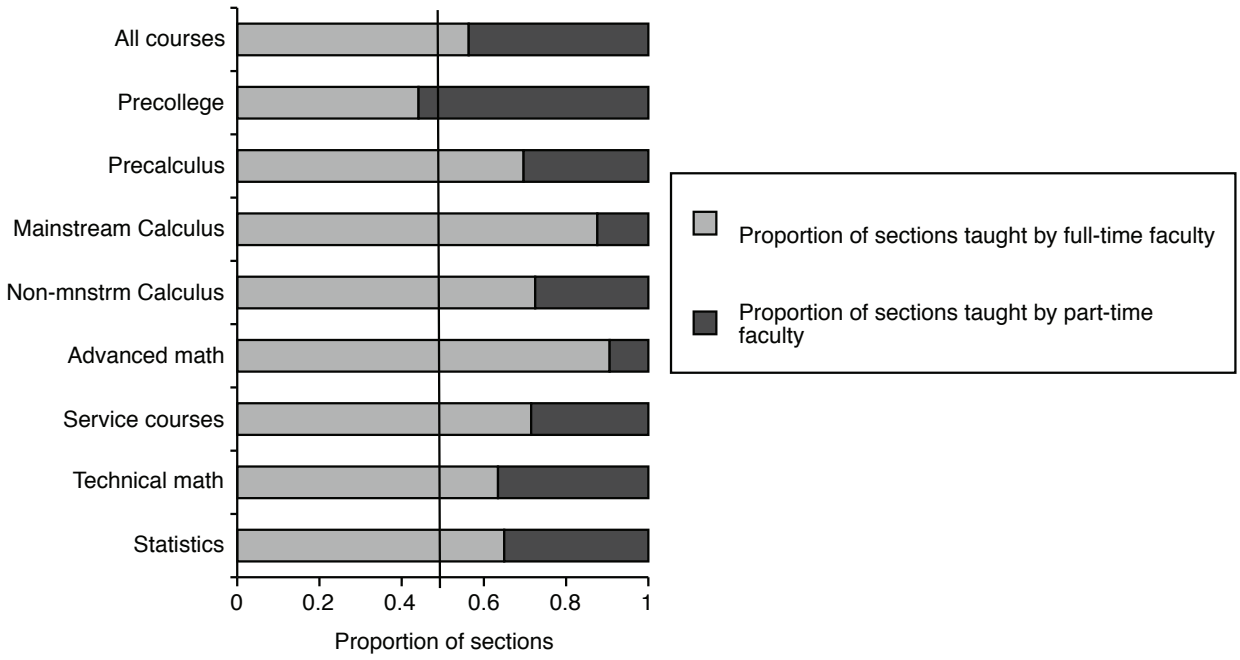

FIGURE TYE.9.1 Proportion of sections of mathematics and statistics courses taught by full-time and part-time faculty in mathematics programs at public two-year colleges by type of course in fall 2005.

Instructional Practices In Mathematics Programs

Table TYE.10 presents the percentage of class sections in mathematics courses at public two-year colleges that used various instructional practices in fall 2005. The predominant instructional method was the standard lecture format, with percentage of use in an individual course ranging from 93% in Differential Equations and 81% in Mainstream Calculus I to 74% in each of College Algebra and Elementary Algebra. The only exceptions to the predominance of the lecture method were Mathematics for Elementary School Teachers and certain business mathematics courses. CBMS2000 reported that 78% of all class sections used the lecture method. This last percentage was 77% in 1995.

Data and analysis on how first-year courses were taught at four-year institutions can be found in Chapter 5 of this report in Tables FY.2 through FY.10. For comparative data about four-year and two-year institutions, see Chapter 1, Tables S.11 through S.13.

Instructional methods in precalculus and calculus courses

In fall 2005 there also were clear patterns among various types of courses regarding the four instructional techniques included in the survey (use of a graphing calculator, inclusion of a writing component, computer assignments, and the use of group projects). For all calculus courses (both mainstream and non-mainstream) and for precalculus courses, the graphing calculator was used more frequently than any other technique. The percentage of sections using graphing calculators in calculus and precalculus courses ranged from 74% to 81%, very similar to the range in 2000 of 69% to 83%. Only Non-mainstream Calculus II had a distinctly lower use (40%), and this may well be attributed to its extremely low reported enrollment.

Table TYE.11 gives an historical perspective over ten years on the use of writing assignments and group projects in various types of calculus courses. This table reflects monitoring by the CBMS survey of the overall effect of the calculus reform movement on calculus instruction. In earlier years, use of these methods was associated closely with adoption of "calculus reform" either by entire departments or by individual faculty members, but by 2005, the best aspects of the 1990s movement for calculus instructional and content reform had settled into almost every available calculus textbook, making it hard to classify any mathematics program as reformist or non-reformist based on the use of such instructional techniques.

For a broader perspective than Tables TYE.10 and TYE.11 can give, the following display adds computer assignments to the overall picture, as well as the percentage use of all three techniques in the

Precalculus course. This layout focuses on what happened in these areas from 2000 to 2005. As noted above, during this period there was a slight increase in the already high percentage usage of graphing calculators in all these courses. But in almost every course and for almost every one of the three techniques, the percentage of use declined over this five-year period, sometimes substantially. The three exceptions were under group projects. Only one of the three exceptions had a significant percentage increase, and this increase was in the low-enrollment Non-mainstream Calculus II course for which data were less reliable.

	Writing Assignments		Computer Assignments		Group Projects	
	2000	2005	2000	2005	2000	2005
Precalculus	22%	14%	16%	9%	20%	21%
Main Cal I	31%	19%	35%	20%	27%	19%
Main Cal II	25%	18%	37%	30%	25%	25%
Main Cal III	21%	16%	35%	28%	23%	20%
Non-M Cal I	20%	14%	15%	9%	20%	14%
Non-M Cal II	39%	21%	24%	0%	8%	27%

Calculus data for four-year institutions can be found in Tables S.11 and S.12 in Chapter 1, broken down by the size of the lecture section used by the institution.

On-line resource systems

CBMS2005 added a new survey question related to the use of on-line resource systems in instruction. These systems, which have been vigorously promoted by publishers as supplements to textbooks and sometimes as stand-alone instructional systems, can involve a wide variety of teaching aids such as automated outside-of-class practice, automated graded homework assignments, and automated testing. As Table TYE.10 reports, these systems were used in only a small percentage of precalculus and calculus classes at two-year colleges. Their proportion of use was about the same in four-year institutions (S.11 and S.12). Only in arithmetic courses, algebra courses of all kinds, and statistics courses did their use reach 10% of sections.

Instructional methods in courses other than precalculus and calculus

Graphing calculator usage in courses other than Precalculus and the various levels of calculus held steady or grew modestly between 2000 and 2005. However, the use of graphing calculators in sections of College Algebra showed a 14-point drop to 60%. In sections of the combined College Algebra/Trigonometry course, which also had a large decline in availability, calculator usage dropped 33 points to 53%. Courses reporting an especially large growth in percentage of sections using graphing calculators were Differential Equations, up 29 points to 81%; Probability, up 27 points to 83%; Statistics, up 14 points to 73%; and Mathematics for Liberal Arts, up 13 points to 33%.

For writing assignments, there was an almost across-the-board decline in use between 2000 and 2005 in courses other than Precalculus and the various levels of calculus. In most cases, the decline was small, in the range of five percentage points, but a few cases stand out. Geometry, which was being offered at notably more colleges in 2005, reported use of writing in 25% of sections, up 21 points from 2000. Writing was down 35 points to 38% in Introduction to Mathematical Modeling and was down 14 points to 52% in courses for future elementary school teachers. Use of writing in courses for liberal arts students was down five points to 36%, but still maintained their standing in the top six of courses that used writing.

Changes in the percentage of sections using computer assignments between 2000 and 2005 varied greatly. Geometry was up 20 points to 23%. Combined College Algebra/Trigonometry was up 14 points to 25%. Discrete Mathematics and Finite Mathematics were up 10 and 11 points to 33% and 19%, respectively. On the other hand, Linear Algebra dropped 11 points to 29%. Probability dropped 10 points to 49%. Introduction to Mathematical Modeling dropped seven points to 17%. Mathematics for Liberal Arts and Mathematics for Elementary School Teachers each dropped eight points to 7% and 13%, respectively.

TABLE TYE.10 Percentage of on-campus sections using different instructional methods by course in mathematics programs at public two-year colleges, in fall 2005.

		Percentage of sections taught using						
	Type of Course	Graphing calculators %	Writing assignments %	Computer assignments %	Group projects %	On-line resource systems %	Standard lecture method %	Number of sections
1	Arithmetic	2	3	13	9	14	64	4,400
2	Pre-algebra	5	9	18	9	7	74	5,954
3	Elementary Algebra (HS)	17	7	14	8	11	74	15,331
4	Intermed Algebra (HS)	32	8	13	9	11	77	12,773
5	Geometry (HS)	33	25	23	15	0	68	356
6	College Algebra	60	17	8	14	14	74	7,866
7	Trigonometry	67	14	3	16	7	81	1,529
8	College Algebra & Trig	53	8	25	10	13	78	654
9	Intro Math Modeling	80	38	17	59	6	64	248
10	Precalculus [1]	75	14	9	21	6	76	2,601
11	Mnstrm Calculus I	79	19	20	19	5	81	2,226
12	Mnstrm Calculus II	81	18	30	25	7	86	1,054
13	Mnstrm Calculus III	74	16	28	20	4	83	693
14	Non-mstrm Calculus I	77	14	9	14	3	76	883
15	Non-mstrm Calculus II	40	21	0	27	0	89	40
16	Differential Equations	81	11	27	21	5	93	290
17	Linear Algebra	60	18	29	14	0	68	204
18	Discrete Mathematics	47	39	33	23	0	82	123
19	Elementary Statistics	73	44	45	24	10	85	3,872
20	Probability	83	55	49	50	0	68	270
21	Finite Mathematics	55	17	19	11	3	68	844
22	Math for Liberal Arts	33	36	7	25	6	79	2,232
23	Math for Elem Tchrs	21	52	13	48	3	48	1,665
24	Business Math [2]	6	2	18	1	0	87	539
25	Business Math [3]	18	7	7	6	2	24	1,430
26	Tech Math (non-calc)	39	4	5	5	5	72	863
27	Tech Math (calc)	63	17	21	30	0	83	64
28	Other math	27	10	5	7	6	63	1,193

[1] Includes precalculus, elementary functions, and analytic geometry.
[2] Not transferable for credit toward a bachelors degree.
[3] Transferable for credit toward a bachelors degree.

TABLE TYE.11 Percentage and number of calculus sections in mathematics programs at two-year colleges that assign group projects and that have a writing component, in fall 1995, 2000, and 2005. (Data for 2005 include only public two-year colleges.)

		Percentage of sections with group projects			Percentage of sections with a writing component			Number of sections		
Course number	Type of course	1995	2000	2005	1995	2000	2005	1995	2000	2005
11	Mainstream Calculus I	22	27	19	20	31	19	2325	2298	2226
12	Mainstream Calculus II	18	25	25	13	25	18	1008	957	1054
13	Mainstream Calculus III	22	23	20	16	21	16	733	686	693
14	Non-mstrm Calculus I	20	20	14	17	20	14	1010	728	883
15	Non-mstrm Calculus II	22	8	27	16	39	21	75	57	40

Distance learning

The comments that precede Table E.4 in Chapter 3 explain why the survey question in CBMS2005 about "distance learning" was phrased in terms of course enrollment, rather than the number of class sections, for both four-year and two-year colleges.

In the 1995 CBMS survey, two-year colleges were asked about course sections taught using television. Technology rapidly made this question obsolete. The 2000 survey inquired about the number of course sections taught via "distance learning," which was described as a course structure in which at least half the students in the section received the majority of instruction in a format where the instructor was not physically present. CBMS2005 asked the same question of two-year colleges as was asked in 2000, but CBMS2005 asked in terms of course enrollment because distance-learning sections are not bound by room-size limits and tend to vary dramatically in enrollment depending on local administrative practice.

Looking back over ten years, less than 1% of mathematics class sections at two-year colleges were offered via television in 1995, and only 2.5% of sections in 2000 were described as using distance learning. Among high-enrollment courses in 2000, College Algebra had 6.7% of sections offered via distance learning, and Elementary Statistics had 5.8%.

For fall 2005 in two-year colleges, the relevant data are in Table TYE.12. The rounded-by-course enrollment figures given in that table exclude dual enrollments and total 1,670,000 students. When per-course distance enrollment is calculated, using the percentages in Table TYE.12, almost 81,000 students are reported in some form of distance education in fall 2005, about 5% of the mathematics program enrollment at two-year colleges.

At four-year institutions in fall 2005, "distance learning" was used sparingly, with only one of the course groupings in Table E.4 showing more than 2% of total enrollment in a distance format. By contrast, in two-year colleges (again, see Table TYE.12), only six of the 27 individual courses listed show a distance enrollment of less than 2%. At two-year colleges, the percentage of distance enrollment was quite high in some courses such as Geometry (12%), Business Mathematics (11%), Introduction to Mathematical Modeling (11%), and Mathematics for Elementary School Teachers (10%). In Elementary Statistics the percentage was 9%.

TABLE TYE.12 Percentage of distance-learning enrollments (= where at least half of the students receive the majority of their instruction using a method where the instructor is not physically present) among all enrollments (excluding dual enrollments) in certain courses in mathematics programs at public two-year colleges in fall 2005, and total enrollments (in 1000s) in those courses.

	Type of Course	Total Enrollment[4] (1000s)	Percentage Distance Enrollments
1	Arithmetic	104	4%
2	Pre-algebra	137	3%
3	Elementary Algebra (HS)	380	4%
4	Intermed Algebra (HS)	336	5%
5	Geometry (HS)	7	12%
6	College Algebra	206	6%
7	Trigonometry	36	4%
8	College Algebra & Trig.	14	1%
9	Intro Math Modeling	7	11%
10	Precalculus	58	4%
11	Mainstream Calculus I[1]	51	5%
12	Mainstream Calculus II	19	1%
13	Mainstream Calculus III	11	2%
14	Non-mstrm Calculus I	21	5%
15	Non-mstrm Calculus II	1	0%
16	Differential Equations	4	0%
17	Linear Algebra	3	2%
18	Discrete Mathematics	2	2%
19	Elementary Statistics	111	9%
20	Probability	7	7%
21	Finite Mathematics	22	5%
22	Mathematics for Liberal Arts	59	8%
23	Math for Elem Teachers	29	10%
24	Business Mathematics[2]	13	9%
25	Business Mathematics[3]	14	11%
26	Tech Math (non-calculus)	16	1%
27	Tech Math (calculus)	1	0%

Note: 0% means less than one-half of one percent.

[1] Mainstream calculus courses are typically for mathematics, physics, and engineering majors.
[2] Not transferable for credit toward a bachelors degree.
[3] Transferable for credit toward a bachelors degree.
[4] Does not include dual enrollments.

Services Available to Students

Chapter 2 of this report contains a comparison of academic services and other resources available to four-year college students and to two-year college students in fall 2005. See Tables SP.11 through SP.15 in that chapter. Table TYE.13 gives the percentage of mathematics programs at two-year colleges that offered various services to students in fall 2005.

Placement testing, tutorial laboratories, outreach projects, independent study, honors programs, programs for minorities, and programs for women

Table TYE.13 reports that diagnostic or placement testing was almost universally available in two-year colleges (97%). SP.11 reports that 97% of these colleges made such testing mandatory for first-time students, 90% of colleges required that the student discuss the placement scores with an advisor, and 88% used this score as part of a mandatory course placement program.

SP.11 also reports the source of placement tests used by two-year colleges. The decrease in locally produced tests was dramatic, from 99% to 11%. About one-third of colleges reported using commercial tests from American College Testing (ACT), and one-third reported using tests from Educational Testing Service (ETS). About 25% used other test providers. This almost-universal movement to commercial test providers likely is related to the transfer of many advising responsibilities, as discussed below, to centralized advising centers.

Mathematics tutorial centers or labs were available at almost all colleges (95%).

Two new items associated with the mathematics program had been included for the first time in the 2000 survey: outreach projects to K–12 schools and opportunities for independent study. In 2005, both had grown in availability at two-year colleges, from 20% to 25% and from 25% to 38%, respectively. By contrast (see SP.14 in Chapter 2), opportunities for involvement with K–12 schools dropped in four-year colleges from 47% to 34%, though many other opportunities at four-year colleges were more broadly available.

Special programs to encourage minorities in mathematics were reported in 15% of two-year colleges, up from 4% in 2000 and surpassing the 11% reported in 1995. Over ten years, honors sections in mathematics programs continued to grow, from 17% in 1995 to 20% in 2000 and to 24% in 2005. Participation in mathematics contests was reported by 37% of colleges.

Faculty advisors and advising

The period from 1995 to 2000 witnessed a 50% drop (down 32 percentage points) in colleges that offered mathematics advising to students by members of the mathematics faculty. By 2005, this pattern had partly reversed itself with 40% of colleges, up from 33%, reporting that advising was available from mathematics faculty.

CBMS2000 attributed these numbers to a systematic move among two-year colleges over the previous decade to locate academic advising within a student services unit where generalists offered academic counseling in all subject areas. The motivation for such a move offered in the CBMS2000 report remained valid in 2005. Two-thirds of the mathematics faculty are part-time, many of whom do not assist with advising. Hence, the full-time faculty is stretched thin to cover this duty. The student body itself is very fluid—part-time, drop-in/drop-out, night-only, weekend, working, non-residential—and not readily available on campus when the relatively few permanent full-time faculty members are present. Hence, offering advising through a student services unit, where it can be tied directly to diagnostic and placement testing, makes advising accessible to more students.

Anecdotally, mathematics faculty members complain about the accuracy of the advice students receive from non-mathematicians working in multi-disciplinary advising units. This might in part explain the increase in faculty involvement in advising that appeared in fall 2005.

The 2006 Community College Survey of Student Engagement (CCSSE), conducted under the auspices of the Community College Leadership Program at The University of Texas at Austin, reported that the majority of community college students felt academic advising was the most important support service their colleges provided, even more important than financial aid. Yet in that survey 29% of part-time students and 16% of full-time students (23% of all students) reported that they did not use advising services. Among remedial students, 26% reported that they rarely or never participated in academic advising. This last percentage was an extremely large 41% for students taking college-level courses.

The largest student group (43%) in the CCSSE survey reported that the best source of academic advising was a faculty member. Friends, family, or other students were listed as the best advising source by 26%. Only 10% of students indicated that the best academic advice came from a non-faculty-member academic advisor, and only 7% said that the best advice was on-line or obtained via computer. A companion survey, the 2006 Community College Faculty Survey of Student Engagement, indicated that about 90% of full-time faculty and 60% of part-time faculty spent some time advising students during a typical week, though CCSSE reported this fact negatively, namely, that 10% of full-time faculty and 40% of part-time

faculty reported spending zero hours weekly advising students.

The CCSSE survey, based on data from 2004, 2005, and 2006, included 249,548 community college students at 447 colleges in 46 states. The survey can be downloaded at http://www.ccsse.org. A news release about the survey is at http://www.edb.utexas.edu/education/news/2006/CCSSE_06.php. Highlights are given at http://www.edb.utexas.edu/education/news/2006/CCSSE_highlights06.php. The survey is reported in the December 1, 2006 issue of *The Chronicle of Higher Education*.

In light of the CCSSE data about faculty involvement in advising and the increase in mathematics faculty advising reported in CBMS2005, there is evidence that many students seek and get mathematical advising from faculty members. This occurs in spite of the apparent systematic institutional shift of advising to generic advising centers suggested in earlier CBMS surveys. The CCSSE survey strongly suggests that faculty advising is what students prefer.

TABLE TYE.13 Percentage of two-year colleges offering various opportunities and services to mathematics students, in fall 2000 and 2005. (Data for 2005 include only public two-year colleges.)

Opportunity/Service	2000	2005
Diagnostic or placement testing	98	97
Mathematics lab or tutorial center	98	95
Advising by a member of the mathematics faculty	33	40
Opportunities to compete in mathematics contests	28	37
Honors sections	20	24
Mathematics club	14	22
Special mathematics programs to encourage minorities	4	15
Lectures/colloquia for students, not part of math club	9	6
Special mathematics programs to encourage women	4	7
K-12 outreach opportunities	20	25
Undergraduate research opportunities	4	9
Independent mathematics studies	25	38
Other	4	4

Mathematics labs and tutoring centers

In fall 2005, as noted above, 95% of mathematics programs at two-year colleges reported a mathematics lab or tutorial center. Table TYE.14 shows the various services available in these centers. Almost all labs (94%) offered tutoring by students. Media-oriented tools such as videotapes, computer-aided instruction, computer software, and internet access were common in labs, as reported by three-quarters of the colleges. The involvement of full-time faculty in tutoring labs was reported by 50% of colleges, up 10 points from 2000, with part-time-faculty involvement about the same. Paraprofessionals were part of the personnel in two-thirds of the labs. These latter are non-faculty staff who may not hold any collegiate degrees or no collegiate degrees beyond the bachelors.

TABLE TYE.14 Percentage of two-year colleges with a mathematics lab or tutorial center that offer various services to students in fall 1995, 2000, and 2005. (Data for 2005 include only public two-year colleges.)

	Percentage of two-year colleges with math lab/tutorial center that offer various services to students		
Services offered in mathematics lab or tutorial center	1995	2000	2005
Computer-aided instruction	69	68	75
Computer software such as computer algebra systems or statistical packages	65	69	72
Internet resources	na	53	77
Media such as videotapes	70	74	68
Organized small-group study sessions	na	na	62
Tutoring by students	84	96	94
Tutoring by paraprofessionals	58	68	67
Tutoring by part-time mathematics faculty	39	48	48
Tutoring by full-time mathematics faculty	38	42	51

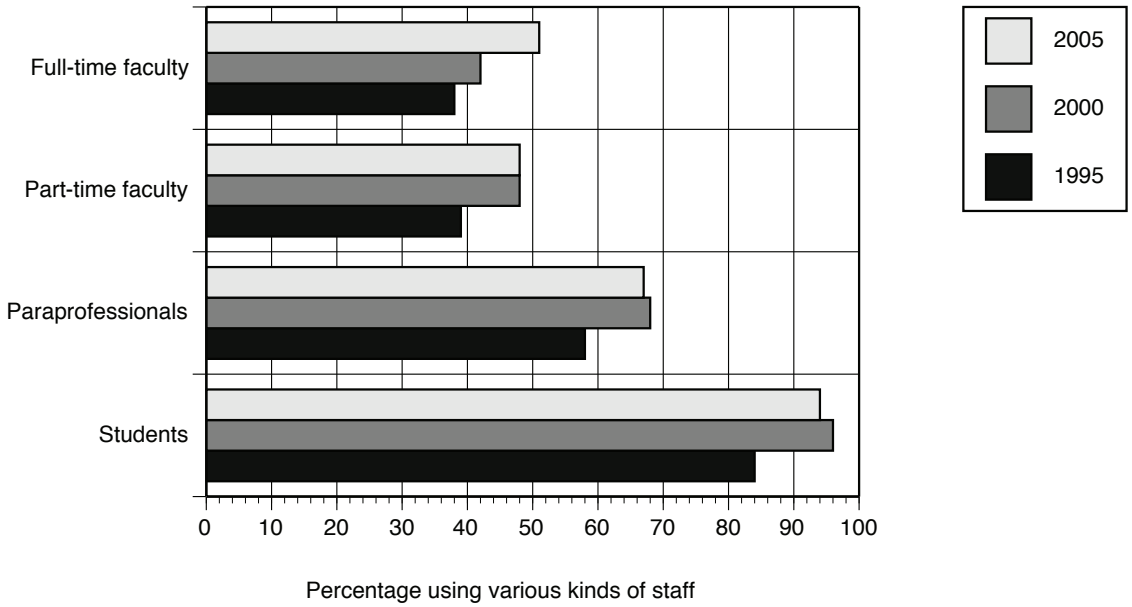

FIGURE TYE.14.1 Percentage of two-year colleges using various sources of personnel for staffing mathematics labs or tutoring centers in fall 1995, 2000, and 2005. (Data for 2005 include only public two-year colleges.)

Mathematics Courses Taught Outside of the Mathematics Programs

Not unlike their four-year counterparts, two-year colleges have a long history of offering mathematics courses in instructional units outside of the mathematics program. Tables TYE.15, TYE.16, and TYE.17 give the enrollment in mathematics courses offered outside of mathematics programs. These enrollments were estimated by mathematics program heads. Thus, they may not be as accurate as the numbers given for enrollment within mathematics programs.

In fall 2005, 80% of the outside enrollment was in precollege (remedial) courses taught either in a learning lab or in another unit such as a developmental studies division. The remainder of this outside enrollment was concentrated in business mathematics taught in a business division, statistics and probability also mostly taught in a business division, and technical mathematics taught in occupational training programs.

Percentage of precollege mathematics taught outside of the mathematics program

The largest and most important component of this "outside" mathematics enrollment is precollege developmental courses. The structure of precollege course offerings within a particular college is affected by the institution's philosophy concerning developmental education. Two views predominate. Either a student takes all developmental courses (mathematics, reading, and writing) in a self-contained unit devoted to developmental studies, or developmental courses are offered as part of the disciplinary curriculum.

The earliest CBMS survey for which "outside" precollege mathematics enrollment data are available on a course-by-course basis was in 1990. The following percentages are obtained by using Table TYE.3 and Table TYE.15. They trace the pattern of enrollment outside the mathematics program from 1990 to 2005 in Arithmetic, Elementary Algebra and Intermediate Algebra as a percentage of total enrollments in the course or the course group.

	1990	1995	2000	2005
Arithmetic/Prealgebra	18%	19%	17%	20%
Elementary Algebra	13%	12%	12%	15%
Intermediate Algebra	9%	4%	4%	7%

These "outside of mathematics program" precollege-level courses experienced a 42% drop in enrollment from 1995 to 2000 but rebounded with an 89% enrollment increase from 2000 to 2005. Though built on a much smaller base, nonetheless this percentage increase was about three times the percentage enrollment increase from 2000 to 2005 within the mathematics program itself.

Organization of mathematics courses outside of the mathematics program

Table TYE.17 shows 31% of colleges indicated that some part of their developmental mathematics program was administered separately from the mathematics program. This percentage was 29% in both 2000 and 1995. Almost all of the precollege enrollment outside of the mathematics program likely was in a learning center or some form of a developmental education division within the college.

The "shift to outside enrollment" for precollege mathematics courses that shows up in CBMS2005 is too small to harbinger a return to the large, independent developmental mathematics divisions of the 1970s, but it is a statistic that is interesting to watch.

TABLE TYE.15 Estimated enrollment (in 1000s) in mathematics and statistics courses taught outside of mathematics programs at two-year colleges, in fall 1990, 1995, 2000, and 2005. (Data for 2005 include only public two-year colleges.)

	Enrollment (in 1000s)			
Type of course	1990	1995	2000	2005
Arithmetic/Pre-algebra	42	54	43	60
Elementary Algebra (HS level)	38	41	27	65
Intermediate Algebra (HS level)	27	10	10	26
Business Mathematics	32	26	18	15
Statistics & Probability	15	9	7	12
Technical Mathematics	10	8	5	10
Total	164	148	110	188

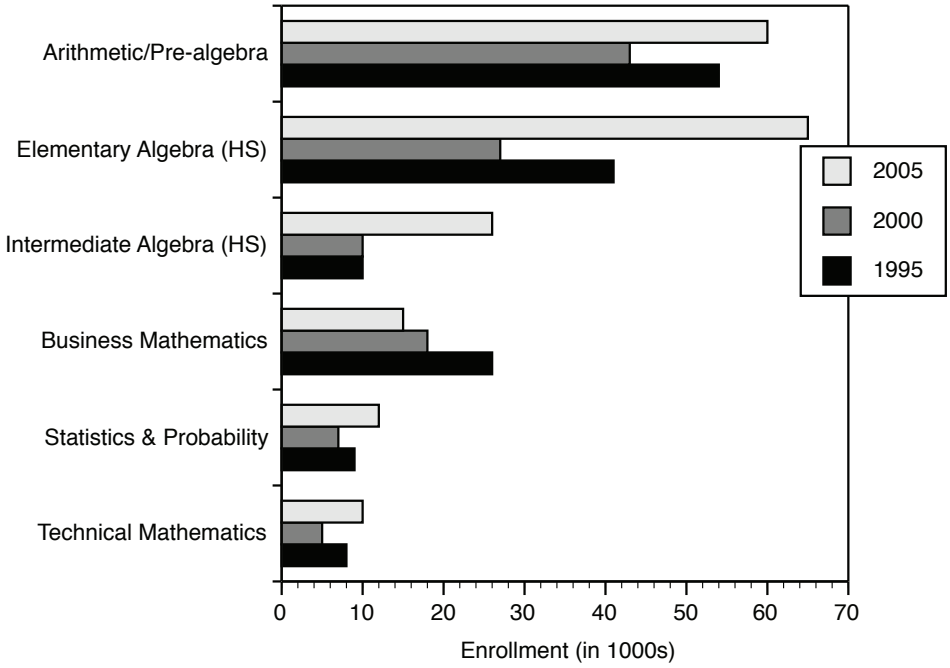

FIGURE TYE.15.1 Estimated enrollment (in 1000s) in mathematics and statistics courses taught outside of mathematics programs at two-year colleges in fall 1995, 2000, and 2005.

TABLE TYE.16 Estimated enrollment (in 1000s) in mathematics courses taught outside of mathematics programs at public two-year colleges, by division where taught, in fall 2005.

	Mathematics Enrollment (in 1000s) in Other Programs			
Course	Occupational Programs	Business	Learning Center	Other Depts/ Divisions[1]
Arithmetic/Pre-algebra	1	1	9	50
Elem Algebra (HS)	1	0	5	59
Intermed Algebra (HS)	0	0	3	22
Business Mathematics	0	14	0	1
Statistics & Probability	0	8	0	4
Technical Mathematics	8	0	0	1
Total	**11**	**23**	**17**	**137**

Note: 0 means less than 500 enrollments and this may cause column sums to seem inaccurate.

[1] A developmental studies department whose mathematics component is not supervised by the mathematics department would be an example.

TABLE TYE.17 Percentage of two-year colleges in which some of the precollege (remedial) mathematics course offerings are administered separately from, and not supervised by, the mathematics program, e.g. in a developmental studies department, with estimated percentages of enrollment outside of the mathematics program, by type of course, in fall 1990, 1995, 2000, and 2005.

Mathematics Outside of the Mathematics Program	1990 %	1995 %	2000 %	2005 %
Percentage of TYCs with some precollege mathematics courses outside of mathematics program control	na	29	29	31
Arithmetic/Pre-algebra	18	19	17	20
Elementary Algebra	13	12	12	15
Intermediate Algebra	9	4	4	7

Special Instructional Activities In Mathematics Programs

Teacher training

Enrollment data in Tables TYE.3 and TYE.5 give a partial perspective on the involvement of mathematics programs at two-year colleges in teacher education, especially in the preparation of future K–8 teachers. The expansion of two-year-college activity in this area has been rapid. Hence, the topic was one of the survey's Special Projects both in CBMS2000 and in CBMS2005. The reader should see Tables SP.2 and SP.4 in Chapter 2 for a comprehensive perspective on the mathematics education of future teachers at two-year and four-year institutions. For a more detailed discussion concerning two-year colleges, with an emphasis on the scope and organizational structure of teacher education in mathematics programs at two-year colleges, see the last section of Chapter 7.

Dual-enrollment courses

In fall 2000, so-called dual-enrollment courses were a growing phenomena that affected two-year college mathematics programs. Hence, in 2005 additional information was collected about these courses. A discussion of the 2005 survey results, including enrollment data and comparisons to what is happening in the same regard at four-year institutions, can be found with the Special Projects analysis in Chapter 2, Tables SP.16 and SP.17. Additional commentary on dual enrollment also can be found in Chapter 7 where it is discussed with emphasis on the credentials and the supervision of those who teach such courses.

These dual-enrollment courses earned credit both for high school graduation and at the two-year institution. In most cases, these courses were <u>not</u> "outside" the mathematics program in the sense of the CBMS survey. They had some level of supervision from the mathematics program, and most mathematics programs counted them among the courses offered by the program. However, these courses often were at the edge of mathematics program supervision since they often were taught by the regular high school mathematics faculty, who were hired and paid by the high school district.