MSCS MESS

Department of Mathematics, Statistics, and Computer Science
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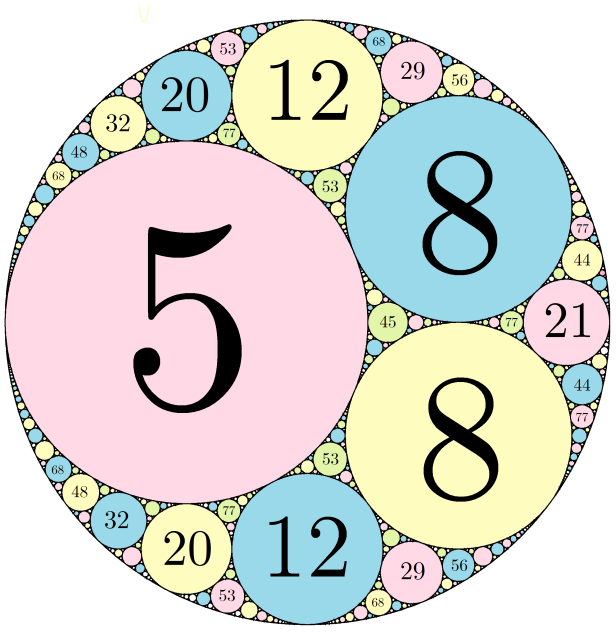
No Colloquium Next Week

Next Friday's Research Seminar

Title:	Apollonian Packings and Number Theory
Speaker:	Ian Whitehead
Time:	3:40 PM
Date:	October 19
Place:	RNS 204

About the Talk: Start with four circles, all tangent to one another; then fill in the gaps between them with additional tangent circles. If you keep filling the gaps with smaller and smaller circles, you will generate an Apollonian circle packing. This picture has a rich history, from the time of Alexander the Great to René Descartes, to Japanese temple geometry. Amazingly, if you start with four circles whose curvatures are integers, then all the circles in the packing have this property. In my talk I'll describe some of the number theory that's been inspired by Apollonian packings in the last 20 years: theorems and conjectures about the growth of curvatures in a packing, and which integers can appear as curvatures. I will finish with my own work on the domain of multivariable power series defined by Apollonian packings.

About the Speaker: Ian Whitehead is a number theorist specializing in the distribution of prime numbers and connections to multivariable functions with many symmetries. He went to college at Stanford University and returned to his hometown of New York City for graduate school at Columbia University. He held a postdoctoral position at the University of Minnesota and is now a visiting assistant professor at Macalester College.



Spring Preview

With registration coming up in the next few weeks, we at the MSCS Mess reached out to professors leading seminar or topic courses in order to give students an idea about what the courses entail. Read on for the course descriptions.

Math 282: Introduction to Computational Geometry with Professor Wright
Computational geometry is an area at the intersection of mathematics and computer science that deals with algorithms for solving geometric problems. These problems often involve geometric objects such as lines, planes, and polygons. Applications of computational geometry include computer graphics, robotics, geographic information systems, and computer vision. Some fundamental problems in computational geometry include:

1. Given a set of points, find their convex hull (that is, the smallest convex polyhedron containing all of the points).

2. Given a set of line segments in a plane, find all of their intersection points.

3. Given a set of points, find two with the smallest distance between them.

4. Given a set of seed points in a space, compute a Voronoi diagram – a cell decomposition of the space such that each cell contains all points that are closer to one particular seed point than to any other seed point.

This course will focus on theory and algorithms related to polygons, triangulations, convexity, curves, Voronoi diagrams, polyhedra, and configuration spaces. The recommended background for this course includes some experience with proofs and with coding. Please talk with Prof. Wright if you have any questions about this course.

Math 382: Pure Mathematics: Analytic Number Theory with Professor Grodzicki
Humanity has been investigating the properties of the natural numbers for millenia (seriously – Euclid's proof of the infinitude of primes dates back to around 300 BC). This course will skip forward a couple of thousand years and focus on exploring the (often surprising) connections between Calculus and the structure of the natural numbers. For example, we will see how analysis can be used to enhance our understanding of the distribution of the primes, as well as how analysis can be used to highlight the appearance of primes in various evenly-spaced sequences of integers. Topics will range from Goldbach's problem and the circle method to the Riemann zeta function and random matrix theory. The only prerequisite is Math 244; we will discuss whatever material we need from algebra, probability, complex analysis, or Fourier analysis. In particular, no background in number theory is assumed. This course will count towards a 2-3 sequence for the IMAP

Math 384: Financial Mathematics with Professor McKelvey
Wall Street is awash in exotic financial instruments. Math 384: Mathematics of Finance, is about exploring the mathematical properties of these instruments and, more importantly, combinations of these instruments. This course will not make you rich, but will help you understand some important aspects of institutional high finance. The misuse of these instruments are blamed, by some, for the financial crisis of ten years ago. Some argue that we are currently in the early stages of a similar fiasco in the near future.

The financial instruments we will discuss include forward and futures contracts, call and put options, foreign exchange trading, and the more mundane stocks and bonds. A particular focus will be the pricing of these instruments. It is important to understand this pricing because deviation from the correct price, by you or others in a market, typically opens up arbitrage opportunities, the chance to make money without risk.

In addition to discussing individual instruments, we will discuss hedging and portfolio design that allow investors to take advantage of very clever combinations of financial instruments.

Prerequisites: Math 220 (Linear Algebra) along with Math 266 (Probability) or a 200-level statistics course.

Happy Fall Break!

Q: What's a snake's favorite language?
A: Python!

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