Music is math. Sounds good?
Prof. Giorgio Bornia

Music is the place where sounds meet feelings.
We play music because we feel. We listen to music because we feel.
And guess what? Mathematics - apparently such a cold discipline - takes part in this emotional process.
We will explore the world of music through mathematics.
In this journey, a good old companion will lead us: the guitar.

Modeling Spider Populations
Bridget Mann, M.S. student

This activity will give students exposure to concepts of calculus and differential equations in the context of spider populations. We have two differential equations that model the populations of adult and juvenile spider populations, which are then displayed graphically. Students can change different parameters in both equations (such as birth rates, development rates, cannibalism rates, and death rates) and can see in real time how these changes can impact the two population graphs. We have designed several experiments for them to follow. The goal is to give students exposure to the power math can have, and to allow them to see and experiment with that power for themselves.

Next Up!
Prof. Raegan Higgins

This will be a hands-on introduction to difference equations. We will introduce a variety of basic sequences and see how to establish recursive relationships.

The Math Behind AI
Prof. Victoria Howle

ChatGPT: What is it really doing? Is it "artificial"? Is it "intelligent"? What is some of the math behind it?

Germain's Variational Problems and Noether's Symmetries
Prof. Alvaro Pampano

In this presentation we will introduce some of the pioneering variational problems introduced by the French mathematician Marie-Sophie Germain in the beginning of the 19th century and we will discuss how the symmetries of the problem may help to understand the equilibria. These symmetries are often referred to Noether's Symmetries in honor of the German mathematician Emmy Noether who first proved the respective result. The presentation will be supplemented with several videos of physical experiments (such as soap bubbles and films, and Chladni plates) which will show how these variational problems arise naturally in real life.

Describing the Human Brain
Prof. Travis Thompson

Special proteins play a role in our brain and help to keep everything running smoothly.Much like a baker may burn a batch of cookies from time to time, our brain can make bad versions of these proteins too. A healthy brain quickly dumps these bad proteins in the trash but, as we age, our brains' trash can stops functioning correctly. Unfortunately, if they aren't stopped, bad proteins can go around and convince the good ones to turn bad, too! This leads to diseases like Alzheimer's disease, which we can model with some simple mathematical equations. In this talk we discuss the link between mathematics and Alzheimer's disease and students will act out a set of equations that describe the tension between good and bad proteins in the neuro-degenerative drama that plays out in the aging human brain.

An Invitation to Projective Geometry
Prof. David Weinberg

By introducing a new system of coordinates, a new world of geometry is revealed. The projective line, the projective plane, and points at infinity will be explained. We will see why there are no parallel lines in projective geometry (they intersect at infinity). Time permitting, we will see the great unifying power of projective geometry by studying conic sections in the projective world.