Math 110: Great Ideas in Mathematics

As children, our first encounter with mathematics involves learning how to count. We begin our study by revisiting counting but turn our skills to counting approximately, seeking patterns, asking difficult questions, and finding counterintuitive answers.

Math 110 at a Glance **Summer 2009**

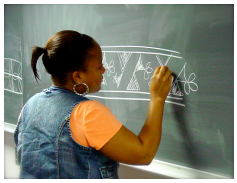
Patterns
Observation of natural phenomena coupled with an activity as basic as counting lead to mathematical insights.

Infinity

Are there different sizes to infinity?

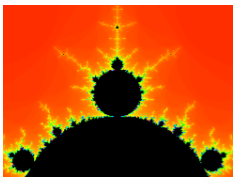
Code Breaking
Students learn the basics of RSA public key cryptography.

Symmetry

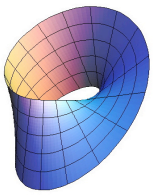


Students analyze designs to identify elements of symmetry and asymmetry.

Chaos
Analysis of chaotic systems reveals hidden beauty and order.



Topology

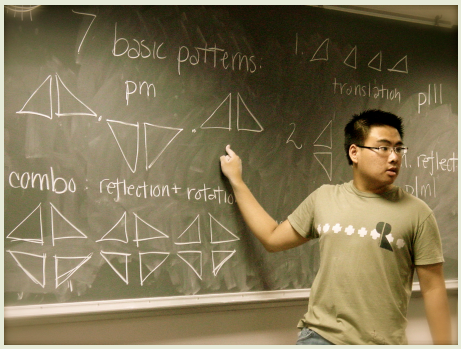


Students explore the Mobius strip and other topological delights.

Course Overview

Say goodbye to the days of mindless formulas and number crunching. The goal of Math 110 is to investigate some of the greatest ideas in mathematics through activities and lively discussions. Students of Math 110 take an active role in learning, challenge themselves to understand some deep (even abstract) mathematical ideas, develop life-long problem solving skills, and take risks. Students learn that taking risks in thinking may lead to making mistakes but that is often an important step in learning mathematics.

Math 110 tackles mathematical ideas from several branches of mathematics such as number theory, probability, statistics, chaos theory, geometry, and topology. That being said, another goal is to train ourselves to think like a mathematician. For example, we will look at nature, observe and identify patterns, generalize to formulate an abstract theory, and then compare our theory with nature to see if it checks out. In many cases, we want to recognize that it may be more useful to consider a simpler question first before attacking a more complex or abstract one.



Hong Nguyen, 2007 Summer Scholar & 2008 Teaching Assistant, lectures on symmetry groups in Math 111 to the 2008 Summer Scholars. Hong will be returning as the Teaching Assistant for Math 110 for the 2009 Bates Summer Scholars Program.

As hard as it may be to believe, we will set the stage for a counterintuitive discussion about infinity on the first day of class!

Class discussions and work on projects lead students to consider questions like:

- Are there two non-bald people on the Earth with the same number of body hairs?
- Are all infinities created equal?
- Can the observation of things that occur in nature lead us to mathematical generalities?
- Can order come from chaos?
- Is there a sexiest rectangle?
- Is there a 4th dimension? Can we see it?
- Can ideas or pictures be infinitely intricate?
- When is a donut equivalent to a coffee cup?
- Are coincidences as rare as they seem?
- How can we cut cake between 3 people while ensuring that each person is equally satisfied with their portion?
- Do the reproductive habits of Fibonacci's rabbits have anything in common with the Parthenon?
- What are public key codes and can we break them?
- Can a floor be tiled so that it has no repeating pattern?
- Is it possible to devise a flawless voting scheme when there are 3 or more candidates?