“MathBlast”

Monday, December 14, 2015 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 grade students and math teachers from local area schools to participate in math workshops with Williams College professors. Students and teachers choose three thirty-minute workshops from the list below.

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

1. Fibonacci Numbers and the Golden Ratio Rm: B103
   *Instructor: Allison Pacelli*

2. Geometry Constructions with Compass and Straightedge. Rm: B107
   *Instructor: Lori Pedersen*

3. Mathematical Card Tricks Rm: B105
   *Instructor: Mihai Stoiciu*

4. Patterns and Algorithms Rm: B104
   *Instructor: Eyvi Palsson*

5. Soap Bubbles and Mathematics Rm: BAud
   *Instructor: Frank Morgan*

6. Why Knot? Rm: B106
   *Instructor: Colin Adams*

The Schedule

8:45-8:55 Opening Remarks in Bronfman Auditorium
9:00-9:30 Workshops
9:35-10:05 Workshops
10:05-10:25 Snack break in Bronfman lounge area
10:30-11:00 Workshops resume (#5 NOT OFFERED)
11:10 Catch buses back to school
1. Fibonacci Numbers and the Golden Ratio  
**Instructor: Allison Pacelli**

Have you ever wondered why most clovers have 3 leaves rather than 4, or why credit cards have the dimensions they do? Fibonacci numbers! Leonardo Bonacci, also known as Fibonacci, is perhaps best known for the famous infinite sequence of numbers he introduced in the year 1202. We will look at some fascinating properties of the Fibonacci numbers, including their connections to the golden ratio which appears in architecture, nature, and even the Mona Lisa.

2. Geometry Constructions with Compass & Straightedge.  
**Instructor: Lori Pedersen**

The ancient Greeks constructed geometric figures using only a compass and straightedge. Some constructions were straightforward, while others seemed impossible. Hundreds of years later, some of these constructions were proved undoable with other branches of mathematics than geometry! We will learn to bisect an angle and draw a line perpendicular to another line using a compass and straight edge, but not a protractor. After learning a few basic skills, we will find the centroid of a triangle. Then we’ll see how the centroid is the center of mass for the triangle.

3. Mathematical Card Tricks  
**Instructor: Mihai Stoiciu**

Did you know that some card tricks are all about math? We will explain how ideas from algebra and combinatorics (the pigeonhole principle, modular arithmetic, permutations) make these card tricks work. In particular, we will show how to select an ordered set of four cards from five random cards in such a way that one can uniquely determine the fifth card. Therefore, you can make your friend guess the fifth card from ANY set of five cards.

4. Patterns and Algorithms  
**Instructor: Eyvi 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.”

5. Soap Bubbles and Mathematics  
**Instructor: Frank Morgan**

Soap bubbles continue to fascinate and puzzle mathematicians. The show will include a little guessing contest with demonstrations, explanations, and prizes.

6. Why Knot?  
**Instructor: Colin Adams**

Take a string, tie a knot and glue the loose ends together. How can you tell if you can disentangle the knot without cutting it open? Knot theory has applications to DNA and to synthetic chemistry, where chemists try to create knotted molecules. We will discuss various aspects of knot theory, make some human knots and talk about how to describe knots over the phone or to a computer.