



Spring 2018

Newsletter

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Pi Day Extravaganza!

When: March 14th 6pm - 8pm
Where: Talley Piedmont Ballroom



- Talk to organizations about how they recruit math and stats majors
- Learn from alumni about all the ways you can use your math/stats degree
- Come see Bank of America, SAS, Chiltern, Fidelity, and more (we are expecting 8 companies + alumni)
- FREE FOOD!



Association for Women in Mathematics

The Association for Women in Mathematics (AWM) is a national organization whose purpose is to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences.

Our student chapter hosts weekly brown bag lunches on Wednesdays from 11:00AM-12:00PM in SAS 4104. Attendees bring their own lunches, and have the opportunity to be in a casual and supportive discussion environment, while we provide a tasty treat! AWM is NOT exclusively for women, and we would like to emphasize that everyone is welcome to join us at this weekly event, including undergraduates, graduate students, and faculty members.

On April 7th, the club will host our annual outreach event, Sonia Kovalevsky Day, for 7th and 8th grade girls to be exposed to fun math-related topics that they may not see in the every day classroom. Anyone interested in volunteering and/or joining our club's mailing list should email Katherine Harris at keharri4@ncsu.

Sports Analytics Club

The Sports Analytics Club is a student-led organization committed to the quantitative analysis of sports. We encourage and enable students of any major to pursue their statistical interests related to any sport. Current activities include work with the Carolina Hurricanes and NC State Baseball. Meetings are bi-weekly on Monday nights. If you have any questions, email Jason Thompson at jrthomp8@ncsu.edu, or check out our website by Googling our club name. Go Pack!

AI Club

Our mission is to inform, bring together, and educate the NC State community about artificial intelligence and its opportunities and threats, and to create a platform for learning and innovation in the field.

We host general meetings, as well as workshops and speakers. The club is multidisciplinary and open to everyone, regardless of skill level or department.

Find out more at our website, <https://aiclub.wordpress.ncsu.edu/>

College of Sciences Student Ambassadors

The College of Sciences Student Ambassadors Program gives outstanding students the chance to engage with the college and promote a vibrant campus culture. Ambassadors get the opportunity to staff the Wolfpack Welcome Week event, interact with alumni, students, and family at Sciences Visitation Days, provide tours to prospective students and families, communicate with admitted students through phone calls and emails, represent Sciences students at events for alumni and special guests, and share experiences on student panels. Being an ambassador gives you the chance to give back to the NC State community by sharing what you love so much about NC State while allowing you to learn more about the college and network with faculty and alumni.



**Change Lives.
Change the World.**

**Add a Degree in
Math Education**

With a Double Degree in Mathematics Education You Can:

Receive scholarships and forgivable loans to teach math in public schools

Share your passion and inspire the next generation of mathematicians

Change students' lives and work alongside dedicated educators in local schools

Specialize in mathematics or statistics

Learn from nationally recognized faculty who have 6-12 classroom experience

Expand your career opportunities

Contact: Dr. Cyndi Edgington | cpedging@ncsu.edu

Visit: go.ncsu.edu/mathematics-education

**When you join the NC State College of Education, you join
the best teacher preparation program in North Carolina.**



#1 Producer*
of STEM Educators in the State

100% Passage Rate*
Licensing Exams in Math Education

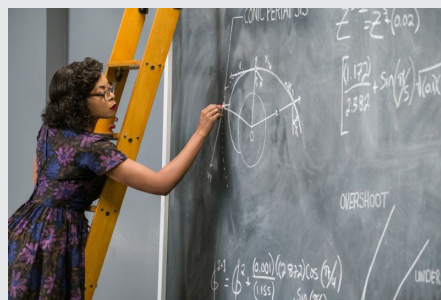
#1 Performing*
Teachers on Overall N.C. Measures

*Sources: N.C. Department of Public Instruction and Diversity in Education

Finding a Career in Math

Hi math students! Did you know you have a designated Career Counselor who can help you with the job/internship search, resumes/cover letters, grad school applications, figuring out what career paths are a good next step, and more? You can schedule an appointment with Wesley Wade via ePACK (ncsu.edu/epack) or you may email him at: wjwade@ncsu.edu

Speaking of ePACK, are you still searching for a summer



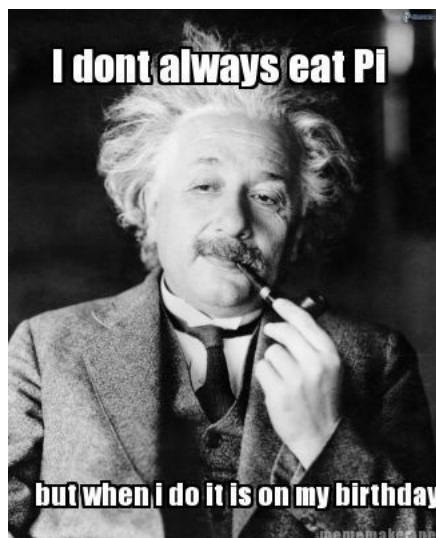
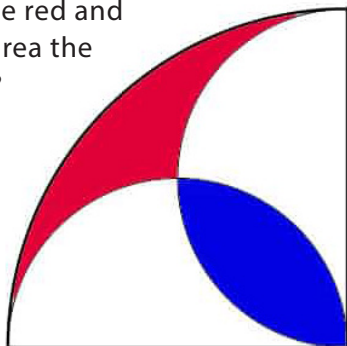
internship? There are currently over 40 internships currently in ePACK for math majors, and many are right here within the Triangle. Just log into ePACK, go to "Jobs/ Internships," select "ePACK jobs -

for NC State students & alumni," and in the "Advanced Search" fields select your major and internship as the "Position Type." If you are looking for a full-time role, just select "Full Time Entry Level" instead of internship.

There are a lot of amazing opportunities for NC State students studying math. Take advantage of your campus resources and schedule an appointment with your Career Counselor, or attend a career-related event!

Puzzles 3.14159265358979323846264338327...

Are the red and blue area the same?



3			1	5	4			1		9	5
	1			3					1	3	6
		4			3		8			2	
5			1			9	2	5			1
	9			5			5				
5	8	1			9			3		6	
	5		8			2			5	5	3
				5			6			1	
2			5	1	5			5			9
	6			4		1			3		
1	5	1					5			5	
5	5		4			3	1	6			8

Each row, column, and jigsaw region must contain exactly the first twelve digits of pi, including repeats: 3.14159265358. Notice that each region will contain two 1's, two 3's, three 5's, and no 7's.

Budapest Semesters in Mathematics: Hayley Russell

What made you decide to study abroad?

It has always been my goal to travel more, and I love learning new languages. I was looking for a program where I could not only take classes that would allow me to graduate on time, but would expose me to how another country teaches mathematics. I wanted to study abroad for a semester so I could experience living in a different country and really getting to know the culture and the language.



Why did you choose this program?

I first heard about Budapest Semesters in Mathematics (BSM) from my advisor freshman year. It is a very unique program, not attached to any one university, and designed specifically for advanced math majors. They have also have a program designed for math education majors as well. I chose this program because Hungary is known for being very good at teaching mathematics and has raised many famous mathematicians like Paul Erdős, John von Neumann, Lajos Pósa, etc. The program offers several classes not usually offered at NCSU as well as several unique to Hungary. In addition, I wanted to live in a country where English was as widely spoken to challenge myself to learn a new language.

What classes are you taking and how do they compare to NC State's?

I'm taking combinatorics, graph theory, Hungarian language, and Discovery Learning: The Pósa Method. I'm also taking a computer graphics class at Aquincum Institute of Technology (AIT). In my math classes I'm given weekly problem sets similar to NC State, but the majority of my grade is determined by one midterm and a final. The Posa Method class is one of the classes unique to this program. It is a problem solving class where we are given a wide variety of problems that don't require an advanced mathematical background, but employs some creative thinking and clever tricks. There is also an educational aspect to this class where we discuss how we came to a solution, alternate proofs, and discuss how these problem solving skills could be taught in a high school setting to advanced students.

What difficulties have you faced while studying abroad?

It took me a little while to learn how to navigate the multitude of buses, trams, metros, and trains, but the public transportation is very convenient and almost never late. In Budapest, you can get around without knowing Hungarian, but when I traveled to some smaller more rural towns, I struggled to find people who spoke English.

Would you recommend studying abroad to other students at NC State?

Definitely! Studying abroad has been one of the best decisions I've made while at NC State. Living abroad in a different culture has challenged me to adapt, but also exposed me to beautiful sights, delicious food, and the witty sarcasm found in most Hungarians. Though several of the classes are equivalent to classes offered at NC State, they are more challenging and cover the material more thoroughly. If you are a math major I would highly recommend this program, Budapest Semesters in Mathematics Education, or Math in Mocsow. If you are interested in computer science, I would recommend looking into Aquincum Institute of Technology. Feel free to contact me with any questions at hsrussel@ncsu.edu.

Kwangil Koh Lecture: Andrew Belmonte Games, Decisions, Evolution and Change



April 19th

4:30 pm - 5:30 pm

Andrew Belmonte, professor of mathematics and materials science and engineering at Penn State University, will deliver the seventh Kwangil Koh Lecture on Mathematics in Our Time. A pre-talk reception will begin at 4 p.m. in the SAS Hall atrium. Belmonte will examine how humans play games. Sometimes we roll the dice or buy lottery tickets — sometimes we play chess or mind games of manipulation. History gives us two examples of the development of new mathematical ideas and directions from our playful habits: games of chance, which led to the formulation of probability theory, and games of strategy, which led to game theory. Belmonte will discuss how these two theories come together to provide a mathematical approach to conflict and other interactions for populations in biology, economics and other situations where simple optimization does not explain what we see. Along the way, we will grapple with the challenges of cancer and the dynamics of social media.

Advanced Mathematics Courses

MA 493 Introduction to Mathematical Optimization

10:15 am - 11:30 am TH

Instructor: Dávid Papp

Mathematical optimization (also called mathematical programming) is a rich and thriving mathematical discipline that has become an essential part of the toolkit of computational mathematics, statistics, and most fields of engineering. The aim of this course is to provide an accessible but rigorous introduction to the practical and theoretical fundamentals of mathematical optimization. The course will cover modeling techniques (using contemporary applications), the fundamental analytical results in the area (optimality conditions, Lagrange multiplier theory, duality theory), and gives an overview of the most widely used algorithms. Find out more at <https://goo.gl/f8bxCB>.

MA 551 Introduction to Topology

11:45 am - 1:00 pm TH

Instructor: Patricia Hersh

This course would be a good choice for strong undergraduate math majors considering going to graduate school. The main topic of point set topology will give a useful foundation for many other areas of math such as analysis, geometry, and algebraic topology. The class will introduce sophisticated ways to think about notions such as continuity that often can lead to simpler, more intuitive proofs. Towards the end of the semester, we will turn to the topic of the fundamental group, a so-called invariant of topological spaces, namely an algebraic gadget that can sometimes detect when two different spaces are different from each other in fundamental ways; this will be done by giving a way to multiply loops on the space with each other.

MA 573 Mathematical Modeling of Physical and Biological Processes I

11:45 am - 12:35 pm MWF

Instructor: Alen Alexanderian

Introduction to model development for physical and biological applications. Mathematical and statistical aspects of parameter estimation. Compartmental analysis and conservation laws, heat transfer, and population and disease models. Analytic and numerical solution techniques and experimental validation of models. Knowledge of high-level programming languages required.

MA 430 Mathematical Models in the Physical Sciences

11:45 am - 1:00 pm TH

Instructor: Ronald Fulp

(1) Vector fields, Derivations, Differential 1-forms in 3 and 4 dimensions

(2) Work, Potential Energy, Newton's Law, Conservation of Energy, Newtonian relativity

(3) Axiomatic Thermodynamics, Processes, Work, Internal Energy, Zero-th Law, Heat, First Law, Second Law and Entropy.

These topics will be presented both from an intuitive perspective and rigorously from a mathematical perspective. Axiomatic thermodynamics continues to be developed in the mathematical and physics literature and by no means is a finished product. Eddington reportedly said that if a physical theory was found to be in conflict with other theories or with experiment then one should modify those other theories but if it conflicts with the second law of thermodynamics there is no hope for that other theory. Einstein said that the second law is the only physical law whose basic concept will never be overthrown. The basic axioms can be understood mathematically almost better than the physical concepts which are often not presented well or at least that is what mathematicians believe!

MA 555 Manifold Theory

11:45 am - 12:35 pm MWF

Instructor: Irina Kogan

Prerequisites: Multivariable Analysis (MA 426) or a very strong performance in Calc III (MA 242), and any Linear Algebra course.

In advanced calculus (e.g. MA 426), the students learn how to define and to perform differentiation and integration on \mathbb{R}^n , but often in math, science and engineering one needs to do calculus on more complicated shapes, such as a sphere, or a hyperboloid, or a torus. The main difference is that on \mathbb{R}^n one can add points (vectors) but on other shapes, like a sphere, points can not be added in a meaningful way. We will learn how to go around this issue and will define and study differentiation and integration on sufficiently "nice" shapes, called manifolds.

BMA 771 Biomathematics I

3:00 pm - 4:15 pm MW

Instructor: Kevin Flores

Role of theory construction and model building in development of experimental science. Historical development of mathematical theories and models for growth of one-species populations (logistic and offshoots), including considerations of age distributions (matrix models, Leslie and Lopez; continuous theory, renewal equation). Some of the more elementary theories on the growth of organisms (von Bertalanffy and others; allometric theories; cultures grown in a chemostat). Mathematical theories of two and more species systems (predator-prey, competition, symbiosis; leading up to present-day research) and discussion of some similar models for chemical kinetics. Much emphasis on scrutiny of biological concepts as well as of mathematical structure of models in order to uncover both weak and strong points of models discussed. Mathematical treatment of differential equations in models stressing qualitative and graphical aspects, as well as certain aspects of discretization. Difference equation models.

SUM Series

Math and Pizza

The SUM Series features informal talks on mathematical topics. The talks are held Thursdays from 4:30pm - 5:30pm in 2102 SAS Hall. You will have a few minutes to help yourself to pizza before the talk.

There is a low-volume (weekly) email list dedicated to announcements of upcoming SUM Series talks; for upcoming topics or to join the list, check out the SUM Series website: <http://go.ncsu.edu/sumseries>. To follow us on social media use @ncsumseries and visit <https://www.facebook.com/SUMseries/>

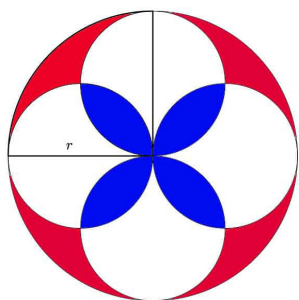
SUM Series is not affiliated with SUM Club

Math Alumni

Ever wondered what you could do with your degree? Maybe you know but want the inside scoop. Well then Alumni are a great resource for you! They have made it through the same program that you are in now and have gone on to the working world. Don't have time to reach out on your own? Don't worry! We asked Math Alumni about their careers and for advice they would give someone preparing to enter their field. Check out their responses on our new Alumni page! <https://math.sciences.ncsu.edu/undergraduate/dfind-grads/>



Solutions



3	2	5	1	5	4	6	3	1	8	9	5
4	1	5	2	3	8	5	9	5	1	3	6
6	1	4	5	9	3	5	8	3	1	2	5
5	3	3	1	8	5	9	2	5	6	4	1
8	9	2	6	5	1	1	5	4	3	3	5
5	8	1	5	2	9	4	3	3	5	6	1
1	5	3	8	1	6	2	4	9	5	5	3
9	4	5	3	5	1	5	6	8	2	1	3
2	3	6	5	1	5	3	1	5	4	8	9
3	6	8	9	4	5	1	5	1	3	5	2
1	5	1	3	6	3	8	5	2	9	5	4
5	5	9	4	3	2	3	1	6	5	1	8

Place four identical quarter circles together to see the full circle. We can see that it comprises four smaller circles that overlap. The area of the four overlapping smaller circles (the white and blue sections) is equal to the area of four of these circles minus the area of the overlap (the blue section). The area of the whole circle minus the area of the red section is equal to the area of the white and the blue sections.

The radius of each of the smaller circles is half r , or $r/2$. So the area of each smaller circle is $\pi(r/2)^2$, or $\pi r^2/4$, which is $\pi r^2/4$.

So, the area of four smaller circles is $4 \times \pi r^2/4 = \pi r^2$.

The white and blue section is equal to πr^2 minus the blue section. The white and blue section is equal to πr^2 minus the red section. If these statements are both true, the blue and red sections must be equal. Since each quarter has the same ratio of blue to red, each blue section must have the same area as each red.