The Almagest

The bi-weekly newsletter of the Alma College Department of Mathematics and Computer Science. Your trusted source for news.

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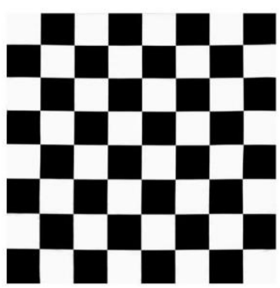
Next Colloquium – Wednesday, Nov. 13th

The next Math & C.S. colloquium will be given by Dr. Garry Johns. Dr. Johns is a professor of mathematics at Saginaw Valley State University. Dr. Johns's presentation is entitled "The Checkerboard Problem: Experimental vs. Theoretical Mathematics."

Historically, mathematicians have focused on proofs and theoretical mathematics to answer questions and solve numerical problems. In recent years, computers and experimental methods have been used to investigate solutions for large or complicated problems. Both approaches have advantages and challenges.



In 2015, Gary Chartrand from Western Michigan University introduced a puzzle that he called the Checkerboard Problem where he placed coins on various squares to satisfy certain conditions. In this talk, I will share how both experimental and theoretical mathematics played a part in finding solutions to this problem. Along the way, I will discuss open problems and opportunities for undergraduate research. ~ *Dr. Johns*

"The Checkerboard Problem: Experimental vs. Theoretical Mathematics"

Date: **Wednesday, November 13th**
Time: 4:00
Place: SAC 109

Refreshments at 3:50.

Winter & Spring Term Courses

Winter and Spring term registration has begun! Here are some courses to consider:

For Winter Term 2020

MTH 221 *Differential Equations*, Dr. Fonley
MTH 223 *Mathematical Structures*, Dr. Molina
MTH 280 *Applied Stat. Methods,* Dr. Westgate
MTH 421 *Abstract Algebra*, Dr. Kaylor
MTH 480 *Senior Presentation Seminar*, Dr. Fonley

CSC 180 *Programming with Data*, Dr. Dexter
CSC 240 *Algorithms and Complexity*, Dr. Dexter
CSC 440 *Compiler Design*, Dr. Thall

PHY 380 *Gen. Relativity & Cosmology*, Dr. Jensen

For Spring Term 2019

CSC 180 *Technology and Dis/ability,* Dr. Dexter

Cognates for the Math Major

In addition to the 36 credits for the mathematics major, there are two required cognates: CSC 120 and a non-mathematics course, approved by the Mathematics Department, with a mathematics prerequisite of MTH 113 or higher.

Below are the approved cognates with mathematics prerequisites given in parentheses.

CSC 240 *Algorithms and Complexity* (MTH 220)
CSC 335 *Computer Graphics* (MTH 220)
PHY 121 *Introduction to Physics I* (MTH 121)
CHM 331 *Chemical Thermodynamics* (MTH 122)
CHM 332 *Quantum Chemistry* (MTH 122)
BUS 309 *Managerial Finance* (MTH 116 or 121)

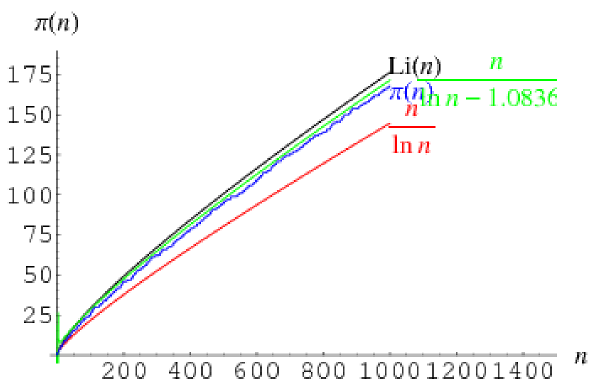
Math Club

The Math Club meets **every Tuesday** at 9:00 pm in Dow 132. *All are welcome!*

The Distribution of Primes: Where are they Hiding?

Since about 300 BCE we have known that there are infinitely many prime numbers. The first proof was given by Euclid in the *Elements*. While there have been many different proofs of this fact throughout the years, one question has eluded mathematicians for hundreds of years regarding prime numbers. Where can we find them?

In order to better understand the distribution of prime numbers, mathematicians have been working on a prime counting function $\pi(x)$, where $\pi(x)$ gives the number of primes less than or equal to a real number x. It wasn't until the end of the 18th century when Gauss and Legendre managed to conjecture that $\pi(x) \sim \frac{x}{\ln(x)}$. This approximation of $\pi(x)$ is also known as the prime number theorem.



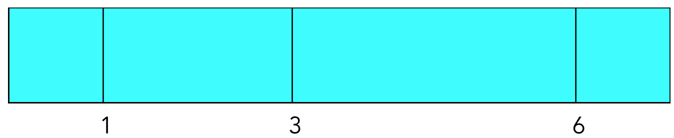
Source: Wolfram MathWorld

With this approximation we are able to glean a wide range of information about prime numbers such as the probability that a number less than some N is prime, as well as how large the gaps between primes are in a given range. Despite what we can find out about primes, each of these estimates are only estimates after all. The main goal of examining $\pi(x)$ is to try to find more accurate approximations of the prime counting function.

However, this is easier said than done, as it requires tackling problems, such as the Riemann hypothesis, which remain unsolved. In short, the Riemann hypothesis asks about the location of the non-trivial zeros of the Riemann-Zeta function. The reason we care about this conjecture is that should it be proven true, then $\pi(x) = li(x) + O\left(\sqrt{x} * \ln(x)\right)$, where $li(x)$ is the integral logarithm and O is big O notation. This definition of the prime counting function provides a significantly tighter bound on the error for the prime counting function. As we continue to work on this problem, hopefully we can continue to not only prove the more accurate prime counting function, but also discover even more accurate definitions. ~ *Brandon Hart*

Puzzle of the Bi-week

This 7-inch ruler looks insufficient as it only has lines at the 1, 3 and 6-inch positions. Yet, it can measure any given number of inches, 1 through 7, with a single application of the ruler. For example, from the 1-inch mark to the 6-inch mark measures 5 inches, and you can easily verify that the other whole number measurements are also possible.



Can you find a way to mark a 13-inch ruler with only 4 lines so that that all measurements from 1 to 13 inches are possible?

A prize of **$2.00** will be given to the first student who submits a correct solution to Dr. Molina.

Solution to Previous Puzzle

Players A and B are bowling. They alternate turns, with Player A going first. Whoever gets the first strike wins. Player A has a 1/2 probability of getting a strike on each turn, and Player B has a 1/3 probability. What is the probability Player A wins?

There have been no correct solutions submitted for this problem! There is a prize of **$5.00** for the first student to submit a correct solution to Dr. Westgate.

Student assistant:	Brandon Hart
Faculty advisor:	Brad Westgate
Distribution:	Jackie Gage SAC 224

If you would like to submit an announcement or a short article, please send it via e-mail to Brad Westgate (westgatebs@alma.edu).

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