

UNDERGRADUATE MATHEMATICS MOVIE!

The next ~~seminar~~ **movie** (!) will be this coming **Tuesday, May 20th**, with refreshments beginning at **3:45** in the Math Common Room, **Bailey 204**, and the video following at **4:00** in **Bailey 207**.

TITLE: NOVA Documentary on Fermat's Last Theorem

ABSTRACT: In 1637 Pierre de Fermat was reading *Arithmetica*, by Diophantus – a mathematician of ancient Greece. As he read, Fermat scribbled proofs and made notations and conjectures in the margins. Here is his most famous marginal note:

It is impossible to write a cube as a sum of two cubes or a fourth power as a sum of 2 fourth powers and in general, any power beyond the second as the sum of like powers. For this I have discovered a truly wonderful proof, but the margin is too small to contain it.

Today we would say

$x^n + y^n = z^n$ has no integer solutions with $x, y, z \neq 0$,

Mathematicians sought a proof for hundreds of years, and the assertion became known as Fermat's Last Theorem (because it was the only one of Fermat's marginal notations that hadn't yet been verified). The theorem was finally nailed . . . in 1995. In this NOVA documentary, you'll learn about the history of Fermat's Last Theorem and its surprising proof by Andrew Wiles just 13 years ago. Wiles worked on the theorem in isolation (and in secret) for about 9 years and his story gives some insight as to the creative process in mathematics.

Pieces from Theses: A View from Jessica Rudin ('08)

I've always been very intrigued by the college admissions process. How in the world does the admissions office know exactly how many students to accept so that the right number of students will matriculate? Further, how does financial aid play a roll in this process? I decided that I wanted to do my thesis on this topic, and luckily, the Math department was very accommodating to my request. At the time, I knew very little about probability and statistics, and Kelly Black, my thesis advisor, knew very little about the college admissions process and financial aid. Together we would spend the fall and winter trimesters sorting through data and trying to make sense of the very complicated admissions process.

The financial aid office notifies students of their financial aid package when they are accepted. At that point, it is completely unknown which students (and how many) will accept Union's offer, and who will decline and choose to attend another school. The problem with this is that, if more students accept than predicted, Union will be forced to scramble for money outside of the original financial aid budget. On the other hand, if fewer students matriculate than anticipated, then there will be extra money left in the financial aid budget that could've been better used to attract a desirable incoming class and student body. The goal of my thesis was to determine the role that financial aid plays in a student's decision to matriculate. Further, I would look at different subgroups of students, separated by gender, ethnicity, high school GPAs and SAT scores, and of course, financial aid package. It is important to note that a student's financial need is calculated by the financial aid office and factored into the aid package that they are offered, so I did not need to explore that variable.

The data that I had to work with included every student that applied to Union in 2004, 2005, and 2006, and there were close to 12,000 such students. I immediately removed all students who were not accepted (since they were not offered any money) and all students who applied Early Decision (since they will, by nature, matriculate at a rate of almost 100%). This left me with 5,348 students in my sample, and 1,444 different financial aid packages. As for the financial aid packages, I would bin them into five different categories for my analysis.

For the majority of students, it seemed to be the trend that the larger the financial aid package offered, the greater the rate of matriculation. For example, students offered no money matriculated at a rate of about 17%, students offered up to 10,000 at a rate of about 25%, students offered between \$15,000 and \$25,000 at a rate of about 31%, and students who were offered over \$25,000 matriculated at a rate of about 40%. It is interesting to note, however, that students who received financial aid packages between \$10,000 and \$15,000 did not follow the same trend, and they matriculated at a lower rate of about 16%. It turns out that almost all of the students in this category were Presidential Scholarship recipients, the largest of Union's merit scholarships, which are awarded to students of strong academic achievement. We found later that, in fact, the trend for students receiving merit scholarships is opposite that of students receiving regular financial aid packages. This is partially because students who receive merit scholarships did not necessarily apply for aid (so naturally they respond differently to a financial stimulus) and also, these students are most likely receiving very competitive packages and offers from other colleges and universities.

We also noticed a different trend when looking at students of different ethnicities. For minority students in general, we found that those students who were offered a financial aid package of less than \$25,000 would matriculate at a rate of less than 10%, but for students who received packages greater than that amount, matriculation rates jumped to well over 30%. One interesting, statistically significant difference that we observed was between the male and female matriculation rates for Asian students receiving over \$25,000. In this case, males matriculated at a rate of about 57%, while females matriculated at a far lower rate of about 31%.

Still, we must remember that I didn't have data on every high school senior applying to college. In fact, I only had information on students who applied to Union regular decision and were admitted. Thus, I performed multiple hypothesis tests (using chi-squared and pooled samples where appropriate) in order to test whether the results that I observed (the differences between the matriculation rates of different subgroups) were statistically significant or not.

I really enjoyed getting the opportunity to look closely at the admissions data. Unfortunately, because I spent so much time learning about the tools of statistics and the formulas and programs necessary to analyze the data, I didn't have as much time as I would've liked to look into other variables. For example, I'd love to look at how financial aid affects local students compared to students from across the country, or international students. Another interesting thing to look at could be how students from public high schools are affected differently by financial aid than students from private high schools.

The coolest part of the whole experience was that I got to entirely design my own thesis. I had wanted to better understand the admissions process for a long time, and I was fortunate enough to be able to take two terms writing an honors thesis on exactly the material that I was interested in. One thing I know for sure is that it's not easy to work in admissions and it's a very challenging task to try and attract the ideal incoming class of freshmen... but Union seems to do a good job!

Problem of the Newsletter: May 16, 2008

Congratulations to **Schuyler Smith** for submitting a correct solution to last week's problem. You can view a winning solution on the bulletin boards in Bailey Hall.

Here is this week's problem: Complete the multiplicative alphabetic by determining the correct digit for each letter. Explain how you arrived at the solution.

Professor Friedman will accept solutions until 12:00 noon Thursday, May 22nd. Email your solution to him (friedmap@union.edu) or put it in his mailbox in the Math Department's office.

$$\begin{array}{r}
 V \quad O \quad O \\
 D \quad O \quad O \\
 \hline
 * \quad M \quad * \quad * \\
 * \quad M \quad A \quad L \\
 * \quad * \quad L \\
 \hline
 S \quad P \quad E \quad L \quad L
 \end{array}$$