

## EXECUTIVE SUMMARY

Most important findings

- Pass rates were within a $74 \%-100 \%$ range for students who finished their courses
- Students with low diagnostic pretest scores coupled with low arithmetic placement scores are the least likely to pass Math 100
- Town Hall Education Arts Recreation Campus (THEARC) students who need to re-take the Math 060 course are the most likely to withdraw or drop
- Math 101 courses that are paired with a lab have higher pass rates than those without a lab
- For African American female students within the School of Professional Studies (SPS), learning about mathematicians of non-European descent, some of whom made contributions right here in Washington D.C., was an eye-opening experience, and contributed to the University's cross-curricular goals

Overview of the most important recommendations

- To increase Math 100 pass rates, students who score within the 20-25 arithmetic range on the Accuplacer placement test should take a math course elsewhere first. If they score within this range and still think they are ready for Math 100 (which is possible), they can take the pre diagnostic test to see if they score above $19 \%$.
- To improve retention, enforce stricter rules with THEARC students whereby if they are repeating, then they cannot withdraw or drop the course without special permission, as to avoid situations where classes only contain two students.
- To strengthen skills in graphing and writing linear equations, explore the possibility of pairing all Math 101 courses with a lab section and/or creating a new course that expands upon Math101S
- To strengthen the skill levels of students in operations with fractions, explore the possibility of pairing Math 100 with a lab section
- To meet the needs of SPS students, recruit and provide incentives for tutors who can effectively accommodate the weekend and evening schedules of the SPS student population
- To accurately place students, re-adjust the Accuplacer score ranges for placement in math courses for the unique SPS student population
Table of Contents
EXECUTIVE SUMMARY ..... 1
Table of Contents ..... 2
List of Figures ..... 5
Introduction ..... 7
Topics of report ..... 7
Profile of my Spring 2011 SPS students ..... 7
Snapshot ..... 8
Math 100 ..... 8
Course description ..... 8
Findings ..... 8
Pass rates ..... 8
Attendance ..... 10
Repeaters ..... 11
Results of diagnostic pre and post tests. ..... 11
Performance by chapter ..... 12
Performance by homework section ..... 12
Summary ..... 13
Math 060 ..... 13
Course description ..... 13
Findings ..... 13
Pass rates ..... 13
Attendance ..... 15
Repeaters ..... 15
Results of diagnostic pre and post tests ..... 15
Performance by chapter ..... 16
Performance by homework section ..... 17
Summary ..... 18
Math 101S ..... 18
Course description ..... 18
Mathematician presentation assignment ..... 18
Findings ..... 19
Pass rates ..... 19
Attendance ..... 21
Repeaters ..... 21
Results of diagnostic pre and post tests ..... 22
Performance by chapter ..... 22
Performance by homework section ..... 23
Summary ..... 24
Math 109 ..... 24
Course description ..... 24
Findings ..... 25
Pass rates ..... 25
Attendance ..... 27
Performance by chapter ..... 27
Performance by homework section ..... 28
Summary ..... 29
Additional Findings ..... 30
Relationship between Math 100 diagnostic pretest and passing ..... 30
Potential relationship between placement scores and Math 100 failure rate ..... 30
Potential relationship between Math 101S and grade distribution ..... 31
Math 101S relationship between attendance and homework average ..... 32
Math 101S study plan relationship. ..... 32
Relationship between Math 109 attendance rates and day and time a class is taught ..... 33
Interesting figures ..... 34
Recommendations ..... 36
Appendices. ..... 38
Appendix A ..... 39
Appendix B ..... 45
Appendix C ..... 48
Appendix D ..... 52


## List of Figures

Figure 1: Overview ..... 8
Figure 2: Math 100 enrollment status ..... 9
Figure 3: Math 100 overall grade distribution ..... 9
Figure 4: Math 100 grade distribution by student ..... 10
Figure 5: Math 100 attendance rates ..... 10
Figure 6: Math 100 diagnostic test results ..... 11
Figure 7: Math 100 class performance by chapter ..... 12
Figure 8: Math 100 class performance by section ..... 13
Figure 9: Math 060 enrollment status ..... 14
Figure 10: Math 060 overall grade distribution ..... 14
Figure 11: Math 060 grade distribution by student ..... 15
Figure 12: Math 060 diagnostic test results ..... 16
Figure 13: Math 060 class performance by chapter ..... 17
Figure 14: Math 060 class performance by section ..... 17
Figure 15: Math 101S enrollment status ..... 19
Figure 16: Math 101S overall grade distribution ..... 20
Figure 17: Math 101S grade distribution by student ..... 20
Figure 18: Math 101S attendance rates ..... 21
Figure 19: Math 101S diagnostic test results ..... 22
Figure 20: Math 101S class performance by chapter ..... 23
Figure 21: Math 101S class performance by section ..... 24
Figure 22: Math 109 enrollment status ..... 25
Figure 23: Math 109 overall grade distribution ..... 26
Figure 24: Math 109 grade distribution by student ..... 26
Figure 25: Math 109 attendance rates ..... 27
Figure 26: Math 109 class performance by chapter ..... 28
Figure 27: Math 109 class performance by section ..... 29
Figure 28: Relationship between Math 100 diagnostic pretest and passing the course ..... 30
Figure 29: Side by side comparison of arithmetic placement score of students passing and failing Math 100 ..... 31
Figure 30: Comparison of 101S and 101 ..... 31
Figure 31: Relationship between attendance and homework grades for Math 101S ..... 32
Figure 32: Relationship between hours using Study Plan and gains in Math 101S diagnostic test ..... 33
Figure 33: Pass rates by course for those students who finished the course ..... 34
Figure 34: Math 109 specialist section connections between homework averages and test averages ..... 35
Figure 35: Placement scores and overall grades of students in Math 101S ..... 36

## Introduction

This report will provide a comprehensive overview of findings for each of four courses taught by a mathematics specialist during the Spring 2011 semester, and comparative findings for two different courses taught by two adjunct faculty members. More specifically, it will discuss information for one section of Math 100, Math 060, Math 101S, Math101, and two sections of Math 109. The primary sources of data used in this report are student enrollment information, course statistics calculated by mymathlab, and student placement scores from Accuplacer. The main goal of this report is to bring to light the culmination of a semester's worth of hard work on the part of students and teachers, to identify strengths and weaknesses, and to offer suggestions for ensuring the success of students who will take these courses in the future. Sub-goals include analyzing potential relationships between diagnostic tests and final grades, examining pass/fail rates of students who repeat, and examining factors which affect learning outcomes.

## Topics of report

For each course, at the minimum, the following information will be provided: details about the course, pass rates and grade distributions, attendance rates, diagnostic test gains (excludes Math 109), repeating students (excludes Math 109), class performance by chapter, class performance by homework section, and a brief summary of the findings. In sections entitled "additional findings" and "interesting figures", I provide comparative findings and findings that reveal potential relationships between various pieces of data. I conclude the report with some recommendations for future semesters. Below, I provide a brief description of the population I served and a snapshot of data across all four courses that I taught, and then move to discuss each course individually.

## Profile of my Spring 2011 SPS students

School of Professional Studies math learners are students who typically enter Trinity not having taken a mathematics course in 5-10 years or more. These students tend to carry more anxieties and phobias surrounding mathematics than College of Arts of Sciences students (CAS) (many of whom have just matriculated from high school and recently completed Algebra I or II), and thus require specialized attention. With the exception of 3 of my students, all students were female. Two of these three males withdrew or dropped their respective course. With the exception of 1 or 2 students, all of my students were Black/African-American. Many of these students were older, had families, and worked full time. Some learners had learning disabilities for which accommodations were provided by Academic Services.

## Snapshot

Figure 1: Overview

$\left.$| Course and |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Section | | Enrollment |
| :---: |
| (January) | | Enrollment |
| :---: |
| (May) |$\quad$| Withdrew, |
| :---: |
| Dropped, |
| Did not |
| finish |$\quad$| Passing |
| :---: |
| Rate |
| (Original |
| Roster) | | Passing Rate |
| :---: |
| (Regular |
| Attendees) | | Overall |
| :---: |
| Class |
| Average |
| (Regular |
| Attendees) | \right\rvert\,

*Note: This snapshot does not include data for the 2 courses taught by the adjunct faculty.

## Math 100

## Course description

Math 100, Introduction to Pre-Algebra, is designed for students with little or no high school algebra, or those who have not taken high school algebra in a number of years. It provides a comprehensive overview of basic computational skills and their applications, such as fractions, decimals, ratios and proportions, percentages, measurement, and an introduction to algebra. Findings are presented in the next section.

## Findings

## Pass rates

26 students enrolled in the course. Six students ( $27 \%$ of the class) either withdrew or dropped.
One student attended twice and neither withdrew nor dropped leaving a total of 19 students ( $73 \%$ of the class) who actually finished the course. This is illustrated below.

Figure 2: Math 100 enrollment status


The pass rate was $54 \%$ for all enrolled. Of the $73 \%$ who finished the course (i.e. did not drop or withdraw and took the Final exam) $74 \%$ passed. Below is an illustration of the grade distribution for the class (for those students who finished the course).

Figure 3: Math 100 overall grade distribution


Of the nineteen students who finished the course, four students earned grades of A or A-, seven students earned grades of B+, B or B-, three students earned grades of C+ or C, and five students earned a C- or lower. In other words, $21 \%$ of the class earned some variation of an A, $37 \%$ of the class earned some variation of a B, $16 \%$ of the class earned C or $\mathrm{C}+$, and $26 \%$ of the class earned a failing grade. Failing was defined as attaining an overall average of less than a C. These five students who failed were students J, M, P, Q, and S (as shown in the next figure). I attribute the failure of students $\mathrm{P}, \mathrm{Q}$, and S , to missing the first day of class in which 5 sections were covered (1.1-1.5), and course expectations were discussed. In addition, a consistent factor amongst students who failed was a low arithmetic Accuplacer score.

Below is an illustration of how the grades of each of these 19 students were distributed.
Figure 4: Math 100 grade distribution by student


The majority of students performed within an $80-89 \%$ range. As calculated by mymathlab, the overall class average was $80.1 \%$ and the overall class median was $81.9 \%$. The class had relatively good performance.

## Attendance

15 (79\% of the class) of the 19 students who finished the course, had an attendance rate of $90 \%$ or higher. Three ( $16 \%$ ) of these 19 had an attendance rate of $80 \%-89 \%$. The remaining 1 student (5\%) had an attendance rate of $73.3 \%$. The attendance rate is illustrated below.

Figure 5: Math 100 attendance rates


Attendance was very good. I attribute this to the policy where a student can miss no more than 2 classes (since it is a foundational course) or their grade would be lowered by one full letter grade. One exception was made for a student who was pregnant and had doctor's orders for bed rest.

## Repeaters

Of the 26 students enrolled in the course, 7 were repeating. Of the 19 students that finished the course, 5 were repeating ( 2 of the 7 repeaters did not finish the course). Of these 5 that were repeating the course, 3 passed and 2 failed. Of the two that failed, one was very close to the $72 \%$ passing average, but due to that fact that 3 out of 4 of her exams were D's and F's, the instructor did not feel that she had truly mastered the material well enough to move to Math 101. I attribute the success of the three students that passed, to attending the first day of class, while the failure of the other 2 repeaters, I attribute to missing the first day of class.

## Results of diagnostic pre and post tests

A diagnostic test was given for students to take home during the first two weeks of the semester and again during the last two weeks of the semester. The test was a resource provided for instructors by mymathlab. Both tests contained the exact same items. Students were asked not to use calculators on certain portions. Only those students who completed and returned both tests were considered for analysis. Below are the results of the students' scores on the diagnostic tests.

Figure 6: Math 100 diagnostic test results


All 12 students made gains of some kind. Students B, F, G, I, M, and R made the greatest gains. Student B's score increased by 32.8 percentage points, a relative percent change of $134.98 \%$. This is massive. Student F's score increased by 20 percentage points, a relative percent change of $56 \%$. Student G's score increased by 41.4 percentage points, a relative percent change of $170.4 \%$, again a huge change. Student I's score increased by 20 percentage points, a relative percent change of $60.8 \%$. Student M's score increased by 12.8 percentage points, a relative
percent change of $68.8 \%$. Finally Student R's score increased by 25.7 percentage points, a relative percent change of $120.7 \%$, a huge gain.

Another interesting finding was that students $\mathrm{B}, \mathrm{I}$, and R were receiving tutoring from either myself or a university provided tutor. In particular, of students B, F, G, I, M, and R, student M was the only one that did not pass the course.

## Performance by chapter

Below is an illustration of how the class performed on each chapter.
Figure 7: Math 100 class performance by chapter


The class average starts high, then declines, hits a minimum at Chapter 4, and then rises at Chapter 5. The scores fall below the average minimum threshold in Chapter 4 in particular. This is the chapter on fraction notation, addition, subtraction and mixed numerals. This is the material that students in CAS also tend to struggle with as they usually have not learned it very well in elementary school, and come into college, without a very good grasp of it. The problems covered in this Chapter require a lot of practice.

## Performance by homework section

The illustration below conveys more detailed information about sections within chapters that had variation in performance. Sections 4.4-4.6 were covered but are not reflected in the illustration below (homework was not officially assigned on these sections due to the proximity of when 4.4 - 4.6 were covered, and the exam that would test these sections). Students did however, receive practice problems for these sections as review for the exam, and many made use of my office hours for reinforcement of the concepts in these sections.

Figure 8: Math 100 class performance by section


Class performance falls below the minimum threshold in sections 4.1-4.3, 5.5, and 5.7. These sections covered least common multiples; adding, order and operations; subtraction, equations, and applications; more with fraction notation and decimal notation; and solving equations. These are typically the most challenging topics for learners of arithmetic and basic skills, thus the dips in performance make sense.

## Summary

Though the pass rate for those who finished the course was average at best, attendance and gains in subject matter as assessed by the diagnostic were exceptional.

## Math 060

## Course description

Math 060, or Elementary algebra, is intended to provide students at THEARC with an intensive review of high school algebra. Topics include a review of basic arithmetic operations, the real number system, algebraic expression and exponents with basic rules of algebra, linear equations and inequalities with applications, and graphs of equations and inequalities. Findings are presented in the next section.

## Findings

## Pass rates

Six students enrolled in the course. Four students ( $67 \%$ of the class) either withdrew or dropped, leaving a total of 2 students (33\%). This is illustrated below.

Figure 9: Math 060 enrollment status


The pass rate was $33 \%$ for the all enrolled. Of the $33 \%$ who finished the course, $100 \%$ passed. Below is an illustration of the grade distribution for the students who finished.

Figure 10: Math 060 overall grade distribution


Students A and B (as labeled in the next figure) earned a B- and C+ respectively. In other words, $50 \%$ of the class earned some variation of a B and $50 \%$ of the class earned some variation of a C. Passing in this class was defined by attaining an overall course average of C or higher. Despite doing better overall than Student B, Student A actually had a slightly lower test average than Student B. The A's that she earned however, on the subsequent exams mitigated the effect of the zero on the first test, and enabled her to pass the course. No special treatment was given for this student (she was not allowed to make up the first exam as she had no medical reasons or emergencies). In addition, the fact that she earned an A in the prerequisite Math 030, likely had some effect on her passing. Student B, although earning a B in Math 030, suffered from moderate math phobia. Below is an illustration of each individual student's grades.

Figure 11: Math 060 grade distribution by student


The overall class average was $79 \%$ and the class median was $79 \%$. Class performance remained above the minimum threshold.

## Attendance

Student A had an attendance rate of $76.9 \%$ and Student B had an attendance rate of $100 \%$. Due to the small class size, no illustration will be provided for attendance. Student A missed several classes during the beginning of the semester and consequently missed the first exam.

## Repeaters

Of the six students who enrolled in the course, three were repeating. All three repeaters, either withdrew or dropped the course. This is a disturbing finding and suggests that a student attending THEARC who must repeat Math 060 is not likely to actually complete the course the next time they register. This will be addressed in the recommendations.

## Results of diagnostic pre and post tests

A diagnostic test via mymathlab, similar to the one was used with CAS 101 students, was created. Students were asked to take this diagnostic during the first 2 weeks of the semester, and again during the last 2 weeks of the semester. Both tests contained the exact same items. Below are the results of the students' scores on the diagnostic tests.

Figure 12: Math 060 diagnostic test results


Both students made some gains. Student A however, made the most significant gain. She had an increase of 43.6 percentage points and had a relative percent change of $130.9 \%$. Student B had an increase of 7.1 percentage points and a relative percent change of $17.7 \%$. Student A was a very young woman while student B was at least 10-15 years older and the material was likely not as fresh as it was for the younger woman who likely graduated from high school much more recently. Student A also earned an A in the prerequisite Math 030, a factor that typically correlates with future grades. Although the gains of Student B may seem small, this student had a lot fear about doing math, so her progress cannot be minimized.

## Performance by chapter

Below is an illustration of how the class performed on each chapter.

Figure 13: Math 060 class performance by chapter


The class average started in the 80 's, peaked in Chapter 9 (intro to real numbers and algebraic expressions), declined during Chapters 10 and 11, and hit a minimum in Chapter 11. This is quite normal as the material tends to become more challenging towards the end of the course. Graphs of linear equations are usually where students have the most trouble. This was witnessed last semester with the CAS 101 population. Even still, class performance remained above the minimum threshold.

## Performance by homework section

The illustration below conveys more detailed information about sections within chapters that had variation in performance.

Figure 14: Math 060 class performance by section


The sharpest declines in class performance occurred in sections 6.6, 9.8, and 10.3. Scores fell below minimum thresholds for these sections which covered applications of percent, simplifying expressions/order of operations, and using the addition and multiplication principles together to solve equations. These dips make sense as these topics tend to be some of the most challenging topics for algebra learners because of the abstract nature of equations and expressions.

## Summary

It is difficult to conclude much having 2 students, but with this population (THEARC), it seems that having to repeat Math 060 course strongly predicts dropping or withdrawing from the course. Small class size did seem to have its benefits here as reflected by the class performance by chapter data, but having such a small class presents challenges to cooperative learning and dynamic classroom interactions.

## Math 101S

## Course description

Math 101S, Introductory Algebra, is a course intended to provide students with an intensive review of high school algebra. Topics include a review of basic arithmetic operations, the real number system, algebraic expression and exponents with basic rules of algebra, linear equations and inequalities with applications, and graphs of equations and inequalities. The $S$ in Math 101S indicates that this course is paired with a 2 hour block of supplementary lab time every Friday. During lab, students took opportunities to gain clarity on certain topics, engage in group activity, and become more proficient through extensive practice problems. Labs varied in nature from intense group work to less formal math jeopardy.

## Mathematician presentation assignment

Students were provided the opportunity to learn about mathematicians of non-European decent. They gave 10 minute presentations to the class on various mathematicians they had researched. Several students discovered that their selected mathematicians (some who were male and some who were female) had major influences right here in Washington D.C. One student provided copies of memos, a birth certificate, and other documents of importance relevant to their mathematician. This student, one of the oldest students in the class, discovered that the charter school she drove by every day, was named for an African American mathematician, Euphemia Lofton Haynes, a graduate of neighboring Catholic University. The class was shocked. Of greatest significance in this assignment, was that my students knew concretely that African American men and women "did mathematics," and did it quite well, right in the students' own hometowns.

Findings are presented in the next section.

## Findings

## Pass rates

Eight students enrolled in the course. Three students ( $37.5 \%$ of the class) either withdrew or dropped, leaving a total of 5 students $(62.5 \%)$. This is illustrated below.

Figure 15: Math 101S enrollment status


The pass rate was $63 \%$ for all 8 students who were originally enrolled. Of these $63 \%$ who finished the course, $100 \%$ passed the course. Passing in this course, was defined as attaining a C or higher. Below is an illustration of how the grades of these five students were distributed.

Figure 16: Math 101S overall grade distribution


One student earned an A-, 2 students earned B+ and B, and 2 students earned $\mathrm{C}+$ and C . In other words, $20 \%$ of the class received some variation of an A, $40 \%$ of the class received some variation of a B, and $40 \%$ of the class received a C+ or C. Similarly to the identical Math 060 course, passing was considered having an average of $72 \%$ or higher. Student E (shown in the next figure), the student with the lowest grade, was a repeater. The individual student grades are illustrated below.

Figure 17: Math 101S grade distribution by student


Students A and D had the two highest passing grades. The overall class average was $82.1 \%$ and the overall class median was $83.9 \%$. Class performance was fairly good.

## Attendance

Attendance (including lab days) ranged from $75 \%-100 \%$ and not surprisingly all of these students passed the course. Four of the five students ( $80 \%$ of the class) had attendance percentages within a $93.2 \%-100 \%$ range. High attendance can be attributed to the selfmotivated and competitive nature of this group of students. The attendance rates for this class are illustrated below.

## Figure 18: Math 101S attendance rates



The one student ( $20 \%$ of the class) with the lowest attendance rate of $75 \%$ was actually a CAS student (student C from the previous figure). Two of the students with attendance averages in the $90^{\text {th }}$ percentiles received a C (the lowest grade of all five students) and C+. Interestingly, the student who received the C , was repeating, and the student receiving the $\mathrm{C}+$, registered late and missed 2-3 sessions at the start of the semester, thereby spending about 1-2 weeks playing catch up with the homework and lecture. This highlights the importance of not missing the first day of class.

## Repeaters

Of the eight students enrolled in the course, 2 were repeating. Of the students who finished the course, 2 were repeating (students B and C). Both passed, which I attribute to the extra lab day, small size of the class, and their dedication. For student C in particular, (the young CAS student), the material was very fresh.

## Results of diagnostic pre and post tests

A diagnostic test via mymathlab, similar to the one was used with CAS 101 students, was created. Students were asked to take this diagnostic online during the first 2 weeks of the semester, and again during the last 2 weeks of the semester. Both tests contained the exact same items. Below are the results of the students' scores on the diagnostic tests.

Figure 19: Math 101S diagnostic test results


Students A-D made nice gains. Student A's score increased by 25 percentage points and she had a relative percent change of $96.5 \%$. Student B's score increased by 24.7 percentage points and she had a relative percentage change of $177.7 \%$ (massive change). Student C's score increased by 20.4 percentage points and she had a relative percent change of $50.87 \%$. Student D's score increased by 10.2 percentage points and had a relative percent change of $25.63 \%$. The most unique finding was that Student E's score (she took Math 100 two times) decreased by 8.9 percentage points, a relative percent change of $-18.98 \%$. I suspect math anxiety kicked in for this woman who was older and for whom mathematics was quite a struggle. She had two tutors in fact.

In sum, $60 \%$ of these students made relative gains of $50 \%$ or more from the skills they had coming into the course, to the skills they acquired upon leaving. The case of Student B, a repeater, is also an interesting one because although she passed the course with a $\mathrm{C}+$, she had the greatest percentage change in the diagnostic test. Given that she failed Math 101S the first time she took it, her progress was indeed phenomenal.

## Performance by chapter

Below is an illustration of how the class performed on each chapter.

Figure 20: Math 101S class performance by chapter


The class average remained in the 90 's until chapter 11, which still remained above the minimum threshold of $72 \%$. Chapter 11 material, graphing equations and writing equations, is notorious for declines in student performance. This is consistent with the findings for the Math 060 course in which course coverage is identical.

## Performance by homework section

The illustration below conveys more detailed information about sections within chapters that had variation in performance.

Figure 21: Math 101S class performance by section


The sharpest declines in class performance occurred in sections 6.8 and 11.6. Section 6.8 covered interest rates on credit cards and loans. Section 11.6 covered parallel and perpendicular lines. These were very challenging sections for the students.

## Summary

Pass rates were exceptional, the class average was very good, and diagnostic test gains were good. The passing grades of these students support research about the benefits of small class size and support a hypothesis about the benefits of a lab day in addition to regular instruction time. This is hard to say concretely because this particular class was very ambitious and driven and may not necessary reflect future Math 101S populations.

## Math 109

## Course description

Math 109, Foundations of Mathematics, is a non-traditional, application-driven course that focuses on teaching students how to think critically with numerical or mathematical information.

The course is designed to teach quantitative reasoning by emphasizing topics, both useful and relevant to a liberal arts program, that enable students to become quantitatively literate. These mathematical topics include the concepts of logic, set theory, finance, probability theory, and linear models of growth. This course was taught by a specialist and an adjunct. Findings are presented in the next section.

## Findings

## Pass rates

52 students enrolled in the two sections of this course. 21 students ( $40 \%$ of the sections) withdrew, dropped, or did not take the Final. 31 students ( $60 \%$ ) finished the course. This is illustrated below.

Figure 22: Math 109 enrollment status


The pass rate was $50 \%$ for the all enrolled. Of the $60 \%$ who finished across both sections, $84 \%$ passed. Below is an illustration of the grade distribution for the 31 students (across 2 sections) who finished the course.

Figure 23: Math 109 overall grade distribution


Of the 31 students who finished the course, seven earned grades of A's or A-s. 6 students earned B+, B, or B-, 11 earned C+, C, or C-, two students earned a D+ or D, and five failed with a D- or F. In other words, $23 \%$ of the classes earned some variation of an A. $19 \%$ of the classes earned some variation of a B. $36 \%$ of the classes earned $\mathrm{C}+, \mathrm{C}$, or $\mathrm{C}-, 6 \%$ of the classes earned a $\mathrm{D}+$ or D, and $16 \%$ earned a failing grade. Passing this class was defined by attaining an overall average of $63 \%$ or higher. Student $L$ (shown in next figure), who was one of the 3 in my course who passed with an A-, was a former student of mine in the prerequisite CAS Math 101S course the previous semester of Fall 2010, and earned an A- in that course as well. Not surprisingly student O who earned an F , had the lowest attendance rate and Student I who also earned an F, had missed some key classes as well. Below is an illustration of how the grades of each of these 31 students were distributed.

Figure 24: Math 109 grade distribution by student


Student E actually scored higher than $100 \%$ because of high scores on exams and full credit on bonus questions on exams. The majority of students performed within a $70-79 \%$ range. The
overall class average for the specialist taught section was $78 \%$ and $71.4 \%$ for the adjunct taught class. The overall class median for the specialist taught section was $77.1 \%$ and $73.7 \%$ for the adjunct taught section. Given the challenging nature of the material in this course, these averages are very good.

## Attendance

21 of the 31 students ( $68 \%$ ) across both sections had an attendance rate of $90 \%$ or higher. The attendance rates are illustrated below.

Figure 25: Math 109 attendance rates


Looking at the sections taken together, it appears that attendance is not that great, but when we look at attendance separately by section, attendance tells a different story, a classic case of Simpsons Paradox. This is addressed in the Additional Findings section.

## Performance by chapter

Below is an illustration of how the specialist taught class performed on each chapter. These specific statistics were not available for the adjunct taught class.

Figure 26: Math 109 class performance by chapter


The class average began in the high 70's, increased to the 80 's, peaked during Chapter 3 , then declined, and fell below minimum standards during Chapter 9. This is interesting for several reasons. The title of Chapter 3 was Numbers in the Real World and involved learning about percent change, understanding the abuses of percentages, scientific notation, applying percents to incidences of diseases, and chances of acquiring a disease in terms of false positives and negatives. The sharp rise in this chapter might be due in part to the real world connections and feelings that the subject matter was applicable to their lives. Chapter 9 on the other hand dealt with modeling in the "real world" and built upon concepts of linear equations and slope, concepts that are taught in Math 101/S. The sharp decline suggests that students did not master this material in Math 101/S or equivalent course at the University they transferred from. Several students indicated that they had never been taught how to plot points or draw lines, which is quite disturbing. The decline in Chapter 9 also suggests that the real world of Chapter 9 was perhaps fundamentally different somehow for them from the real world of Chapter 3. Perhaps the abundance of nursing majors in the class and the personal connections they may have made to Chapter 3 account for differences.

## Performance by homework section

The illustration below conveys more detailed information about sections within chapters that had variation in performance for the specialist taught section.

Figure 27: Math 109 class performance by section


Class performance falls below a $70 \%$ in sections 1D, 4D, 9A, and 9B. The subject matter of 1D was analyzing arguments. Students were required to understand the fundamental differences between inductive and deductive arguments, and determine validity and soundness of deductive arguments. Essentially, students were being asked to engage in critical thinking and as illustrated, struggled with this. This seems reflective of a larger nationwide problem.

Section 4D covered loan payments, credit cards, and mortgages and required students to be able to enter information into a calculator and distinguish amongst the different formulas within the section. This section required students to utilize problem solving skills, in particular translating written words into pieces of information for a mathematical formula. This too seemed to present challenges, again reflective of a larger national problem.

Within the one class, there were about 5 different models of graphing calculators and scientific calculators being used by students, which made explaining the input of information somewhat challenging. Sections 9A and 9B dealt with functions and linear modeling. These sections required students to be able to write equations given two points on a line and determine the slope of a line from its graph, skills that should have been mastered in Math 101/S and usually are not, as evidenced by the decline of the SPS Math 101 students (CAS as well) in that very particular chapter on graphing.

## Summary

For a challenging class such as this one, pass rates and attendance were still relatively good. The number of withdraws and drops however, was not desirable but likely comes with the nature of this kind of class. Data reveals that students must be at minimum exposed to concepts of graphing and linear equations in Math 101 in order to succeed in the latter sections of Math 109.

## Additional Findings

## Relationship between Math 100 diagnostic pretest and passing

Perhaps the most telling finding was that of the students who completed both the pre and post diagnostic tests for Math 100, students with two of the lowest diagnostic pre-test scores failed the course. This is illustrated in the figure below.

Figure 28: Relationship between Math 100 diagnostic pretest and passing the course


The two students J and M, with overall scores of 69.8 and 70.8 below the minimum threshold for passing, also had some of the lowest diagnostic pre-test scores, 15.7 and 18.6 respectively.

## Potential relationship between placement scores and Math 100 failure rate

Students were placed into Math 100 based on their placement scores on the arithmetic and algebra portions of the Accuplacer test. The students who did the best in the course seemed to have higher arithmetic scores. We can compare the scores of students who passed with those of students who failed. This is illustrated below.

Figure 29: Side by side comparison of arithmetic placement score of students passing and failing Math 100


The data shows that the majority of students who passed Math 100 had arithmetic placement scores between 29 and 76. It is hard to say however, whether a student with a score within the $20-25$ ranges will pass or fail. What is evident, is that none of the students who failed had Accuplacer arithmetic scores higher than 27.

## Potential relationship between Math 101S and grade distribution

In order to see what conclusions if any could be drawn from looking at two different Math 101 courses, two figures were created.

Figure 30: Comparison of 101S and 101


The pass rate was $73 \%$ for the Math 101 class and $100 \%$ for the Math 101S class (for students who finished). Two things are noteworthy here. The 101 class that incorporated an extra day of instruction had higher percentages of A's, B's, and C's and no failing grades. The second thing to note is that the class without the extra day of instruction is taught by an adjunct while the course with the lab is taught by a math specialist. It is not clear, whether the grades are better because of lab, because of the small size of the lab infused class, because of the specialist, or for
some other reason. To complicate matters, although both instructors covered Chapters 10 and 11, the adjunct taught Chapters 12 and 13 (designated by a different specialist as CAS 102 material) instead of 6 and 9 which were covered by the specialist in the lab class. Even with these differences, it would not be unreasonable to suggest that pairing a lab day with instructional course could result in higher pass rates.

## Math 101S relationship between attendance and homework average

Student C had the lowest attendance rate and had the lowest homework average in the class, while the other students with the highest attendance rates had the highest homework averages ( $87.5 \%$ and above), suggesting a positive relationship between attending class and homework mastery. This is illustrated below.

Figure 31: Relationship between attendance and homework grades for Math 101S


For students A and D in particular, high attendance was essentially synonymous with high homework averages. In sum, Math 101S students who attend lecture and lab will do better on the homework assignments.

## Math 101S study plan relationship

The study plan is a feature in mymathlab that allows students to get extra practice on each section. The study plan generates different problems for each student based on their performance on a sample quiz or test for that section or chapter. It lets student know which types of problems within the section they have mastered and which they need more practice with. Interestingly, students in Math 101S who spent the most time in the study plan did not have the highest test
averages, but did have the greatest gains in the diagnostic test. Study plan then, seems to be related to skills gained upon exiting the course. Below is an illustration of this relationship.

Figure 32: Relationship between hours using Study Plan and gains in Math 101S diagnostic test


Although a student could successfully pass the course without spending a lot of time doing the extra practice problems in the Study Plan, what this representation suggests is that students that do invest this time, may ultimately have become more mathematically proficient than those who do not invest the time. It is hard to say this concretely of course, as during the last two weeks of the semester, the focus for the students is on studying for the Final exam and not on doing well on the diagnostic post-test, which did not count towards their overall grade, potentially making passing less of a priority. Additionally, student E spent significant time in the Study Plan, and had a loss on the diagnostic.

Relationship between Math 109 attendance rates and day and time a class is taught
As mentioned earlier, looking across both sections of the Math 109 course, attendance in the 90100 percentile range is below $70 \%$, but looking at each section individually reveals a different picture.

Figure 26: Comparison of attendance in different 109 Sections

$81 \%$ of students had attendance rates within the $90 \%-100 \%$ range in the specialist taught section compared to $53 \%$ in the adjunct taught section. The question then is, why is it that $27 \%$ more students had attendance rates of $90-100 \%$ in the section taught by the specialist, than in the section taught by the adjunct. One reason for this could be the day of the week on which these courses are taught. The specialist's course ran on Saturday afternoons while the adjunct's course ran on Friday nights. It could be that Friday nights were seen as less desirable by students for attending than Saturday afternoons. Other reasons for this difference cannot be concluded at this time.

## Interesting figures

Figure 33: Pass rates by course for those students who finished the course


From this graph, we can see that Math 100 has the lowest pass rates of all 5 classes (this includes 2 sections of 109).

Figure 34: Math 109 specialist section connections between homework averages and test averages


For students E, F, G, I, K, L, M, and P, high homework averages seem to be positively related with high test score averages. In other words for $50 \%$ of these Math 109 students, high homework scores indicate that they will also have high test scores. This supports that there is some compatibility between the in class tests and the online homework.

Figure 35: Placement scores and overall grades of students in Math 101S


Arithmetic scores on the Accuplacer between the range of 35-60 seem to be consistent for the most part with good grades in Math 101S.

## Recommendations

Students who score within the 20-25 arithmetic range on the Accuplacer may need to take a math course elsewhere first. If they score within this range and still think they are ready for Math 100 (which is possible), we can have them take the pre diagnostic test to see if they score above $19 \%$. Having these students take the course elsewhere, might help to strengthen pass rates for Math 100 and reduce the number of withdraws and drops in this course.

Stricter rules need to be in place for THEARC students whereby if they are repeating the course, then they cannot withdraw or drop the course without special permission. This will hopefully ensure that these students matriculate in a timely fashion.

We should think about exploring the possibility of pairing more Math 101 courses with a lab section to strengthen the skill levels of students in graphing and linear equations content matter, an essential prerequisite topic for Math 109. In addition, we should think about exploring the possibility of pairing Math 100 with a lab section to strengthen the skill levels of students in operations with fractions, at topic that nationwide, students struggle with.

Students might benefit from an intermediary course that extends the algebraic and graphing content of Math 101S as preparation for Math 109, particularly, for nursing majors.

Students who work during the day need tutors who can accommodate them in the evenings and on the weekends. Academic Services must recruit and provide an adequate number or tutors for the SPS student population.

Finally, based on student performance, an analysis of the Accuplacer test which relies on CAS 102 content mastery ( a course which currently does not exist in SPS), and the differences between the SPS and CAS populations, I propose the following Accuplacer cut scores for placement into math courses:

| Arithmetic Score | Algebra Score | Math Course Placement |  |
| :--- | :--- | :--- | :--- |
|  |  | SPS | THEARC |
| $20-25$ | N/A | Take course elsewhere <br> unless passing diagnostic <br> test with $19 \%$ or higher | Take course elsewhere unless <br> passing diagnostic test with <br> $19 \%$ or higher |
| $26-34$ | N/A | 100 | 030 |
| $35-60$ | 101 (higher end of the range) <br> $101 S$ (lower end of the <br> range) | 060 |  |
| 61 and up | 25 (potentially) | 109 | 111 |

## Appendices

## Appendix A

Math 100 Raw Data

| absolute <br> change <br> in diag | relative <br> \% change <br> in <br> diagnostic | Repeating | Seeing <br> Tutors | Hrs. <br> Spent <br> in <br> Study <br> Plan | Test <br> avg |  |
| :---: | :--- | :--- | :---: | :---: | :---: | :---: |


| Withdrew <br> or <br> Dropped | Passed | Failed |
| :---: | ---: | ---: |
| 7 | 14 | 5 |


| $\begin{gathered} \text { Math } \\ 100 \end{gathered}$ | Diagnostic Pretest | Diagnostic Postest | Attendance rate | $\begin{aligned} & \hline \text { Hw } \\ & \text { avg } \end{aligned}$ | Grade in Course | Overall Grade | Avg needed to pass | passed |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A | 25.7 | 30 | 93.3 | 97.5 | C+ | 78.6 | 72 | yes |
| B | 24.3 | 57.1 | 100 | 89.4 | B- | 80.4 | 72 | yes |
| C | 18.6 | 28.6 | 93.3 | 73.4 | C | 75 | 72 | yes |
| D |  |  | 93.3 | 93.1 | A | 92.5 | 72 | yes |
| E | 55.7 | 61.4 | 100 | 47.3 | B | 83.6 | 72 | yes |
| F | 35.7 | 55.7 | 86.7 | 92.1 | A- | 90.8 | 72 | yes |
| G | 24.3 | 65.7 | 100 | 98 | A- | 89 | 72 | yes |
| H |  |  | 93.3 | 98.3 | B+ | 88.9 | 72 | yes |
| I | 32.9 | 52.9 | 100 | 100 | A | 93.7 | 72 | yes |
| J | 15.7 | 17.1 | 93.3 | 78.5 | C- | 69.8 | 72 | no |
| K |  |  | 100 | 99.5 | B | 83 | 72 | yes |
| L |  |  | 93.3 | 60.1 | C | 73.9 | 72 | yes |
| M | 18.6 | 31.4 | 100 | 92.6 | C- | 70.8 | 72 | no |
| N | 31.4 | 32.9 | 100 | 89.4 | B+ | 88.7 | 72 | yes |
| O |  |  | 73.3 | 99.1 | B | 85.4 | 72 | yes |
| P |  |  | 93.3 | 48.4 | C- | 71.9 | 72 | no |
| Q | 37.1 | 38.6 | 80 | 95.8 | F | 55.2 | 72 | no |
| R | 21.4 | 47.1 | 100 | 92.4 | B- | 81.9 | 72 | yes |
| S |  |  | 86.7 | 72.5 | D+ | 67.9 | 72 | no |


| absolute <br> change <br> in diag | relative <br> \%hange <br> in <br> diagnostic | Repeating | Seeing <br> Tutors <br> or <br> office <br> hrs | Hrs. <br> Spent <br> in <br> Study <br> Plan | Test <br> avg |  | Elementary <br> Algebra |
| ---: | :--- | :--- | :--- | ---: | :---: | :---: | :---: |
| 4.3 | 16.73152 | No |  | 12 | 70.3 | 45 | N/A |
| 32.8 | 134.9794 | No | Yes | 34 | 73.5 | 38.1 | N/A |
| 10 | 53.76344 | No | Yes | 14 | 71.4 | 22 | 21 |
|  |  | No |  | 0 | 91.9 | N/A | N/A |
| 5.7 | 10.23339 | No |  | 1 | 84.5 | 26 | 72 |
| 20 | 56.02241 | Y- |  |  | 0 | 91.6 | 60 |
| 41.4 | 170.3704 | No |  | 9 | 84.6 | 44 | N/A |
|  |  | Yes |  | 1 | 86.3 | 24 | N/A |
| 20 | 60.79027 | No | Yes | 7 | 91.7 | 31.2 | N/A |
| 1.4 | 8.917197 | No | Yes | 5 | 61.4 | 27 | N/A |
|  |  | No |  | 68 | 77.3 | 21 | 52 |
|  |  | Yes |  | 8 | 68.1 | 22.1 | N/A |
| 12.8 | 68.8172 | No |  | 4 | 58.5 | 24 | N/A |
| 1.5 | 4.77707 | No |  | 16 | 85 | 76.1 | N/A |
|  |  | No |  | 1.5 | 82.6 | 44.5 | N/A |
|  |  | Yes | Yes | 22.5 | 67.4 | 20 | 21 |
| 1.5 | 4.043127 | Yes |  | 4 | 42.3 | 22 | N/A |
| 25.7 | 120.0935 | No | Yes | 29 | 74.2 | 29 | 21 |
|  |  | No |  | 4 | 62.2 | 25 | 31 |


|  |  |
| :--- | :--- |
| OverallCla | Overall <br> Class <br> median |
| ss average | me |

> Pass rate
> of
> students

Pass rate of who all enrolled finished
$\begin{array}{llll}80.1 & 81.9 & 0.53846153 & 0.736842\end{array}$

|  | Number <br> of |  | Attendance <br> rate |
| :--- | ---: | :--- | ---: |
| Grade in Course | 4 | Number of <br> students |  |
| A, A- | 7 | $90-100 \%$ | 15 |
| B+,B, or B- | 3 | $80-89 \%$ | 3 |
| C+ or C | 5 | $70-79 \%$ | 1 |
| C- or below |  |  |  |


| Book chapters | \% class <br> mastery |
| :--- | :---: |
| Chapter 1 | 93.3 |
| Chapter 2 | 88.7 |
| Chapter 3 | 78.8 |
| Chapter 4 | 69.8 |
| Chapter 5 | 80.3 |

## Considered passing

## 72

72
72
72
72

Considere d passing72
Chapter \% class mastery 7272$96 \quad 72$

95.3

72
$97.6 \quad 72$
94.9

72
$94.1 \quad 72$
$92.9 \quad 72$
$92.4 \quad 72$
$86.2 \quad 72$
$89.1 \quad 72$
$96.8 \quad 72$
$\begin{array}{lll}\text { Section } 2.2 & 93.2 & 72\end{array}$
$\begin{array}{lll}\text { Section } 2.3 & 88.5 & 72\end{array}$
$\begin{array}{lll}\text { Section } 2.4 & 96.3 & 72\end{array}$
$\begin{array}{lll}\text { Section } 2.5 & 81.3 & 72\end{array}$
$\begin{array}{lll}\text { Section } 2.6 & 78.4 & 72\end{array}$
$\begin{array}{lll}\text { Section } 2.7 & 84.4 & 72\end{array}$
Section $2.8 \quad 88.8 \quad 72$
$\begin{array}{lll}\text { Section } 4.3 & 66.7 & 72\end{array}$
Section $5.1 \quad 88.6 \quad 72$
Section $5.2 \quad 89.4 \quad 72$
$\begin{array}{lll}\text { Section } 5.4 & 76.5 & 72\end{array}$
$\begin{array}{lll}\text { Section } 5.5 & 66.8 & 72\end{array}$
Section $5.6 \quad 79.5$

| $\begin{gathered} \text { Mat } \\ \mathbf{h} \\ \mathbf{1 0 0} \end{gathered}$ | Overa 11 Grade | Arithmeti c <br> c | Arithme tic <br> Accupla <br> cer <br> scores <br> of <br> students <br> who <br> passed | Arithmeti <br> c <br> Accuplac <br> er scores <br> of <br> students <br> who <br> failed |
| :---: | :---: | :---: | :---: | :---: |
| A | 78.6 | 45 | 45 | 27 |
| B | 80.4 | 38.1 | 38.1 | 24 |
| C |  | 22 | 22 | 20 |
|  | 75 |  |  |  |
| E | 83.6 | 26 | 26 | 22 |
| F | 90.8 | 60 | 60 | 25 |
| G | 89 | 44 | 44 |  |
| H | 88.9 | 24 | 24 |  |
| I | 93.7 | 31.2 | 31.2 |  |
| J |  | 27 | 21 |  |
|  | 69.8 |  |  |  |
| K | 83 | 21 | 22.1 |  |
| L | 73.9 | 22.1 | 76.1 |  |
| M | 70.8 | 24 | 44.5 |  |
| N | 88.7 | 76.1 | 29 |  |
| O | 85.4 | 44.5 |  |  |
| P | 71.9 | 20 |  |  |
| Q | 55.2 | 22 |  |  |
| R | 81.9 | 29 |  |  |
| S | 67.9 | 25 |  |  |


| Math <br> $\mathbf{1 0 0}$ | Diagnostic <br> Pretest | Overall <br> Grade | Avg <br> needed <br> to pass |
| :--- | ---: | ---: | ---: |
| A | 25.7 | 78.6 | 72 |
| B | 24.3 | 80.4 | 72 |
| 43 |  |  |  |


| Mat <br> $\mathbf{h}$ <br> $\mathbf{1 0 0}$ | Diagnost | Overa <br> ic Pretest <br> ll <br> Grade | Avg <br> neede <br> d to <br> pass |
| :--- | ---: | ---: | ---: |
| A | 25.7 | 78.6 | 72 |
| B | 24.3 | 80.4 | 72 |


| C | 18.6 | 75 | 72 |
| :--- | ---: | ---: | ---: |
| E | 55.7 | 83.6 | 72 |
| F | 35.7 | 90.8 | 72 |
| G | 24.3 | 89 | 72 |
| I | 32.9 | 93.7 | 72 |
| J | 15.7 | 69.8 | 72 |
| M | 18.6 | 70.8 | 72 |
| N | 31.4 | 88.7 | 72 |
| Q | 37.1 | 55.2 | 72 |
| R | 21.4 | 81.9 | 72 |


| C | 18.6 | 75 | 72 |
| :--- | ---: | ---: | ---: |
| E | 55.7 | 83.6 | 72 |
| F | 35.7 | 90.8 | 72 |
| G | 24.3 | 89 | 72 |
| I | 32.9 | 93.7 | 72 |
| J | 15.7 | 69.8 | 72 |
| M | 18.6 | 70.8 | 72 |
| N | 31.4 | 88.7 | 72 |
| Q | 37.1 | 55.2 | 72 |
| R | 21.4 | 81.9 | 72 |

## Appendix B

Math 060 Raw Data
\(\left.$$
\begin{array}{|l|l|l|l|c|c|c|c|}\hline \begin{array}{c}\text { absolute } \\
\text { change } \\
\text { in diag }\end{array} & \begin{array}{c}\text { relative } \\
\text { \% change } \\
\text { in } \\
\text { diagnostic }\end{array} & \text { Repeating } & \begin{array}{c}\text { Seeing } \\
\text { Tutors }\end{array} & \begin{array}{c}\text { Hrs. } \\
\text { Spent } \\
\text { in } \\
\text { Study } \\
\text { Plan }\end{array}
$$ \& \begin{array}{c}Test <br>

avg\end{array} \& \& Arithmetic\end{array}\right]\)| Algebra |
| :---: |$|$|  |  |
| :--- | :--- |
|  |  |
|  | Yes |


| absolute <br> change <br> in diag | relative <br> \% change <br> in <br> diagnostic | Repeating | Seeing <br> Tutors | Hrs. <br> Spent <br> in <br> Study <br> Plan | Test <br> avg |  | Elementary <br> Algebra |
| ---: | :---: | :--- | :--- | :--- | :--- | :--- | :---: |
| 43.6 | 130.9309 | No |  | 2 | 73.2 | 58 | N/A |
| 7.1 | 17.70574 | No |  | 4 | 74.5 | 25 | N/A |


|  |  |  | Pass rate |
| :---: | :---: | :---: | :---: |
|  | Over |  |  |
|  | all | Pass | stude |
|  | Clas | rate of | nts |
| Overall | s | all | who |
| Class | medi | enrolle | finis |
| average | an | d | hed |
| 79 | 79 | 33\% | 100\% |


| Book chapt | \% <br> class <br> maste <br> ry | Conside red passing | Chapter sections | \% <br> class <br> mast <br> ery | Consid ered passing | Grades | Num <br> ber <br> of <br> stude <br> nts | Attend ance |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Chapt er 6 <br> hw | 86 | 72 | Section <br> 6.1 | 90.5 | 72 | A or A- | 0 | $\begin{aligned} & 90- \\ & 100 \% \end{aligned}$ |
| Chapt er 9 <br> hw | 86 90.4 | 72 | Section 6.2 | 90.5 100 | 72 72 | $\mathrm{B}+\mathrm{B},$ or B- | 0 |  |
| Chapt er 10 |  |  | Section |  |  |  |  |  |
| hw | 84.1 | 72 | 6.3 | 80.9 | 72 | $\mathrm{C}+$ or C | 1 |  |
| er 11 <br> hw | 81.2 | 72 | Section $6.4$ | 100 | 72 |  |  |  |
|  |  |  | Section 6.5 | 97.7 | 72 |  |  |  |
|  |  |  | Section $6.6$ | 58.3 | 72 |  |  |  |
|  |  |  | Section $6.7$ | 82.9 | 72 |  |  |  |
|  |  |  | Section $6.8$ | 94.1 | 72 |  |  |  |
|  |  |  | $\begin{aligned} & \text { Section } \\ & 9.1 \end{aligned}$ | 90.9 | 72 |  |  |  |
|  |  |  | $\begin{aligned} & \text { Section } \\ & 9.2 \end{aligned}$ | 100 | 72 |  |  |  |
|  |  |  | Section $9.3$ | 97.6 | 72 |  |  |  |
|  |  |  | $\begin{aligned} & \text { Section } \\ & 9.4 \end{aligned}$ | 95.3 | 72 |  |  |  |
|  |  |  | Section 9.5 | 94.6 | 72 |  |  |  |
|  |  |  | Section $9.6$ | 92.3 | 72 |  |  |  |
|  |  |  | Section $9.7$ | 86.2 | 72 |  |  |  |
|  |  |  | Section $9.8$ | 36.6 | 72 |  |  |  |
|  |  |  | Section $10.1$ | 96.8 | 72 |  |  |  |
|  |  |  |  |  | 46 |  |  |  |



## Appendix C

Math 101S and 101 Raw Data

| absolute change in diag | relative change in diagnostic | Repeating | Seeing Tutors | Hrs. <br> Spent in Study Plan | Test avg | Arithmetic | Elementary Algebra |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 25 | 96.52509653 | No |  | 32 | 82 | 40 | N/A |
| 24.7 | 177.6978417 | Yes |  | 29 | 70.7 | 35 | 22 |
| 0 |  | No |  |  |  |  |  |
| 20.4 | 50.87281796 | Yes |  | 3 | 80.2 | 34 | 36 |
| 0 |  | No, F b- |  |  |  |  |  |
| 0 |  | No, C |  |  |  | 24.6 | N/A |
| 10.2 | 25.6281407 | No |  | 4 | 89.6 | 40 | N/A |
| -8.9 | $18.97654584$ | No | Yes | 19 | 63.2 | 60 | N/A |


| Withdrew <br> or <br> Dropped | Passed | Failed |
| ---: | ---: | ---: |
| 3 | 5 | 0 |

Horace's
101
students

|  | Number <br> of |  |  |  |
| :--- | :--- | :--- | ---: | :--- |
| F | 79 | Grade | students |  |
| D | 89 | A or A- | 1 | 61 |
| C | 87 | B+, B or B- | 3 | 72 |
| B | 99 | C+ or C | 4 | 74 |
|  |  | C- or |  | 75 |
| F | 39 | below | 3 | 15 |
| A | 99 |  |  | 96 |
| B+ | 97 |  |  | 68 |
| C | 71 |  |  | 62 |
| C + | 91 |  |  | 73 |

$$
\begin{array}{ll}
\mathrm{C} & 90
\end{array}
$$

B- 97

| Math <br> $\mathbf{1 0 1 S}$ | Diagnosti <br> c Pretest | Diagnosti <br> c Postest | Attendanc <br> e rate | Hw <br> avg | Grad <br> e in <br> Math <br> $\mathbf{1 0 0}$ | Grade <br> in <br> Cours <br> e | Overal <br> $\mathbf{1}$ <br> Grade | Avg <br> neede <br> d to <br> pass | passe <br> d |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| A | 25.9 | 50.9 | 100 | 96. <br> 1 | B | B+ | 86.4 | 72 | yes |
| B | 13.9 | 38.6 | 93.2 | 100 | C | C+ | 77.8 | 72 | yes |
| C | 40.1 | 60.5 | 75 | 84. <br> 4 | Tr | B | 83.9 | 72 | yes |
| D | 39.8 | 50 | 95.8 | 93. <br> 5 | C | A- | 91.4 | 72 | yes |
| E | 46.9 | 38 | 95.2 | 87 | F,B+ | C | 72 | 72 | yes |


| absolute <br> change <br> in diag | relative <br> \% change <br> in <br> diagnostic | Repeating | Seeing <br> Tutors | Hrs. <br> Spent <br> in <br> Study <br> Plan | Test <br> avg |  | Elementary <br> Algebra |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| 25 | 96.5 |  |  | 32 | 82 | 40 | Arithmetic |$|$



| chapters | class <br> master <br> y |  | class master y | ed passing | section <br> s | class <br> maste <br> ry | ed passing | es <br> studen <br> ts |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Chapter |  |  |  |  | Sectio |  |  |  |
| 6 hw | 91 |  |  | 72 | n 6.1 | 85.8 | 72 |  |
| Chapter |  |  |  |  | Sectio |  |  |  |
| 9 hw | 91.9 |  |  | 72 | n 6.2 | 98.9 | 72 |  |
| Chapter |  | Chapter 10 |  |  | Sectio |  |  |  |
| 10 hw | 91.2 | hw | 90.2 | 72 | n 6.3 | 87.7 | 72 |  |
| Chapter |  | Chapter 11 |  |  | Sectio |  |  |  |
| 11 hw | 86.7 | hw | 70.2 | 72 | n 6.4 | 94.5 | 72 |  |
|  |  | Chapter 12 |  |  | Sectio |  |  |  |
|  |  | hw | 70.1 | 72 | n 6.5 | 95.5 | 72 |  |
|  |  | Chapter 13 |  |  | Sectio |  |  |  |
|  |  | hw | 48.6 | 72 | n 6.6 | 88.3 | 72 |  |
|  |  |  |  |  | Sectio |  |  |  |
|  |  |  |  |  | n 6.7 | 94.3 | 72 |  |
|  |  |  |  |  | Sectio |  |  |  |
|  |  |  |  |  | n 6.8 | 81.2 | 72 |  |
|  |  |  |  |  | Sectio |  |  |  |
|  |  |  |  |  | n 9.1 | 95 | 72 |  |


| Grade | Numb er of studen | Sectio | 96.3 | 72 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | ts | n 9.2 |  |  |  |
|  |  | Sectio |  |  |  |
| A or A- | 1 | n 9.3 | 94.8 | 72 |  |
| $\mathrm{B}+$, B or |  | Sectio |  |  |  |
| B- | 2 | n 9.4 | 93.6 | 72 |  |
| $\mathrm{C}+$ or C | 2 | Sectio |  |  |  |
|  |  | n 9.5 | 89.6 | 72 |  |
|  |  | Sectio |  |  |  |
|  |  | n 9.6 | 92.3 | 72 |  |
| Attende d | Numb er of studen ts |  |  |  |  |
|  |  | Sectio |  |  |  |
|  |  | n 9.7 | 88.3 | 72 |  |
|  |  | Sectio |  |  |  |
| 90-100\% | 4 | n 9.8 | 87 | 72 |  |
| 89\% or | 1 | Sectio |  |  |  |
| less |  | n 10.1 | 95.2 | 72 | 97.8 |
|  |  | Sectio |  |  |  |
|  |  | n 10.2 | 96 | 72 | 97.1 |
|  |  | Sectio |  |  |  |
|  |  | n 10.3 | 85.6 | 72 | 78.4 |


| Sectio |  |  |  |
| :---: | :---: | :---: | :---: |
| n 10.4 | 96.6 | 72 | 91.6 |
| Sectio |  |  |  |
| n 10.6 | 85.9 | 72 | 87.4 |
| Sectio |  |  |  |
| n 10.7 | 90.4 | 72 |  |
| Sectio |  |  |  |
| n 10.8 | 86.7 | 72 |  |
| Sectio |  |  |  |
| n 11.1 | 87.5 | 72 |  |
| Sectio |  |  |  |
| n 11.2 | 87.9 | 72 |  |
| Sectio |  |  |  |
| n 11.3 | 88.9 | 72 |  |
| Sectio |  |  |  |
| n 11.4 | 85.7 | 72 |  |
| Sectio |  |  |  |
| n 11.5 | 89 | 72 |  |
| Sectio |  |  |  |
| n 11.6 | 75.7 | 72 |  |
| Sectio |  |  |  |
| n 11.7 | 93.8 | 72 |  |

## Appendix D

Math 109 (2 sections) Raw Data

| Withdrew <br> or <br> Dropped | Passed | Failed | Did <br> not <br> finish |
| :---: | :---: | :---: | :---: |
| 14 | 2 | 1 |  |


|  | Ov <br> er <br> all |  |  |
| :--- | :--- | :--- | :--- |
|  |  |  | Pass |
|  | Cl | Pass | rate |
| as | rate | of |  |
| Over | s | of | stud |
| allCla | m | all | ents |
| ss | ed | enr | who |
| avera | ia | olle | finis |
| ge | n | d | hed |
|  | 77 |  |  |
|  | .1 | 53.8 |  |
|  | 0 | 461 |  |
| $78 \%$ | $\%$ | 5 | 87.5 |


| $\begin{gathered} \text { Mat } \\ \text { h } \\ 109 \end{gathered}$ | Att end anc e rat e | $\mathbf{H}$ $\mathbf{w}$ <br> a <br> v <br> g | Gra de in Cou rse | 0 <br> ve <br> ra <br> II <br> G <br> ra <br> de | Avg nee ded to pas s | $\begin{aligned} & \text { pas } \\ & \text { sed } \end{aligned}$ | Re <br> pe <br> ati <br> ng | $\begin{gathered} \hline \mathrm{Hr} \\ \text { s. } \\ \text { Sp } \\ \text { ent } \\ \text { in } \\ \text { St } \\ \text { ud } \\ \text { y } \\ \text { Pla } \\ \text { n } \\ \hline \end{gathered}$ | Test avg |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A | 100 | $\begin{array}{\|c} \hline 8 \\ 9 \\ . \\ 5 \\ \hline \end{array}$ | C | 73 | 63 | yes |  | 2.5 | 62 |
| B | 92.3 | $\begin{array}{\|c\|} \hline 9 \\ 1 \\ . \\ 6 \end{array}$ | C | 74 .2 | 63 | yes |  | 5.5 | 65.2 |


| $\mathbf{M}$ | $\mathbf{H}$ | $\mathbf{T}$ |
| :---: | :---: | :---: |
| $\mathbf{a t h}$ | $\mathbf{w}$ | $\mathbf{e}$ |
| $\mathbf{1 0}$ | $\mathbf{a v}$ | $\mathbf{s}$ |
| $\mathbf{9}$ | $\mathbf{g}$ | $\mathbf{t}$ |
|  |  | $\mathbf{a}$ |
|  |  | $\mathbf{v}$ |
|  |  | $\mathbf{g}$ |
|  |  |  |
| A |  |  |
|  | 89 | 6 |
|  | .5 | 2 |
| B |  |  |
|  | 91 | 6 |
|  | .6 | 2. |

\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline C \& 100 \& \[
\begin{aligned}
\& 8 \\
\& 6 \\
\& 9 \\
\& 9
\end{aligned}
\] \& C+ \& \[
\begin{array}{r}
78 \\
.4
\end{array}
\] \& 63 \& yes \& 5 \& 70.1 \\
\hline D \& 96.2 \& 9
9 \& A- \& \[
\begin{array}{r}
89 \\
.6
\end{array}
\] \& 63 \& yes \& 0.5 \& 84.8 \\
\hline E \& 96.2 \& \[
\begin{aligned}
\& 7 \\
\& 5 \\
\& 7 \\
\& 7
\end{aligned}
\] \& C \& \[
\begin{array}{r}
72 \\
.7
\end{array}
\] \& 63 \& yes \& 4 \& 67.9 \\
\hline F \& 100 \& 9
7 \& A \& \[
\begin{gathered}
10 \\
0 . \\
8
\end{gathered}
\] \& 63 \& yes \& 11 \& \[
\begin{array}{r}
102 . \\
2
\end{array}
\] \\
\hline G \& 100 \& 8 \& B- \& \[
\begin{array}{r}
81 \\
.9
\end{array}
\] \& 63 \& yes \& 8 \& 76.3 \\
\hline H \& 92.3 \& \[
\begin{aligned}
\& 2 \\
\& 3 \\
\& 6 \\
\& 6
\end{aligned}
\] \& C \& 72 \& 63 \& yes \& 34 \& 76 \\
\hline I \& 84.6 \& \[
\begin{gathered}
5 \\
5 \\
. \\
5
\end{gathered}
\] \& F \& \[
\begin{array}{r}
51 \\
.8
\end{array}
\] \& 63 \& no \& 0 \& 49 \\
\hline J \& 100 \& \[
\begin{aligned}
\& 9 \\
\& 4 \\
\& 4 \\
\& 4
\end{aligned}
\] \& C \& \[
\begin{array}{r}
73 \\
.7
\end{array}
\] \& 63 \& yes \& 0 \& 65.4 \\
\hline K \& 84.6 \& \[
\begin{gathered}
8 \\
1 \\
7 \\
7
\end{gathered}
\] \& B \& \[
\begin{array}{r}
82 \\
.7
\end{array}
\] \& 63 \& yes \& 6 \& 79.9 \\
\hline L \& 100 \& \begin{tabular}{r}
9 \\
1 \\
\hline \\
3
\end{tabular} \& A- \& \[
\begin{array}{r}
89 \\
.4
\end{array}
\] \& 63 \& yes \& 0 \& 87.7 \\
\hline M \& 100 \& 7
3
.
4 \& C \& \[
\begin{array}{r}
75 \\
.8
\end{array}
\] \& 63 \& yes \& 6 \& 71.5 \\
\hline N \& 92.3 \& 8
2

3 \& A \& $$
\begin{array}{r}
96 \\
.6
\end{array}
$$ \& 63 \& yes \& 2.5 \& 99.5 <br>

\hline
\end{tabular}

| C | $\begin{array}{r} 86 \\ .9 \end{array}$ | $\begin{array}{r} 7 \\ 0 . \\ 1 \end{array}$ |
| :---: | :---: | :---: |
| D | 99 | $\begin{gathered} 8 \\ 4 . \\ 8 \end{gathered}$ |
| E | $\begin{array}{r} 75 \\ .7 \end{array}$ | $\begin{array}{r} 6 \\ 7 . \\ 9 \end{array}$ |
| F | 97 | $\begin{gathered} 1 \\ 0 \\ 2 . \\ 2 . \end{gathered}$ |
| G | 86 | $\begin{array}{r} 7 \\ 6 . \\ 3 \end{array}$ |
| H | $\begin{array}{r} 23 \\ .6 \end{array}$ | $\begin{aligned} & 7 \\ & 6 \end{aligned}$ |
| I | $\begin{array}{r} 55 \\ .5 \end{array}$ | $\begin{aligned} & 4 \\ & 9 \end{aligned}$ |
| J | $\begin{array}{r} 94 \\ .4 \\ \hline \end{array}$ | $\begin{array}{r} 6 \\ 5 . \\ 4 \end{array}$ |
| K | $\begin{array}{r} 81 \\ .7 \end{array}$ | $\begin{gathered} 7 \\ 9 . \\ 9 \end{gathered}$ |
| L | $\begin{array}{r} 91 \\ .3 \end{array}$ | $\begin{gathered} 8 \\ 7 . \\ 7 \end{gathered}$ |
| M | $\begin{array}{r} 73 \\ .4 \end{array}$ | $\begin{array}{r} 7 \\ 1 . \\ 5 \end{array}$ |
| N | $\begin{array}{r} 82 \\ .3 \end{array}$ | $\begin{array}{r} 9 \\ 9 . \\ 5 \end{array}$ |


| O | 65.4 | $\begin{gathered} 6 \\ 0 \\ . \\ 2 \end{gathered}$ | F | $\begin{array}{r} 47 \\ .3 \end{array}$ | 63 | no | 0 | 36.4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| P | 100 | $\begin{aligned} & 9 \\ & 5 \\ & 6 \\ & 6 \end{aligned}$ | B+ | 88 .7 | 63 | yes | 3 | 86.6 |





|  |  |  |  |  |  |  | 1 | 2 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| G | 100 | 86 | B- | 81.9 | 63 | yes | 8 | 76.3 |
| H | 92.3 | 23.6 | C | 72 | 63 | yes | 3 4 | 76 |
| I | 84.6 | 55.5 | F | 51.8 | 63 | no | 0 | 49 |
| J | 100 | 94.4 | C | 73.7 | 63 | yes | 0 | 65.4 |
| K | 84.6 | 81.7 | B | 82.7 | 63 | yes | 6 | 79.9 |
| L | 100 | 91.3 | A- | 89.4 | 63 | yes | 0 | 87.7 |
| M | 100 | 73.4 | C | 75.8 | 63 | yes | 6 | 71.5 |
| N | 92.3 | 82.3 | A | 96.6 | 63 | yes | 2. | 99.5 |
| O | 65.4 | 60.2 | F | 47.3 | 63 | no | 0 | 36.4 |
| P | 100 | 95.6 | B+ | 88.7 | 63 | yes | 3 | 86.6 |
| Q | 93 | 93 | A | 92.4 | 63 | yes |  | 83.1 |
| R | 100 | 97 | A- | 91.5 | 63 | yes |  | 90.1 |
| S | 79 | 78 | C- | 71.9 | 63 | yes |  | 79.7 |
| T | 86 | 90 | D- | 55.4 | 63 | no |  | 53 |
| U | 71 | 41 | F | 23.1 | 63 | no |  | 9 |
| V | 86 | 89 | B | 82.7 | 63 | yes |  | 73.3 |
| W | 93 | 92 | C- | 73.7 | 63 | yes |  | 58.8 |
| X | 93 | 75 | D+ | 68.9 | 63 | yes |  | 59.3 |
| Y | 86 | 82 | D | 59.6 | 63 | yes |  | 48.7 |
| Z | 79 | 96 | A | 92.6 | 63 | yes |  | 85 |
| AA | 93 | 99 | B- | 80.9 | 63 | yes |  | 69.7 |
| BB | 86 | 81 | C- | 69.1 | 63 | yes |  | 68.9 |
| CC | 100 | 88 | C+ | 78.4 | 63 | yes |  | 74.2 |
| DD | 100 | 97 | B | 84 | 63 | yes |  | 80.3 |
| EE | 100 | 37 | D- | 46.3 | 63 | no |  | 38.9 |
|  |  |  |  |  |  |  |  | 69.4 354 |
|  | 81.24 |  |  | 74.80 |  |  |  | 838 |
|  | 91.9 | 839 |  | 968 |  |  |  | 7 |


| Withdrew <br> or <br> Dropped | Passed | Failed | $\begin{gathered} \text { Did } \\ \text { not } \\ \text { finish } \end{gathered}$ | blue means for all classes | Pass rate of all enrolle d | Pass rate of students who finished 83.8709 | Attendanc e rate | Number of student s |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 20 | 26 | 5 | 1 |  | 50 | 7 | 90-100\%: | 21 |
|  |  |  |  |  |  |  | 80-89.9\%: | 6 |
|  |  |  |  |  |  |  | 70-79.9\%: | 3 |
|  |  |  |  |  |  |  | 60-69\% | 1 |



| Withdrew or Dropped | Passed | Failed | $\begin{gathered} \text { Did } \\ \text { not } \\ \text { finish } \end{gathered}$ |
| :---: | :---: | :---: | :---: |
| 11 | 12 | 3 | 0 |
|  | Number <br> of |  |  |
| Grade in | student |  |  |
| Course | $s$ |  |  |
| A or A- | 7 |  |  |
| $\mathrm{B}+\mathrm{B}$ or $\mathrm{B}-$ | 6 |  |  |
| $C+, C$ or $C$ - | 11 |  |  |
| D+, D, | 2 |  |  |
| D-, F | 5 |  |  |
|  | 31 |  |  |

