Analyses of Fall 2007 Lower Division Mathematics Courses 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 fall courses in the following section.

- In Math 5, 42.7% of 110 students failing at mid-semester were able to improve grade to ñC-ò or better.
    - Gateway Exams, tutoring services, and academic workshops aided in this improvement.
        - Students continuing on to Math 21 at UC Merced will be tracked to review how well Math 5 prepares students for Calculus I. In addition, monthly math faculty meetings will be held during spring 2008 to discuss issues surrounding the Math 5 to Math 21 transition.

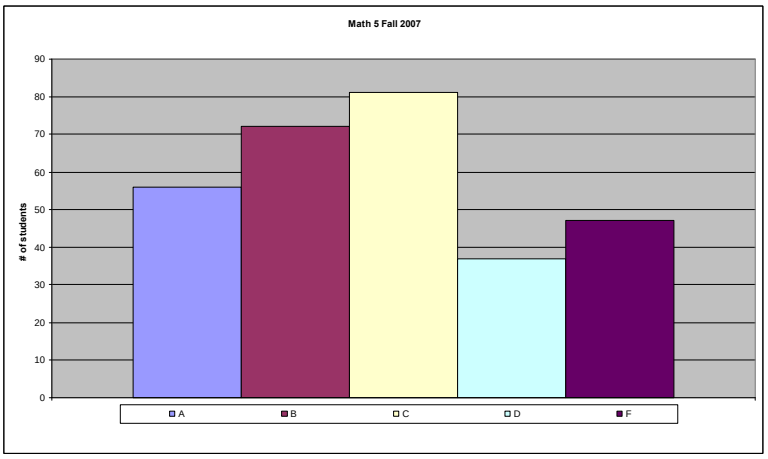
- 45% (68/151) of students failed Math 21.
    - Early assessment exam shows 78.1% (25/32) of students failing exam failed Math 21.
    - Viewing discussion participation scores shows no one receiving less than 80% of discussion points (36 students) received higher than 60% of total possible points.
    - 92.5% (37/40) of students failing at mid-semester failed Math 21.

Course Analyses

The applied mathematics faculty has asked for analyses of mathematics courses offered during the fall 2007 term at UC Merced. Data received from math instructors and the Office of the Registrar is summarized below. For the purpose of this document, a ñpassingò grade is defined as ñC-ò or better in the course.

- Math 005 ï 71.3% (209 of 293) student passed.
- Math 021 ï 55.0% (83 of 151) students passed.
- Math 022 ï 76.9% (93 of 121) students passed.
- Math 023 ï 66.1% (37 of 56) students passed.
- Math 024 ï 74.4% (35 of 49) students passed.
- Math 030 ï 85.2% (23 of 27) students passed.
- Math 032 ï 97.4% (74 of 76) students passed.

Math 5 – Preparatory Calculus



Overview

The chart above shows the final grade distribution for Math 5. Of the 293 students enrolled at the end of the fall 2007 term, 71.3% received an A, B, or C which is similar to the 2006 ï 2007 academic year average of 72.5%.

At mid-semester, 62.8% (110 of 296) were receiving a D or F. Of those 110 students, 47 (42.7%) were able to improve their grades to a level of passing.

Math Placement Exam

Students entering UC Merced in fall 2007 were required to take a 25-question online, non-proctored calculus readiness exam administered by Maple T.A. A student scoring 20 or more is placed into Math 21, Calculus I, while those scoring 19 or less are recommended to enroll in Math 5, Pre-Calculus. The chart below compares studentsô placement score to final Math 5 grade.

Placement Score	n	A, B, C	D, F
20 to 25	3	3 (100%)	0
17 to 19	62	55 (88.7%)	7
11 to 16	98	76 (77.6%)	22
1 to 10	53	27 (50.9%)	26

The Maple T.A. placement exam and 20-score cut-off appear to be achieving acceptable results.

Gateway Exam

Math 5 Gateway Exams were administered for the first time this term, fall 2007. These exams test algebraic and computational skills students should have attained in high school and will be built upon during Math 5. Passing the exam does not increase a studentôs grade; however, failing to pass the exam will decrease a studentôs grade by 1/3. The results of the exam are as follow:

- 217 students passed.
- 66 did not pass.
- 20 did not attempt.

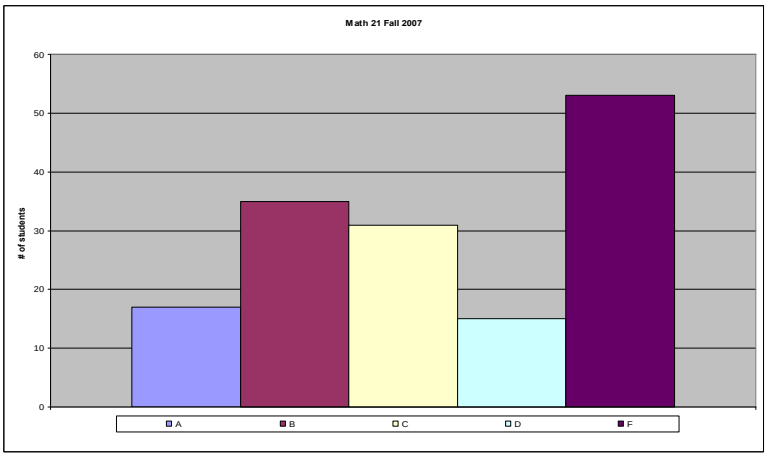
Of the 66 who did not pass, we obtain the following results.

- 3% (2) received an A+, A, or A-.
- 7.6% (5) received a B+, B, or B-.
- 30.3% (20) received a C+, C, or C-.
- 56.1% (37) received a D or F.
- 3% (2) withdrew from course.

The gateway exam is adequately identifying students needing review of fundamental Pre-calculus skills. Earlier completion of the gateway exam will allow more time to address those deficiencies and progress through the semester.

During fall 2006, only 5.7% (2/35) students failing at mid-semester were able to improve their grade from a D or F to a C- or above, compared to 42.7% (47/110) in fall 2007. Anecdotally, a combination of administering the gateway exam, improved student services such as tutoring, and academic workshops all played a role in this improvement.

Math 21 – Calculus of a Single Variable I



Overview

The chart above shows the final grade distribution for Math 21. Of the 151 students enrolled at the end of fall 2007 term, 55% (83) received a letter grade of A, B, or C. The average pass rate for the 2006 ï 2007 academic year was 63%.

At mid-semester, 44 students were receiving a grade of D or F in Math 21, only 40 of which could be identified at end of semester. Of those 40 identified as receiving D or F at mid-semester, 37 received a D or F as a final grade. Therefore, 92.5% (of 40) failing at mid-semester, failed the course. Math 21, Calculus I, is often seen as a transition course. The subject matter is challenging and constantly builds upon previously learned topic. Once a student falls behind, it is often difficult to recover; however, it is not impossible. Early, reliable assessment can help identify students in danger of falling quickly behind.

Assessment

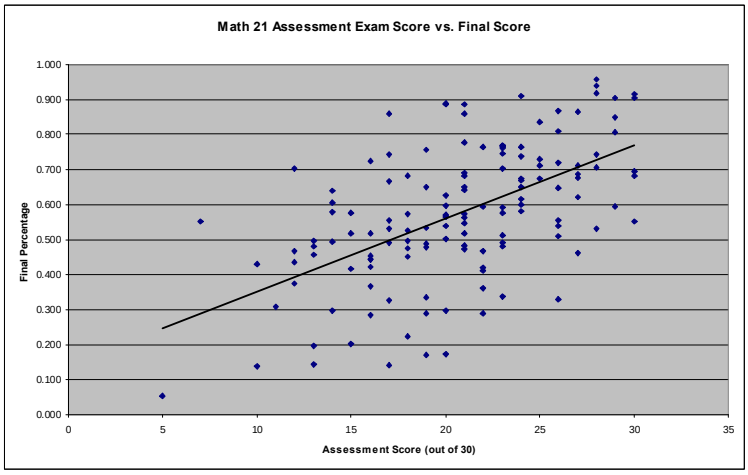
The first step in assessment is given to incoming students as the Math Placement Exam. Students entering UC Merced in fall 2007 were required to take a 25-question online, non-proctored calculus readiness exam administered by Maple T.A. A student scoring 20 or more is placed into Math 21 while those scoring 19 or less are recommended to enroll in Math 5. The chart below compares studentsô placement score and final Math 21 grade.

Scores on the Maple T.A. Math Placement Exam in Relation to
Math 021 Final Grade Fall 2007

	Final Grades					
Placement Test Score	0 F	1 D	2 C	3 B	4 A	Total n
17		1	1			2
18				1	1	2
19	1	1		1		3
20	4	2	5	3		14
21	5		3	6	2	16
22	2		4	3	1	10
23	2		3	5	5	15
24	1	1		4	3	9
25	2	1			2	5
Total	17	6	16	23	14	76
%	**22.4**	**7.9**	**21**	**30.3**	**18.4**	**100**

A weak, but positive correlation ($R^2 = .0451$) between placement and final grade was found, with an average grade of 2.16 for freshmen students. It appears that a score of 20/25 is the pivot point and an adequate cut-off.

The second step of assessment is given as a 30-question diagnostic exam administered at the beginning of the semester by Dr. Michael Sprague. Below are the results correlating studentôs assessment exam score to final score.



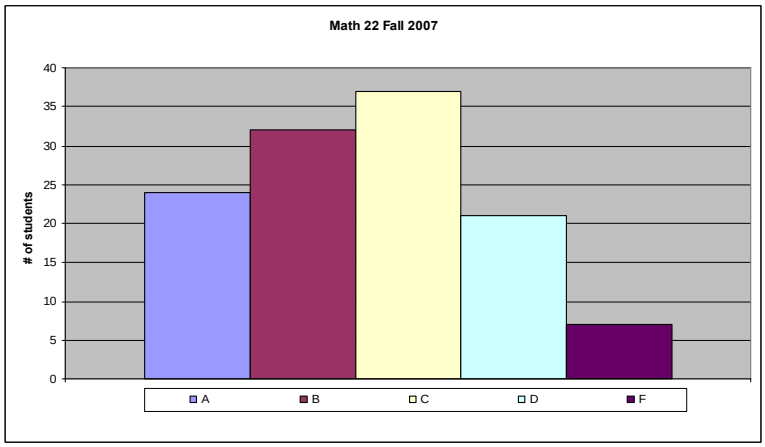
A linear regression computed positively correlates with the final scores ($R^2 = 0.32$).

Of the 151 students enrolled at the end of the term,

- 33.1% (35/106) students scoring 17 or more on assessment failed course.
- 78.1% (25/32) students scoring below 17 failed course.
- 13 had no score.

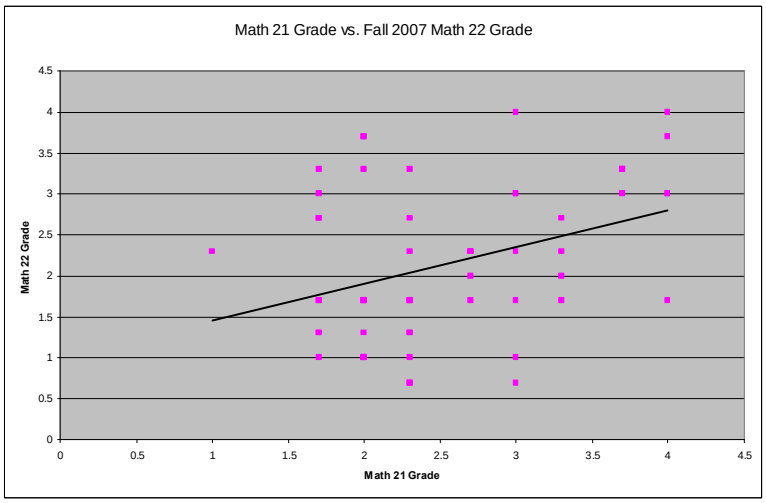
It appears that statistically, a student with a score of 16 or less will fail the course. A score of 17 or more is statistically inconclusive but suggests that a student has the fundamental skills needed to succeed in Math 21. However, this is only a portion of the puzzle for success, with the main portion relying on discipline and effort.

Math 22 – Calculus of a Single Variable II



Overview

The chart above shows the final grade distribution for Math 22. Of the 121 students enrolled at the end of the fall 2007 term, 76.9% (93) received a letter grade of A, B, or C.

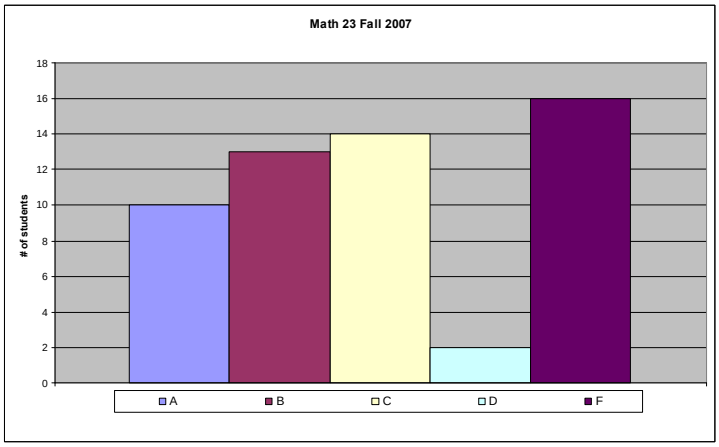


A linear regression computed positively correlates with studentsô fall 2007 Math 22 course grade ($R^2 = 0.1289$).

Math 22 (Calculus of a Single Variable II) is comprised of three categories of students: students passing Math 21 (Calculus of a Single Variable I) at UC Merced, students passing ICP 1 (Integrated Calculus and Physics) at UC Merced, and students who completed Calculus I at another institution. The fall 2007 term is as follows:

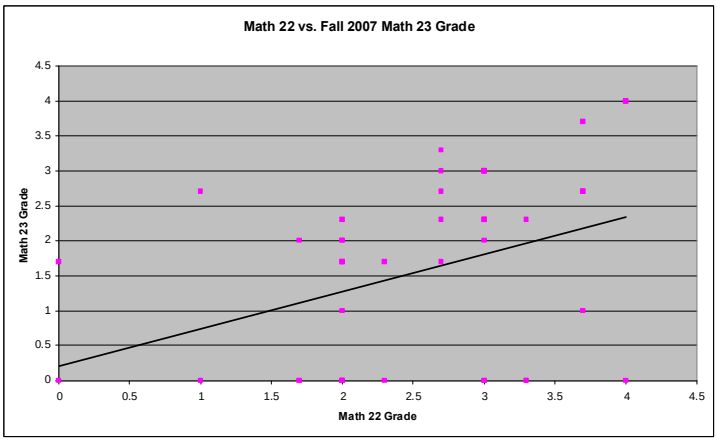
- 57 previous Math 21 at UC Merced students, 15 which failed (26.3%)
- 33 previous ICP at UC Merced students, 11 which failed (33.3%)
- 31 completing Calculus I at other institution, 2 which failed (6.5%)
- 45 students repeating Math 22, 10 which failed (22%)
    - 20 are previous Math 21 students
    - 25 are previous ICP 1 students

Math 23 – Vector Calculus



Overview

The chart above shows final grade distribution for Math 23. Of the 56 students enrolled at the end of the term, 66.1% (37) of students received a letter grade of A, B, or C.

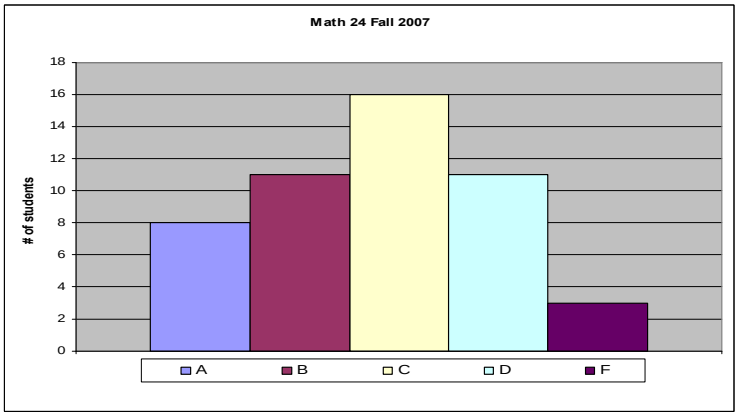


A linear regression computed positively correlates with fall 2007 Math 22 grade (R^2 = 0.144).

Fall 2007 Math 23 student history is as follows:

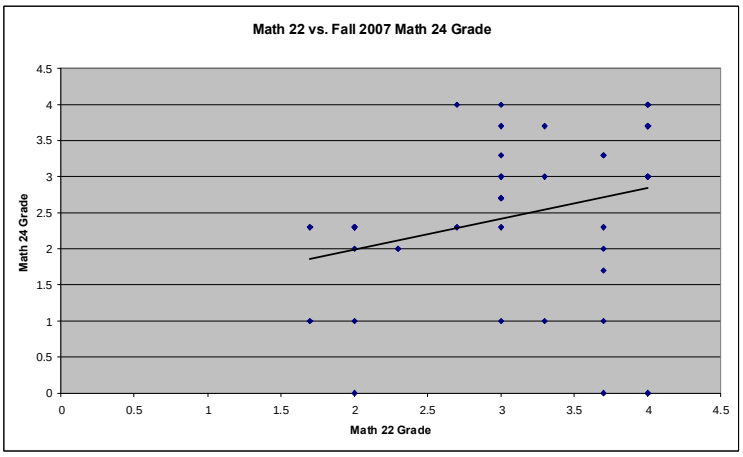
- 48 of the 56 enrolled previously took Math 22 at UC Merced
- 8 students completed Calculus II at other institution
- 7 students repeating Math 23

Math 24 – Linear Algebra and Differential Equations



Overview

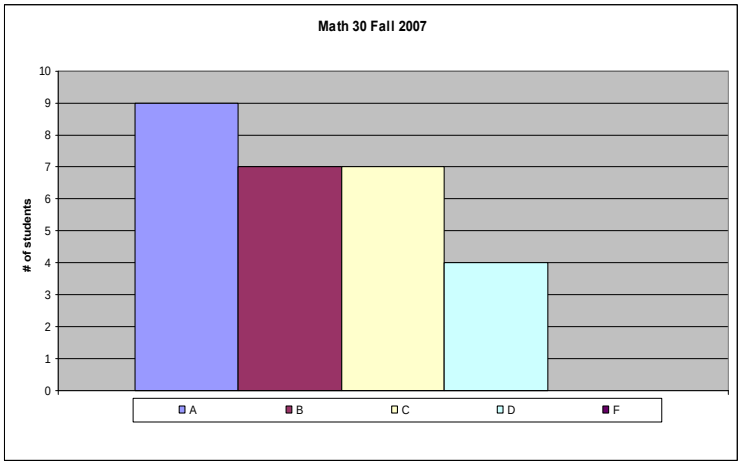
The chart above shows final grade distributions for Math 24. Of the 49 students enroll at the end of the term, 74.4% (35) of students received a letter grade of A, B, or C.



A linear regression computed positively correlates with fall 2007 Math 24 grades, although correlation is not strong (R^2= .0769).

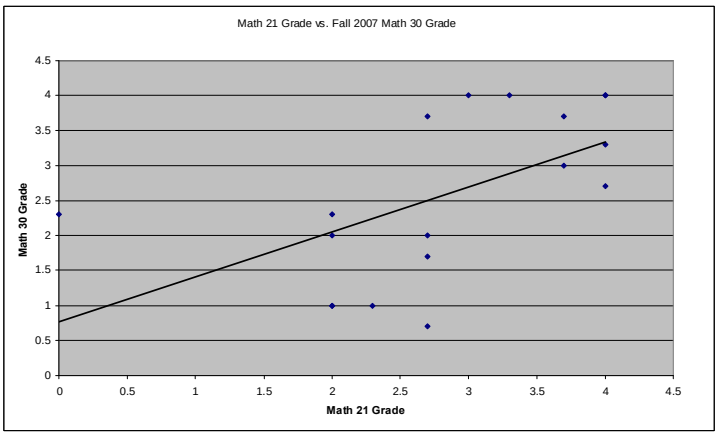
The grades earned in Math 22 correlate more to grades earned in Math 23 than in Math 24.

Math 30 – Mathematical Biology



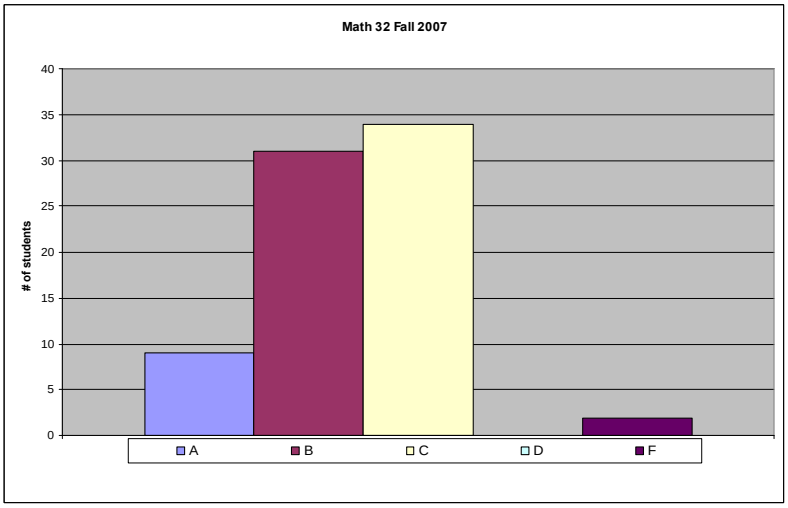
Overview

The above chart shows the final grade distribution for Math 30. Of the 27 students enrolled at the end of the term, 85.2% (23) of students received a letter grade of A, B, or C.



A linear regression computed positively correlates with Math 30 grades ($R^2 = 0.3178$).

Math 32 – Probability and Statistics



Overview

The above chart shows the final grade distribution for Math 32. Of the 76 students enrolled at the end of the term, 97.4% (74) of students received a letter grade of A, B, or C.