Spring 2024

NEWSLETTER

3rd Annual NC State Integration Bee

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Newsletter Contacts

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SUM Club

Each year, the Society for Undergraduate Mathematics hosts a competition where students compete in a single-elimination tournament to solve integrals at the chalkboard faster than their opponents. This year marks the Third Annual Integration Bee at NC State, with 43 participants fighting for eight spots in the playoffs. After an intense competition on February 26th, sophomore Noah Siekierski of the Electrical and Computer Engineering Department took home the winning title for the second year in a row. Congratulations to this year's playoffs field, including:
! Noah Siekierski, Electrical and Computer Engineering
Liam Courtright, Mathematics
* Blan Morrison, Mathematics
Coleman Hines, Mathematics
Valerie Sun, Mechanical Engineering
* Josh Ott, Physics
Aiden MacQueen, Aerospace Engineering
** Arvin Kushwaha, Physics
(* one time playoffs returner, ** two-time playoffs returner, ! previous winner)

Congratulations to all qualifiers, and thank you to undergraduate math majors David Sieg and Etienne Phillips for hosting the event this year! And a huge thank you to the Math Department and Dr. Trino Ascencio-Ibañéz of the Biochemistry department for generously providing the funds for our prizes, which included $150 in cash and $200 in math-y rewards, which were distributed amongst the top four playoff performers.

Washington Elementary Math & Science Night

The Society for Undergraduate Mathematics has actively participated in the Washington GT Elementary Math and Science Night long before the pandemic. This year, the student organization returned once again to host various math games for elementary-aged kids. Activities ranged from building shape nets and identifying the number of faces, edges, and vertices on the 3D shapes, a make-your-own shape station, problem-solving with toothpick geometry configurations, and playing the card game SET.

Thank you to undergraduate stat major Amanda Baright for coordinating the event and activities and to all the volunteers: Quill Nebeker, Diego Osorio Sorto, Adam Schrand, Madeline Snyder, and Camden Toumbleston. Below are a few descriptions of what some of our SUM club members were helping with throughout the night and their overall experience with this outreach event.

Helping with the event was really fun! It's a good feeling to plant the seeds for a love of math, and knowing the kids had some fun at the same time is very cool. **- Diego Osorio Sorto**

Washington GT Elementary's Math and Science Night is one of my favorite outreach events that SUM Club has participated in for the last few years. It's not only fun for us volunteers and the kids at this event, but it's amazing to see parents get involved with their kids to solve our math puzzles or even build fun shapes! **- Amanda Baright**

Washington Elementary Math & Science Night

I'm glad we were able to create such a welcoming and engaging environment for the kids at this event. Many kids think that they don't like learning because of the way schooling can be structured, but when presented with opportunities to express themselves and think critically like this one, they might just find that they do like it after all. **- Adam Schrand**

Washington GT Elementary's Math and Science Night was a wonderful opportunity to witness and foster logical reasoning in youth. I had the pleasure of running the Toothpick Geometry station where students had to manipulate a starting configuration to create a desired outcome (e.g. remove one toothpick to leave 3 squares). The students were engaged and thought through the increasingly challenging problems.
- Camden Toumbleston

NC State Team @ Stanford's TreeHacks Hackathon

TreeHacks is Stanford University's premier hackathon and one of the largest hackathons in the nation, with over 1,000 students participating in the event. This year, senior applied mathematics and electrical engineering student Matthew Murray competed in a team with four other students and took home the Best Consumer Use Case for Blockchain Award. Their journey with their project TrustFile began with a deep-seated concern for the welfare of children in foster care systems. Nearly 48,000 Canadian children and ten times as many in the US lack stable document access in foster care. TrustFile offers a blockchain-based solution for secure document storage.

Pictured: Matthew Murray (far right) and team. For more information about their project, visit: https://devpost.com/software/trustfile

Department Happenings

February 2024 - SUM Club's Math Alumni Career Panel
Earlier this semester, SUM Club hosted a Math Alumni Career Panel that provided students the opportunity to meet three NC State Math Alumni, hear about their experience at NC State and how they got to where they are now, and ask questions. On the panel was:

- *Jamie Loring (B.S. in Applied Mathematics and Statistics, Class of 2023), a Senior Associate Data Visualization Analyst at SAS*
- *Dr. Elisabeth Brown (M.S. and Ph.D. in Applied Mathematics, Class of 2012 and Class of 2017), an NCSU Assistant Teaching Professor in the Mathematics Department*
- *Olga Shvetsova (B.S. in Applied Mathematics, Class of 2022), an Audit Data Analyst at USB*

Monday, April 1st, 2024, from 6:30 to 7:30 pm (SAS 2202)- SUM Club: Mathematical Insights Night: April Fools Edition

Monday, April 15th, 2024, from 6:30 to 7:30 pm (SAS 2202) - SUM Club: Everything I Wish I Knew about Graduate School 3 years ago.

April 4th-14th, 2024 (Titmus Theatre) - University Theatre Show: Ada and the Engine
Mathematician Ada Byron Lovelace, daughter of the infamous Lord Byron, believes in the boundless potential of the "analytical engines" invented by her friend Charles Babbage. Constrained by the social rules of her day, Ada is determined to make her mark. Through love, friendship, and poetic dreams of the future, Ada creates a vision of the world where art and information converge to transform everything at the beginning of the British Industrial Revolution.

In April 2024, the NC State University Theatre will perform Ada and the Engine at Titmus Theatre. For more information about the show, visit https://theatre.arts.ncsu.edu/events-calendar/ada-and-the-engine/

Saturday, April 20th, 2024, Time TBD (Pullen Park) - SUM Club: End of Semester Celebration

SUM Club

The Society for Undergraduate Mathematics (SUM Club) is a student organization for students passionate about mathematics. We connect math undergrads and provide students with academic and professional development, leadership, and service opportunities. This is accomplished through social and outreach activities, presentations
at meetings, career events, and other college- and university-wide involvement. Open to any student, math major, or otherwise, we meet on Mondays at 6:30 pm in the Undergraduate Math Lounge (SAS 2202) to get to know one another, do math puzzles, play games, learn together, and perform outreach.

We would love to have more people involved! Email us at ncsusumclub@ncsu.edu with any questions or to be added to our email list.

Stat Club

If you are interested in statistics or related professions or just want to meet and socialize with other statistics lovers, come join Stat Club. The purpose of the club is to expose people to the endless applications of statistics and what a career in statistics looks like by bringing in guest speakers from industry and academia. This is also a great way for members to network with industry professionals, NCSU faculty, and other statistics majors. Our meetings also consist of workshops to hone your marketability when applying for internships and opportunities. If you have any questions or want to be added to the mailing list, please email us at statistics-club@ncsu.edu. We hope to see you all soon!

Sports Analytics Club

The Sports Analytics Club at NC State is a student-run organization committed to the quantitative analysis of sports strategy and management.
This club is open to all students and faculty members of NCSU. The club encourages and enables students to share ideas and complete research projects on any topic related to sports statistics. We meet weekly on Monday nights at 6:30 pm in SAS Hall, room 1216. Email sportsanalytics@ncsu.edu if you would like to join our email list.

Putnam Club

2024 NCSU Putnam Winners (From left: Etienne Phillips, Blan Morrison, Mason McElroy)

The Putnam Competition Club is a weekly problem-solving club based around preparation for the prestigious William Lowell Putnam undergraduate math competition. The Putnam Competition is hosted once annually in December, and the top scorers have included several respected researchers. Achieving a good score is often a resume booster! During the Putnam Competition Club meetings, we are motivated by solving interesting competition problems and developing problem-solving skills and mathematical knowledge. A typical meeting involves everyone working on trying to solve a problem -- either collaboratively or on their own -- and writing up solutions for practice. No prior competition experience or significant mathematical knowledge is necessary to participate and succeed, as the club is built around developing the necessary skills! Email ecphill6@ncsu.edu if you would like to learn more about The Putnam Competition Club.

Association for Women in Mathematics

The purpose of the Association for Women in Mathematics at NC State is to encourage women and girls to study and have active careers in the mathematical sciences and to promote equal opportunity and equal treatment of women and girls in the mathematical sciences. Events held by AWM include Sonia Kovalevsky Day on April 15, 2023, and an annual Math Research Competition.

Math Honors Program

The Math Honors Program began in the mid-1960s as a means of encouraging excellent undergraduates to pursue a program that would challenge their abilities and better prepare them for their postgraduate career. Since that time, the program has grown from an average of four to five participants, with one to two completing the program each year, to an average now of about 35–40 participants, with 10–14 students completing the program each year. More than half of the participants are double majoring in math and another area such as physics, computer science, math education, chemistry, engineering or a foreign language.
More information can be found by visiting
https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/math-honors-program/

Advanced Mathematics Courses

MA 518 Differential Geometry of Curves and Surfaces
Instructor: Peter McGrath

The course will study curves and surfaces beginning from where the corresponding study in Calculus III left off; using Linear Algebra, we will study the curvature of these objects in greater detail. A focal point of the course will be the celebrated Gauss-Bonnet theorem, which says that the total curvature (the integral of the curvature) of a surface is independent of the way the surface is embedded in space. A corollary is that the total bending of a "deflated" basketball (sphere) is always equal to the total curvature of a fully inflated basketball---although it is possible for portions of the ball to have zero or negative curvature, these regions are necessarily countered by regions with even higher positive curvature.

MA 493 (001) Introduction to Financial Mathematics
Instructor: Andrew Papanicolaou

This course is an introduction to financial mathematics at the undergraduate level. The objective is to familiarize students with the basics of derivatives pricing. Topics include Binomial Tree pricing, Arbitrage Theory, Geometric Brownian motion, and the Black-Scholes model for pricing call and put options. The material in this course is heavily dependent on probability, and so it is recommended that students already have taken MA/ST 421.

Course Text: Sheldon Ross, "An Elementary Introduction to Mathematical Finance" 3rd Ed., Cambridge University Press

This special topics course can replace MA412 or MA413 in the Financial Mathematics Concentration

MA 493 (002) Introduction to Hilbert Spaces
Instructor: Patrick Combettes

Hilbert space theory constitutes the core around which most of modern analysis has grown, with a wealth of applications in areas such as variational analysis, differential equations,harmonic analysis, control, inverse problems, and data analysis. A Hilbert space is a powerful extension of the basic notion of a Euclidean plane, from which it retains many intuitive concepts such as orthogonality, parallelogram and polarization identities, orthogonal coordinate decompositions, projections and best approximation concepts, as well as linear vector transformations.

Outstanding Senior Awards
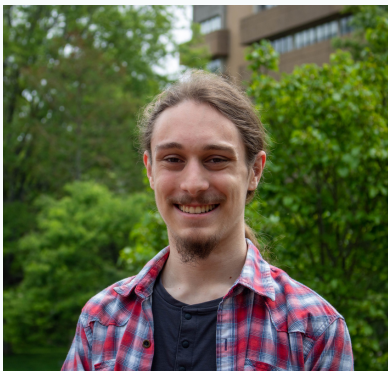
Etienne Phillips: Outstanding Transfer Student Award honors a graduating senior who has made a significant impact and made the most of the limited time they have been at NC State and in their discipline. They have shown outstanding engagement with the NC State or local community, scholarship or leadership. Nominees in this category must be in good academic standing.

Chay Beeson: The award for **Outstanding Scholarship** honors a graduating senior who exemplifies extraordinary academic engagement either bridging concepts across disciplinary boundaries or developing depth of expertise within a singular discipline. Nominees will have performed well in their classes, pursued advanced and challenging coursework, and demonstrated an ability to think creatively and critically. Nominees in this category must have a cumulative GPA of at least 3.75.

Kelsey Hanser: The award for **Outstanding Research** honors a graduating senior who has added significantly to the body of knowledge in her/his research discipline. Nominees for this award will have demonstrated initiative, independence and positive contributions to an active lab/research program. Nominees in this category must be in good academic standing.

Kavin Govindarajan: The Yusor Abu-Salha Award for Outstanding Community Engagement honors a graduating senior who has achieved significant accomplishments in the realm of service. Nominees will be leaders who used their time, talents, and intellect to improve their community. Nominees in this category must be in good academic standing.

Advice From Seniors

Below are a few pieces of advice from the Department of Mathematics Class of 2024.

My advice to math majors is to be ambitious and curious. Explore various applications or fields until you find a few that interest you. Once you have found your interests, proactively research and seize every opportunity. These opportunities could include undergrad research opportunities, internships, and conferences.
- Matthew Murray

If you're passionate about math but worried about career opportunities after college, don't be. Math is (and always will be) about creative problem solving, which is always in high demand.
- Jake Mavrides
(Pictured Right)

Be persistent! Mathematics is a challenging art to master - you are bound to encounter concepts that initially make no sense whatsoever (at least I did). But, it will be worth it to keep trying. Reach out to your professors! It can be intimidating at first, but, at the end of the day, they are people too (they just so happen to know a lot of things). Success in the classroom is crucial, yet the connections you make along the way will be invaluable when starting your career. **- Chay Beeson**

Hi everyone! Looking back on my time at the Math Department here, I have some words of advice to pass along. I would definitely say branch out and try different things, especially if you aren't sure what you're interested in. This can look like taking a course that's outside of what you would usually choose, or trying out a new club that you find interesting. This is a perfect chance to explore new avenues, and you never know what you could find! **- Kelsey Hanser**

"Courage to begin the journey, patience to stick to the path, and humility to take one step at a time." - Dr. Hoon Hong (Quote Selected By **Etienne Phillips**)

Advice From Seniors

I'd encourage the math undergrads to not be afraid to take advantage of the wonderful resource that is the amazing people in our department. Whether it's the advisors, professor, or other students, everyone in the department is passionate and genuinely cares about the success and wellbeing of one another. I've gotten wonderful support from everyone in the department, and I think the culture we have in our department is rather unique in how supportive and welcoming it really is. So, whether it's for help on homework, figuring out what classes to take next semester, or just looking for someone to hang out with, definitely reach out to those in the department (and especially the math lounge)!
- Kavin Govindarajan

I think the two most solid pieces of advice I could impart on to current mathematics undergraduates is to attend your classes, and to know you're not alone.

The first is important because attending classes is the best way to stay on top of your work load. Even if you don't understand everything in the moment, being there and having the opportunity to listen to other questions, and what a professor has to say beyond the written notes is extremely beneficial to you.

Lastly, I know personally speaking being a woman in mathematics it can be daunting. There have been moments when I pause and look around the class and see I am in the minority. Its easy to convince yourself that you don't belong, but trust me when I say that you do. There is a reason you are where you are today. This feeling may not necessarily be because of your gender and it may not be in regards to mathematics but its a normal experience we all go through at some point in our lives.
- Elle Whitlock

We've all been told that college is one of the most challenging times of our lives, and while this may not be true for everyone, one thing is for sure, you will face some challenges along the way. For some, this may be the ever changing decisions about what you want to do after you graduate, it could be your intense course load, or even impactful events in your personal lives. The biggest advice I can give is to put yourself out there and find a community during your time in college who will have your back and support you in your most challenging moments. For me, I was fortunate to find that community among SUM Club and the amazing Undergraduate Math Lounge.
- Amanda Baright

Puzzles, Jokes, Etc.
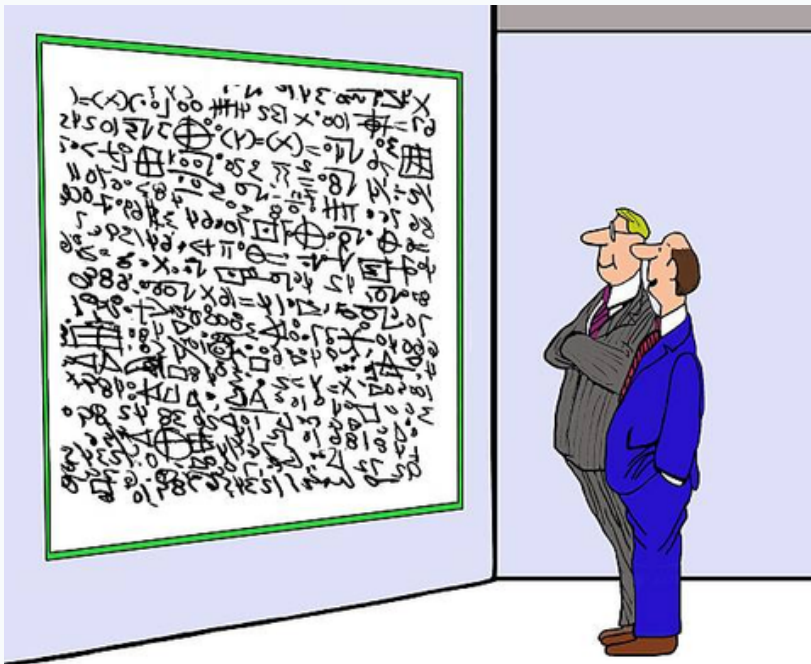
"When you put it like that, it makes complete sense."

1.
Why should you never talk to pi?

2.
What number comes next in the sequence: 61, 691, 163, 487, 4201, ?

3.
A boat has a ladder that has six rungs, each rung is one foot apart. The bottom rung is one foot from the water. The tide rises at 12 inches every 15 minutes. High tide peaks in one hour. When the tide is at it's highest, how many rungs are under water?

4.
Why did the obtuse angle jump in the pool?

A talking sheepdog rounds up all the sheep into a pen for his farmer. He comes back and says, "Okay, all 40 sheep are accounted for." The farmer says, "But I've counted them, and I've only got 36!" The sheepdog replied, "I know I rounded them up."

1. Because he will go on forever... **2.** 9631 **3.** Answer: No rungs will be under water; the boat floats. **4.** Because it was over 90 degrees