Spring 2008 Lower Division Mathematics Course Summary at UC Merced

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In Brief

Points of interest in this document are summarized in brief below. You can find a more detailed analysis of all spring courses in the following section.

- Average grade point is higher in fall than in spring for each course other than Math 21, which had an anomalously low pass rate during the fall. What techniques can we employ that will help maintain focus and effort during spring term?
- Math 5 pass rate is anomalously poor – 43.4% of 129 enrolled passed course.
  - 41 students repeating Math 5 from fall 2007
    - 24 failed.
  - 49 students did not pass gateway exam
    - 41 of which failed course.
  - Low attendance to office hours and tutorials.
- Previous Math 5 students performed very well in Math 21 – 80.5% of 149 enrolled passed course.
- Math 23 abnormally low pass rate – 48.2% of 56 enrolled passed course.
  - 15 students took Math 22 more than once.
  - 18 students are in "poor academic standing."

Spring 2008 Course Overviews

What follows is an overview of lower division mathematics courses at UC Merced for the spring 2008 term. For the purposes of this document, a "C-" or better is considered "passing."

- Math 005 – 43.4% (56 of 129 students) passed.
- Math 021 – 76.1% (162 of 213 students) passed.
- Math 022 – 73.5% (100 of 136 students) passed.
- Math 023 – 48.2% (27 of 56 students) passed.
- Math 024 – 75.3% (58 of 77 students) passed.
- Math 030 – 93.3% (28 of 30 students) passed.
- Math 032 – 86.3% (69 of 80 students) passed.

Table 1. 2007 – 2008 academic year enrollment, pass rate, and grade average summary of lower division mathematics courses.

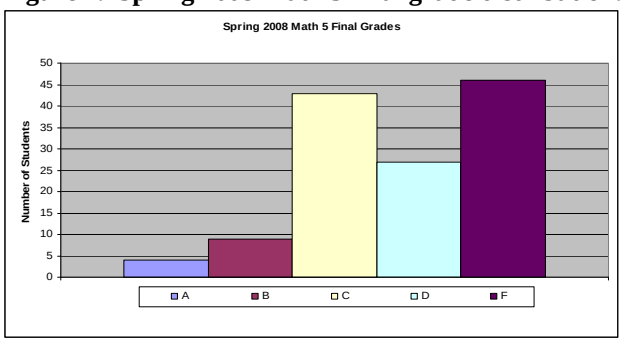
Course	Amount Passing Fall 2008	Fall 2007 Average Grade Point	Amount Passing Spring 2008	Spring 2008 Average Grade Point
Math 5	71.3% of 293	2.16	43.4% of 129	1.18
Math 21	55.0% of 151	1.68	76.1% of 213	2.05
Math 22	76.9% of 121	2.14	73.5% of 136	2.09
Math 23	66.1% of 56	1.95	48.25% of 56	1.57
Math 24	74.4% of 49	2.43	75.3% of 77	2.09

Math 30	85.2% of 27	2.82	93.3% of 30	2.65
Math 32	97.4% of 76	2.58	86.3% of 80	2.39

From Table 1, we see quite an interesting fact -- the average grade point is lower during the spring than fall for all courses, excluding Math 21 which had an anomalously low pass rate during the fall. This trend includes those courses having a higher pass rate in spring than fall.

Math 005: Preparatory Calculus

Figure 1. Spring 2008 Math 5 final grade distribution.



Of the 129 students enrolled in Math 5 during spring 2008, 43.4% (56) passed. Figure 1 above shows the grade distribution for the course. This pass rate is inconsistent from previous terms, which is described in Table 2. A similar pass rate can be seen during the fall 2005 term, but this was prior to the redevelopment of the pre-calculus curriculum. We attempt to explore reasons for this anomaly.

Table 2. Summary Math 5: Pre-Calculus enrollment and pass rates from fall 2005 to spring 2008.

Math 005: Preparatory Calculus		
Semester	Number Enrolled	Number Passing
Fall 2005	306	145 (47.4%)
Spring 2006	123	83 (67.5%)
Fall 2006	178	126 (70.8%)
Spring 2007	46	34 (73.9%)
Fall 2007	293	209 (71.33%)
Spring 2008	129	56 (43.4%)

Sections

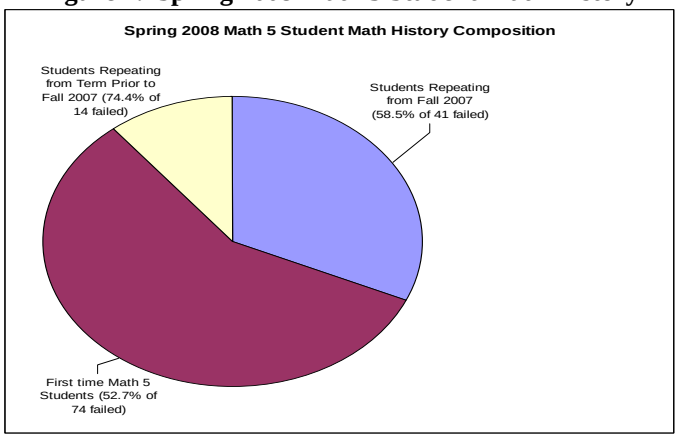
Viewing each section's enrollment numbers and the number of students passing, we hope to bring forth any problems within a particular section. There are five sections of Math 5 during spring 2008 and we have the following results.

- Section 1 (Bianchi) – 51.7% of the 29 enrolled passed.
- Section 4 (Bianchi) – 35.7% of the 28 enrolled passed.
- Section 6 (James) – 43.3% of the 30 enrolled passed.
- Section 7 (DaSilveira) – 40.7% of the 27 enrolled passed.
- Section 8 (James) – 46.7% of the 15 enrolled passed.

From the data, we see each section performed poorly. We conclude that there are no apparent issues with a specific Math 5 instructor.

Student Academic Math History
We begin by looking at the academic math history of students enrolled in Math 5 during the spring 2008 semester. Figure 3 describes the Math 5 course makeup.

Figure 2. Spring 2008 Math 5 Student Math History



From Figure 3, we notice more than 57% of students enrolled in Math 5 during the spring term were taking Math 5 for the first time, of which 39 (52.7%) did not pass the course. Of the 41 students repeating Math 5 from fall 2007, 24 (58.5%) did not pass the course and 10 of the 14 (74.4%) students repeating Math 5 from an earlier term did not pass. Thus, a large portion of the student population in this course had some time between their last math course and enrolling in Math 5. Numerous studies have shown that if mathematical concepts are not used, the ability to recall and utilize these techniques deteriorates. In addition, of the 73 students who failed Math 5, 57.5% (42) are in poor academic standing.

Gateway Exams
The gateway exam tests students in a variety of basic algebraic and computational skills needed throughout Math 5. The exam is administered within the first four weeks of classes and students are able to take the exam twice a day until the end of the four weeks. The results of spring 2008 semester's gateway exams are as follows.

- 80 students passed; 60% (48) passed Math 5.
- 33 students attempted, but did not pass; 15.2% (5) passed Math 5.
- 16 did not attempt; 18.8% (3) passed Math 5.

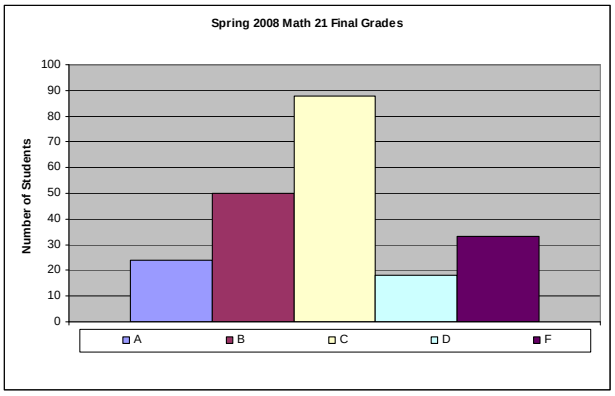
Similar to fall 2007's results, we see that by not passing the exam (attempt or no attempt) yields a substantially larger risk of failing the course – only 8 of 49 students who did not pass gateway managed to pass Math 5 during spring 2008 and 31 of 86 did so during fall 2007. This is somewhat to be expected since this implies two cases; either 1) a student attempted the gateway but lacks the necessary skills to pass the exam, thus lacking essential skills to be successful in pre-calculus or 2) did not attempt to take the gateway, demonstrating a lack of effort on the student's part.

Office Hours and Tutoring
Math 5 has benefited from having a group of instructors who have taught this course several times with adequate results (see Table 2 for each semester's data). One such instructor, Kristen Bianchi, has been teaching Math 5 since fall 2006. She states that

there has been minimal office hour attendance this term and Elizabeth Boretz, Director of the Student Advising and Learning Center, gives comparable data for tutorial sessions -- the same *nine* students attended. From this data, we infer students were not seeking the help needed.

Math 021: Calculus of a Single Variable

Figure 3. Spring 2007 Math 21 final grade distribution.



Of the 213 students enrolled, 76.1% (162) received a passing grade, which is a considerable increase from the fall 2007 pass rate of 55%. Figure 3, above, displays the Math 21 final grade distribution for the spring 2008 term.

Table 3. Summary Math 21: Calculus of a Single Variable enrollment and pass rates from Fall 2005 to spring 2008.

Math 021: Calculus of a Single Variable		
Semester	Number Enrolled	Number passing the course
Fall 2005	39	32 (82.1%)
Spring 2006	65	51 (78.5%)
Fall 2006	234	166 (70.9%)
Spring 2007	128	81 (63.3%)
Fall 2007	153	83 (55.0%)
Spring 2008	213	162 (76.1%)

From Table 3, we see the percentage of students passing Math 21 was steadily declining each term from fall 2005 until fall 2007, and drastically increased this term. At this point, it is unclear why this trend occurred.

Previous Math 5 Students

Previous Math 5 student performance in Math 21 is of interest as it helps us to assess how well our pre-calculus course is preparing students for further mathematics study. Of the 149 students who took Math 5 during fall 2007 and enrolled in Math 21 spring 2008, 80.5% (120) passed Math 21. The grade distribution is as follows.

- 17 received an A+, A, or A-
- 41 received a B+, B, or B-
- 62 received a C+, C, or C-
- 11 received a D+, D, or D-
- 18 received an F

Those students taking pre-calculus during fall 2007 at UC Merced appear to be well prepared for calculus. Table 3 below summarizes the number of students enrolled each term in Math 21, the number of students enrolling in Math 21 the term immediately following in Math 5, and the amount of those students who received a passing grade in Math 21 for each respective term.

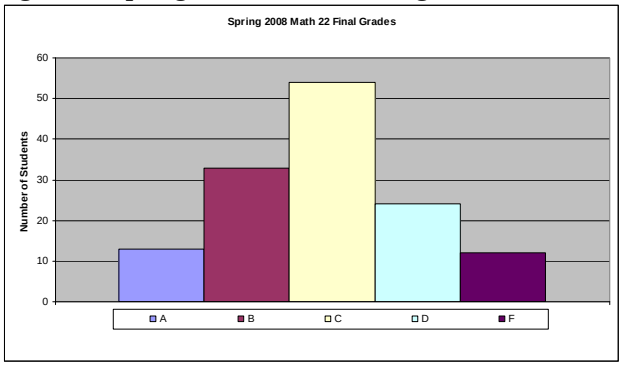
Table 4. Summary of previous Math 5 students' performance in Math 21 from spring 2006 to spring 2008.

Term	Total Enrolled in Math 21	Number enrolled from Math 5 previous semester	Number of Students Receiving an A, B, or C	
Spring 2006	65	47	38	80.90%
Fall 2006	234	54	26	48.10%
Spring 2007	128	72	44	61.10%
Fall 2007	151	11	3	27.30%
Spring 2008	214	149	120	80.50%

From Table 4, we see the fall term pass rate for students previously taking Math 5 at UC Merced are lowest during fall terms. This is somewhat to be expected since this is immediately following summer and the likelihood that students have used their pre-calculus skills during the summer months quite low. As suspected, students are most successful in calculus when taking it the semester immediately following Math 5.

Math 022: Calculus of a Single Variable II

Figure 4. Spring 2008 Math 22 final grade distribution.



Of the 136 students enrolled in Math 22, 73.5% (100) received a passing grade. Figure 4 shows the spring 2008 final grade distribution for Math 22. Table 5 below summarizes the enrollment numbers and pass rates for Math 22 from fall 2005 to spring 2008.

Table 5. Summary Math 22: Calculus of a Single Variable II enrollment and pass rates from fall 2005 to spring 2008.

Math 022: Calculus of a Single Variable II		
Semester	Number Enrolled	Number Passing
Fall 2005	19	18 (94.7%)
Spring 2006	76	68 (89.5%)
Fall 2006	113	69 (61.1%)
Spring 2007	139	54 (39.1%)
Fall 2007	121	93 (76.9%)
Spring 2008	136	100 (73.5%)

From Table 5, enrollment numbers appear to be leveling off at approximately 130 students per semester. The amount of students receiving a passing grade has been inconsistent. However, we have also had several instructors throughout the semesters. For the 2007 – 2008 academic year, Devin Greene has remained the instructor and we see similar pass rates for fall and spring terms.

Among those students enrolled in Math 22 during spring 2008,

- 43% took ICP 001 before Math 22
- 50.7% took Math 21 before Math 22

Among the 58 who took ICP 001,

- 2 received an A+, A, or A-
- 15 received a B+, B, or B-
- 20 received a C+, C, or C-
- 16 received a D+, D, or D-
- 5 received an F

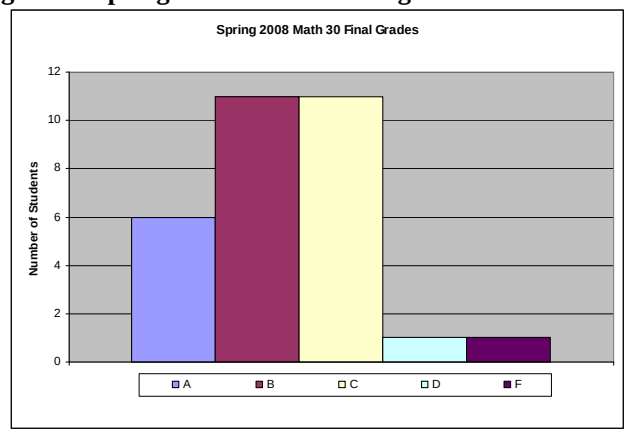
Among the 69 who took Math 21,

- 7 received an A+, A, or A-
- 18 received a B+, B, or B-
- 30 received a C+, C, or C-
- 8 received a D+, D, or D-
- 6 received an F

Thus, 36.2% of previous ICP 001 students failed Math 22 while 20% of previous Math 21 students failed Math 22.

<u>Math 030: Calculus of a Single Variable II for Biological Sciences</u>

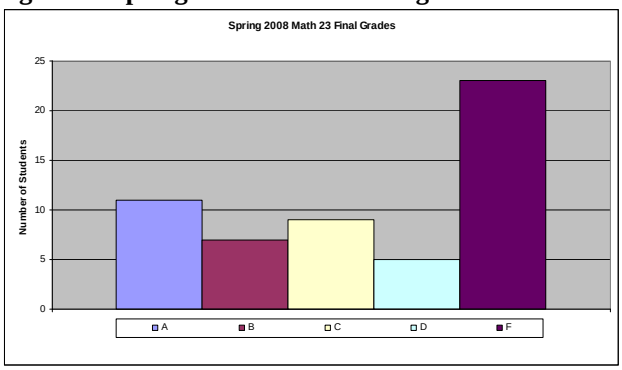
Figure 5. Spring 2008 Math 30 final grade distribution.



Of the 30 students enrolled in Math 30 during spring 2008, 93.3% (28) passed. Figure 5 shows the spring 2008 final grade distribution for the course. Since Math 30 is designed for the Biological Sciences majors, students taking Math 30 are not required to continue on in the mathematics course sequence and have not done so as of yet. Ideas for further assessment of this course are welcomed.

Math 023: Vector Calculus

Figure 6. Spring 2008 Math 23 final grade distribution.



Of the 56 students enrolled in Math 23 spring 2008, only 48.2% (27) received a passing grade. From Table 6, we notice that although there has not been a consistent pass/fail rate for Math 23, 48.2% is an abnormality.

Table 6. Summary Math 23: Vector Calculus enrollment and pass rates from fall 2005 to spring 2008.

Math 023: Vector Calculus		
Semester	Number Enrolled	Number Passing
Fall 2005	7	7 (100%)
Spring 2006	N/A	N/A
Fall 2006	45	27 (60.0%)
Spring 2007	56	45 (80.4%)
Fall 2007	56	37 (66.1%)
Spring 2008	56	27 (48.2%)

Students' Academic Math History

Among the 28 students that failed Math 23,

- 15 took Math 22 more than once
- 9 took Math 22 once, and are taking Math 23 for first time
- 2 are repeating Math 23 for second or third time
- 2 have no previous math history at UC Merced

Furthermore, among the 28 students who failed Math 23, 64.3% (18) are in "poor academic standing," meaning that they are having trouble in other courses as well as Math 23. A sufficient number of these students have a history of academic struggle.

Math 024: Linear Algebra and Differential Equations

Figure 7. Spring 2008 Math 24 final grade distribution.

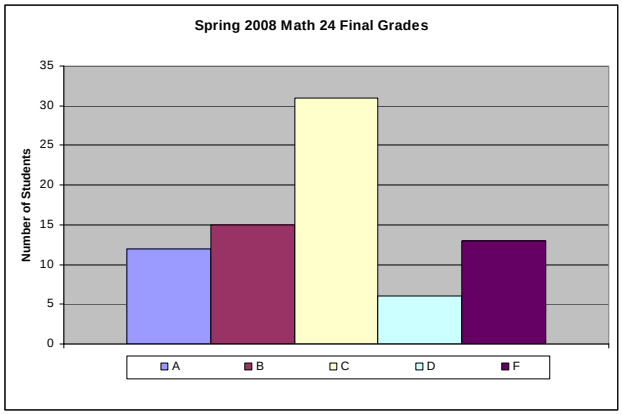


Figure 7 shows the spring 2008 Math 24 final grade distribution. Of the 77 students enrolled, 75.3% (58) received a passing grade. Table 7 gives the enrollment numbers and pass rates for Math 24 from fall 2005 to spring 2008.

Table 7. Summary Math 24: Linear Algebra and Differential Equations enrollment and pass rates from fall 2005 to spring 2008.

Math 023: Vector Calculus		
Semester	Number Enrolled	Number Passing
Fall 2005	N/A	N/A
Spring 2006	17	13 (76.5%)
Fall 2006	30	25 (83.3%)
Spring 2007	31	23 (74.2%)
Fall 2007	49	35 (71.4%)
Spring 2008	77	58 (75.3%)

Math 032: Probability and Statistics

Figure 8. Spring 2008 Math 32 final grade distribution.

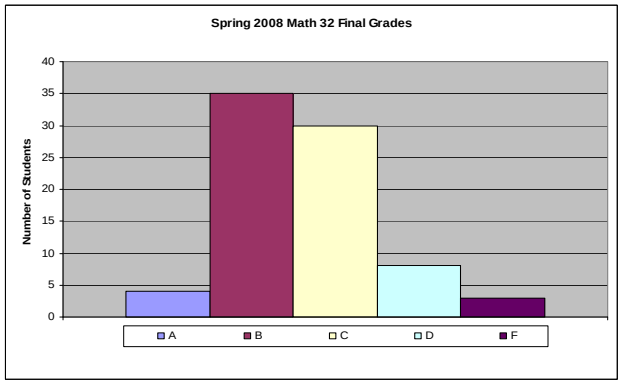


Figure 8 shows the spring 2008 Math 32 final grade distribution. Of the 80 students enrolled, 86.3% (69) received a passing grade.