“MathBlast”

Monday, December 8, 2014 at Williams College
Sponsored by the Williams Center at Mount Greylock and the Williams College Department of Math and Statistics

MathBlast is a morning for 10th graders and math teachers from local area schools to participate in applied math workshops with Williams College professors. Students and teachers attend three thirty-minute workshops ranging from the zombies apocalypse to game theory.

The Workshops (choose your workshop online: http://sites.williams.edu/center-at-greylock/mathblast)

1. Being Bayesian—how could prior knowledge help us?
   Qing (Wendy) Wang

2. Gambles, Games, and Group Dynamics
   Instructor: Professor Stewart Johnson

3. The Golden Ratio and the Fibonacci Sequence
   Mihai Stoiciu

4. Patterns and Algorithms
   Eyvinder Palsson

5. Recommendation Systems and Statistics
   Brianna Heggeseth

   Instructor: Professor Colin Adams

The Schedule

8:30-8:40 Opening Remarks in Bronfman Auditorium

8:45-9:15 Workshops
9:25-9:55 Workshops

10:00-10:15 Snack break in Bronfman lounge area
10:20-10:50 Workshops resume (#1 NOT OFFERED)
11:00 Catch buses back to school
MATHBLAST WORKSHOP DESCRIPTIONS

Being Bayesian—how could prior knowledge help us?
Qing (Wendy) Wang
Probability was originally developed when a group of French mathematicians tried to solve a gambling problem. Since then, it has expanded to various disciplines and has become a crucial component of modern statistics. In the field of Bayesian Statistics, one often works with conditional probabilities by incorporating prior knowledge. We will start with the properties of conditional probabilities using examples of a Catholic Pope, breast cancer prevalence, and homicide investigations. In the end of the lecture, we will become Bayesian statisticians and see how prior knowledge would help us better estimate the likelihood of winning in a poker game.

Gambles, Games, and Group Dynamics
Stewart Johnson
In a gamble you anticipate an outcome of an event, such as a roll of dice or a horse race. In a game, you anticipate the actions of an opponent as they anticipate your actions, as in rock-paper-scissors-lizard-spock. In a group, individuals will act according to how they anticipate the group will act, as in deciding how much to contribute to a group project. We will explore some dynamics that arise from these game-theoretic constructs.

The Golden Ratio and the Fibonacci Sequence
Mihai Stoiciu
We will explain the connection between two very important mathematical concepts: the golden ratio (which is a number) and the Fibonacci sequence (which is a list of numbers). We will then describe several instances where these numbers appear in nature (flower petals, tree branches, shells, animal bodies).

Patterns and Algorithms
Eyvinder Palsson
We live in the times of big data. Computers have made it possible to gather immense amounts of information but the true value of the data lies in making inferences from it. In large data sets it can be difficult to locate trends and patterns, and sometimes our computers lack sufficient power to even process the data. Combinatorics, the mathematics of patterns and algorithms, is a powerful tool to manipulate data and gather useful understanding. In this talk we will explore some algorithms to find patterns and culminate with the famous Erdos distinct distance conjecture that asks: "What is the least number of distinct distances among N points in the plane.

Recommendation Systems and Statistics
Brianna Heggeseth
These days it seems like our computers can read our minds. Amazon knows what I want to buy, Netflix knows what I would enjoy watching, and the New York Times know what news I would be interested in knowing. Underlying this magic mind-reading is complex statistical analysis of large data sets. We will discuss how basic ideas of statistics can help us harness the power of computers so that the machines learn enough about us to become our personal shoppers.
Zombies & Calculus: A Survival Guide
Colin Adams
If you are reading this, then you have managed to survive the zombie apocalypse so far. Congratulations! But as the world sinks further into ruin, what additional strategies can you apply to endure the onslaught? Learn how calculus can help you to defeat the zombie hordes. *(But you needn’t know calculus to benefit.)* The lecture room will be certified a safe haven for the duration of the talk.