

UNDERGRADUATE MATHEMATICS SEMINAR

Important Notice: The seminar is **CHANGING TIME** and **LOCATION** this term! The seminar will still be held on **Mondays**, but refreshments will be available in **Bailey 204** (The Departmental Commons Room) starting at **4:45pm**. After refreshments, the seminar will begin in **Bailey 201**.

The first seminar of the term will be this coming Monday, January 15th, an exciting talk by our own Professor Julius Barbanel.

TITLE: Irrational Numbers: discovery, crisis, and resolution

Abstract: Pythagoras and his followers (who lived and worked about 2500 years ago) thought it obvious that any two line segments are commensurable, or, in other words, that given any two line segments, there is some third line segment that measures each. This assumption turns out to be equivalent to the statement "all real numbers are rational." Many ancient Greek geometric proofs used this assumption. When it was discovered that this assumption is false, it caused a major mathematical crisis. We shall explore the reasons why the Pythagoreans made this commensurability assumption, the discovery that it is false, the ensuing mathematical crisis, and the resolution of this crisis by Eudoxus.

What I did this December recess

A number of math students had some exciting and interesting experiences this past December. Here are a few of their chronicles.

December in New Orleans, by Bilal Mahmood '08.

Over this winter break I, along with 21 other Union students and 2 faculty members, had the opportunity to travel to New Orleans and help with the post-Katrina rebuilding process. Plans had been in the works since last year's trip and Libby Johnson '08 (math major) was one of the main organizers trying to make the trip a possibility once again.

Our journey began on Sunday, December 3rd, 2006 with the short flight to New Orleans and long drive to what would be our home for the upcoming week, Camp Hope. Camp Hope was an old elementary school that had been renovated (to some extent) and run by Americorp volunteers. The floors were bare, the walls seemed more like pieces of thick cardboard and heating and insulation were nonexistent. (I did not think this would be a problem, but 5 nights of 30 degree weather makes you lose a lot of sleep). Our rooms were old classrooms with nothing in them except for about 15 cots. Dinners and snacks included donated items (by the government, I assume) and so many were expired. The most intriguing food item was the "filtered drinking water" which came in a can. The taste was a mixture between old pool water with rusted chunks of metal and water from a garden hose. In fact, almost everyone brought a can back to Union, and I hope to donate some of my filtered drinking to the chemistry and physics departments for analysis.

Our workweek consisted of gutting a house our first day and working with Habitat for Humanity the next four days. Driving to the house we gutted, we saw for the first time the damage that had occurred to neighborhoods and communities. As outsiders I felt as though we never really knew what the area used to be like and would never be able to fully appreciate the severity of the storm and flooding. But being there in person more than a year after the hurricane made a greater impact than any news stories ever had. Gutting houses was a first time experience for all of us. The work was hard, but on the positive side it was comforting to know we couldn't do it wrong. Our main objective was to destroy everything inside down to the houses framework. Piles of siding, appliances, doorframes and furniture were collected next to the street where they were picked up by the city.

For the next 4 days we switched from destroying to building houses. We worked in a different neighborhood

volunteering with Habitat for Humanity. The work included siding, painting, roofing, interior working, and more. Here we got a chance to work with volunteers from all parts of the country and to interact with some of the neighbors. This neighborhood, as well as the previous one, had been under 10 to 20 feet of water. At this point, many of the houses had been abandoned and had notices on them telling the owner they would be bulldozed. Even with all this destruction around, the people moving back were happy and optimistic to be returning.

With our workdays starting by 7:00, we did not have many chances to get out of Camp Hope at night (another factor was the 11:00 pm curfew at Camp Hope). But we still managed to see an Imax movie, go bowling at a 1950s style rock and bowl, and walk around in the French quarter. Overall the trip was exhausting and an incredible experience. It was great seeing the large number of volunteers, all from different backgrounds and working for the same cause. The living conditions weren't the best and the work was laborious, but I would recommend such a community service trip to anyone. To finish up, I would like to personally thank our anonymous alumni donor who made the trip possible for a second year in a row, Mr. Dubow (father of Risa Dubow '07) for providing us with gloves, masks and safety goggles and the Eyman family (Laura Eyman '08) for having us stay over at their house for the last night of our trip.

Also in December, three Union College students, Shawn Bartok, Susan Beckhardt, and Ben Miles, participated in a national mathematics contest for college and university students by taking the "Putnam Exam". The twelve-question exam is six hours long, administered in two three-hour sessions. Here is what Susan and Shawn wrote about their experience.

My Putnam Experience, by Susan Beckhardt '07

I took the Putnam Exam for the first time this December. Because I live in Southern California, it was arranged that I would take the exam at Pomona College. The folks at Pomona were very eager to help, and arranged for me to stay the night with a fellow test-taker before waking up bright and early the next morning to take the 8am test.

My plan during the test was to focus most of my time on only one or two problems each section, rather than attempting all six. This proved to be a good strategy, as I found that it took a great deal of time and effort on each problem before I had *any* results worth submitting, and after that it was worth it to continue on the same problem and try to produce a complete solution.

The problems on the exam covered a wide range of topics, but all were intended to be understood by students with only a basic mathematical training. Thus, they were truly a test of reasoning ability rather than experience or knowledge. My favorite problem, and the one I came closest to completely solving, was "Show that the curve $x^3 + 3xy + y^3 = 1$ contains only one set of three distinct points, A, B, and C, which are vertices of an equilateral triangle, and find its area."

Despite (or perhaps because of) the difficulty of the problems, I really enjoyed taking the exam, and my only regret is that I didn't take it the previous three years!

My Putnam Experience, by Shawn Bartok '08

I have always enjoyed mathematics and have done fairly well in math courses. When I heard that the mean score on the Putnam is often zero, I knew I wanted to take it because of how inherently challenging the problems must be. I knew they'd get me thinking outside of what I've learned and allow me to apply some of what I've taken away from my courses. My goal going into the exam was to get above a zero, but after completing it I'll be happy with whatever I receive because the experience was enough for me.

In order to take the exam I came back to Union over winter break for a weekend. The Math Department supplied my housing (my dorm room), provided breakfast on the morning of the exam, and between the two exam sessions, Professor Barbanel took the participating students on a little tour of Schenectady and then out to lunch. It was well organized. All I really had to do was show up and the Math Department took care of the rest.

I really enjoyed the exam and would recommend the Putnam exam to any student who's interested in math and likes a challenge.

Problem of the Newsletter: January 12, 2007

Let's take the Putnam Problem mentioned in Susan Beckhardt's article as this week's problem!

Professor Friedman will accept solutions to this problem until 12:00 noon Thursday, January 18.