NC State Undergraduate Mathematics

Fall 2021

Newsletter

Applying to Grad School

Contents

Newsletter contacts

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Σ SUM Club

As we are in the middle of the Fall Semester, many of our seniors in the Math Department are beginning to apply to graduate school. We talked with NC State Math Alum Blake Sission about his experiences in applying to graduate school. Blake graduated from NC State in Spring of 2021 and is now attending Columbia University to pursue a PhD in Applied Mathematics.

"Applying to graduate school can be intimidating, it was for me when I was in your shoes last year, but staying organized and giving yourself ample time will help the process go smoothly. Start working on your applications as soon as possible. Most deadlines will be in December or January but take note of the specific dates for the programs you plan to apply for. I found it useful to organize a spreadsheet tracking the deadlines and other application requirements for each school.

Graduate programs generally require reference letters, personal statements, and GRE scores. Ask for references from professors who know you well, whether that be from conducting research with them, grading for one of their courses, or excelling in a class they taught. Again, keep each deadline in mind and ask your references well in advance as a courtesy to their busy schedules. The personal statement is an opportunity to share your mathematical background, interests, and goals, so put in the time to write a well-thought-out and sincere statement. Ask your peers and advisors to critique your drafts, and personalize your statement for each school. Highlight the strengths of the institution that prompted your application and mention the faculty members there whose research interests you. Lastly, make note of each program's GRE general and math subject test requirements, and register to take them sooner rather than later giving you time to retake if needed. hope you find this helpful for your graduate school applications, and good luck!"

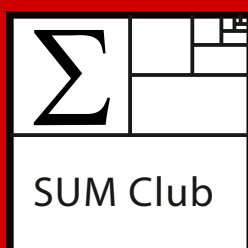We want to thank Blake for his input on his experiences.

Follow this link for tips from NCSU DASA on writing a personal statement:

https://fsl.dasa.ncsu.edu/wp-content/uploads/sites/29/2018/01/Personal-Statements-1.pdf

Good to be Back!

It's our first semester back in person and we sure are glad to be back! Check out some reasons why:

Favorite Part About In-Person Classes:

I love being able to have genuine small talk before and after class.
-Chris Schell

The tight knit community of math majors
- Rachel Tucker

Being able to conect with students
-Beth Rodgers

Being able to actually interact with other students and the professors
-Rebecca Williams

I enjoy being required to actually pay attention rather than multi-task through a Zoom meeting.
-David Sieg

https://www.lib.ncsu.edu/spaces/ground-floor-reading-room

Favorite On Campus Study Spot:

https://facilities.ofa.ncsu.edu/building/sas/

My office
-Yiling Wang

Undergraduate math lounge!
-Annamarie Leske , Etienne & Nicholas Gawron

The outside tables nearby Talley or by Tucker-Owen beach
-Amanda Baright

D.H. Hill Library is my favorite study spot
-Rachel Tucker

Anywhere with nice weather and outlets!
-Beth rodgers

Advice for prospective students/ math majors:

Don't let a hard class intimidate you, Be sure to reach out to classmates and the professor if you need any help. - Amanda Baright

You can do it. Mathematics requires a growth mindset and a willingness to struggle. Stick with it. -Beth Rodgers

Time putting pencil to pen is the best way to understand math. Do not just memorize concepts, but continually ask questions to further understand the subject. There is no limit to one's understanding. - Chris Schell

Don't be afraid to seek out help! - Rebecca Williams

Fake it 'til you make it. If you struggle through it long enough, eventually it will click! -Annamarie Leske
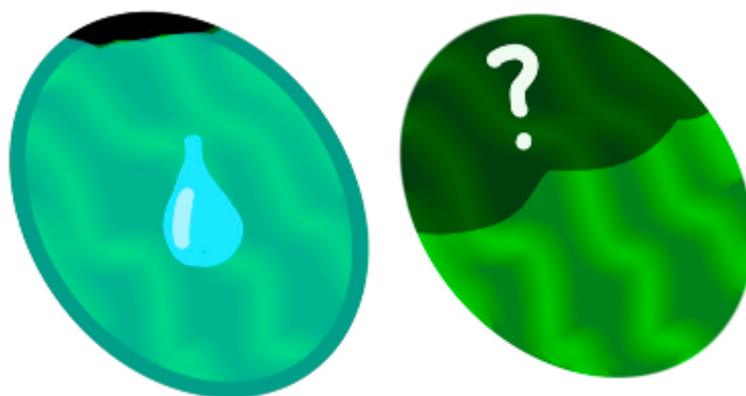

The Undergraduate Math Lounge

Math Puzzle Page

Watermelon

A watermelon is measured to be 99% water (by mass). It is left sitting out in the sun on a hot day, and some water evaporates. It is now 98% water by mass.

Question: By what percent has the mass of the watermelon decreased?

The Ants on a Stick

One hundred ants are dropped on a meter stick. Each ant is traveling either to the left or the right with a constant speed of 1 meter per minute. When two ants meet, they bounce off each other and reverse direction. When an ant reaches an end of the stick, it falls off.

At some point all the ants will have fallen off. The time at which this happens will depend on the initial configuration of the ants.

Question: over ALL possible initial configurations, what is the longest amount of time that you would need to wait to guarantee that the stick has no more ants?
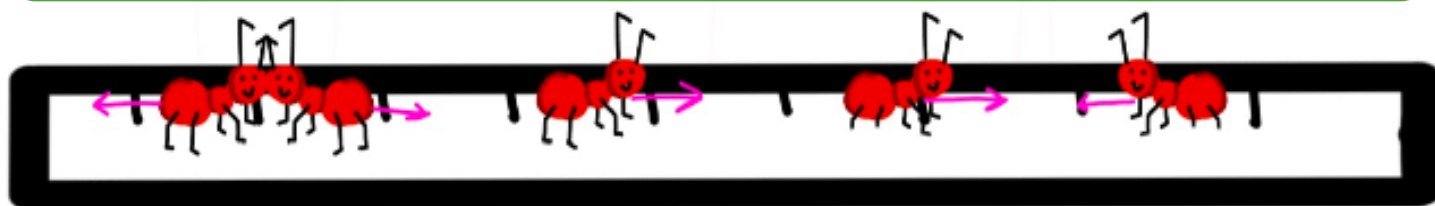
Lowest Double Digit

Question: What is the lowest double digit number?

SUM Club

The Society for Undergraduate Mathematics (SUM Club) is a student organization for students with a passion for 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 the every other Thursday from the start of the semester to get to know one another, do math puzzles, play games, learn together, and perform outreach. The club hosts undergraduates, graduate students, and professionals to share their experiences and knowledge. SUM Club supports the Raleigh community through participation in programs like Service Raleigh and Washington Elementary Math and Science Night. We hope to continue to create a strong undergraduate mathematics community. 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.

MIC Club

The Mathematical Insights Club (MIC) aims to foster an environment where undergraduate students can delve deeper into the field of mathematics. We will discuss undergraduate research, interesting papers, and math history. MIC is a platform for students to share their math interests. Each month two students give a short informal presentation on something they have found interesting, whether it is their own research, a published article, a fun problem, or math history. Come to MIC and advance your ability to discuss mathematics and give your CV a boost! We hope to see you there! mathematicalinsightsclub@ncsu.edu

Sports Analytics Club

The Sports Analytics Club at NC State is a student-run, student-driven club which brings together undergraduates, grad students, and faculty who are interested in the quantitative analysis of sports. We enable members to work on individual and group research projects under the guidance of grad students and our faculty advisors. In addition, we play fantasy sports and prediction contests together. Email sportsanalytics@ncsu.edu if you would like to join 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 really 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!

Math Honors Program

In the year 2021, we want to congratulate the new students who joined the Math Honors Program include **Sarah Bird, Andrew Connelly, Daniel Ferriter, Nicholas Gawron, Matthew Hefferie, Elizabeth Rodgers, Ruixuan Shang, Thomas Steckmann and Rachel Tucker**. Currently we have 26 students active in the Math Honors Program. Lately about 18% of math graduates complete the Math Honors Program and nearly 90% of those students go on to excellent graduate schools or find great jobs. In the past, schools they have attended include Berkeley, Princeton, Stanford, MIT, Cornell, NYU, UCLA, Cambridge and many other top universities. Math honors students have received 25 NSF Fellowships AND 3 DoD Fellowships for graduate school as well as 9 Goldwater Scholarships, 1 Churchill Scholarship and 3 Gates Fellowships. Besides taking a number of challenging advanced Mathematics courses, Math Honors students also do research in Mathematics either at NC State or at a summer REU Program (Research Experience for Undergraduates) nationwide. More than 38 students have participated in a study abroad program focusing on Mathematics via the BSM Program (Budapest Semesters in Mathematics) or the MiM Program (Math in Moscow Program).
Participation in REUs, BSM, MiM and doing undergraduate research in mathematics has helped greatly the success of honors students getting accepted into numerous excellent graduate schools. Dr. Min Kang is happy to talk to any student interested in undergraduate research opportunity in Mathematics. Feel free to email her at mkang2@ncsu.edu for further information or look at the program page:
https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/math-honors-

> For those who have interest in working as a researcher after graduating, participating in undergraduate research is a great asset. However, many students don't know how to locate or search for undergraduate research opportunities. An unofficial list of some undergraduate research opportunities and relevant internships can be found at https://go.ncsu.edu/sum_club_research

Triangle Competition in Math Modeling (TriCoMM) (with prizes!)

Are you interested in solving real-world problems using math and computation? Would you like to research tangible problems? Do you want to win prizes? Then join us to learn more about TriCoMM: Triangle Competition in Math Modeling!

In this contest, you will work in teams of three students to solve a real-world problem using mathematical and computational modeling. For part of a weekend (Nov. 12-14th), you will work with your team to answer your choice of a variety of challenging questions spanning multiple subjects. Participation in this competition offers valuable research and teamwork experience, as well as an opportunity to practice for the prestigious Mathematical Contest in Modeling (MCM). In the past, this contest has provided great examples of experiences that students used in job interviews and graduate school applications.

First place prize includes a sponsorship to compete in the MCM. If you are interested, please email Cole Butler (cbutler5@ncsu.edu) or Evan Curcio (ejcurcio@ncsu.edu). Info sessions will take place during the week of Oct. 25-29, pizza and refreshments will be served!

Advanced Mathematics Courses

MA 493 (Special Topics): Mathematical Foundations of Data Science
Instructor: Dr. Mansoor Haider
This new course will cover foundational mathematical concepts fundamental to data science and data-driven mathematical modeling. The course content was developed by a team of departmental faculty and will include the following topics: basics of machine learning, unconstrained optimization, neural networks and overfitting, parameter estimation and sensitivity analysis for mathematical models, and an introduction to topological data analysis. Some familiarity with MATLAB will be beneficial for students taking this course. *Note that this course is an acceptable advanced math elective for MA/AMA majors.*

MA587: Finite Elements Methods for differential equations
Instructor: Dr. Zhilin Li
Prerequisites: A reasonable background in linear algebra, numerical analysis, and differential equations (e.g. like in courses MA 405, MA 427/428, MA 341)
The Finite Element Method is a MUST for applied mathematicians, engineers, or anyone who uses computers to solve problems that involve ordinary/partial differential equations. The finite element method also provides a tool to study the well-posedness of a mathematical model.
In this course, we will introduce the finite element method, including algorithm implementations, theoretical backgrounds, and applications. We will discuss some commonly used finite element spaces, error analysis, and other related topics. Efforts will also be made on issues of implementation and related software packages. Using the data from the Matlab mesh generator, the students will be able to implement the finite element method using their favorite computer languages for complicated geometries in two dimensions. Students can use their research work as course projects.

MA 518 Geometry of Curves and Surfaces:
Instructor: Dr. Andrew Sageman-Furnas
Time: 10:15 - 11:30 AM Monday/ Wednesday
What does it mean for something to be curved? We agree that a circle or sphere is curved and that a line or plane is not… but, what is a triangle or a potato chip? In this course we investigate these questions from a mix of theoretical (pen and paper), computational (programming), and hands-on (cut and glue) perspectives. We identify the difficulties in drawing a flat map for our spherical Earth, and show how the same problems arise in the creation of animated movies and engineering simulations. We study unexpected relationships between solutions of nonlinear partial differential equations and geometric objects like a configuration of circles in the plane or the shape of a basketball net. We also answer everyday questions, like: Why do our clothes have seams in them? and What is the optimal way to hold a slice of pizza? If you've read this far, consider joining us in Spring 2022 in MA 518 Geometry of Curves and Surfaces.

MA513: Introduction to Complex Variables
Instructor: Dr. Andrew Manion
Time: 4:30 pm - 5:45 pm Tues/Thurs
Prerequisites: MA 425-426
Complex analysis studies the ideas of calculus as applied to functions of a complex variable, where many surprising and beautiful phenomena give the subject its own flavor distinctly different from real-variable calculus. We'll explore the properties of holomorphic (complex-differentiable) functions using Stein and Shakarchi's modern text "Complex Analysis".

Advanced Mathematics Courses

MA 591: Group-Actions, Invariants and Applications
Instructor: Dr. Irina Kogan
Time: 1:30–2:45 pm Tues/Thurs
Prerequisites: A solid mastery of the following courses: MA 425-426, MA405 or MA520, MA 407 or MA521
In an abstract algebra course, the mathematical notion of a group is often motivated by looking
at the set of symmetries of a geometric shape, for instance, the symmetries of a snowflake. But
what is the symmetry group of a differential equation? At the end of the XIX century, Sophus Lie, inspired
by Evariste Galois' work on the solvability of polynomial equations, introduced the notion of a symmetry
of a differential equation and used such symmetries to obtain new methods for solving differential
equations or understanding the structure of their solution sets. Lie's work lead to the introduction of
mathematical structures nowadays called Lie groups and Lie algebras, whose significance in mathematics
stretches well beyond the original purpose for which they were introduced.
The course covers some basics on group actions, algebraic and differential invariant theory,
along with applications to the symmetry reduction of differential equations and equivalence.

Data Science Courses for major electives

DSC 495-001 and DCS 495-009, R/Python for Data Science (1h)

DSC 495-002, Exploratory Data Analysis for Big Data (1h)

DSC 495-003, Natural Language Processing (1h)

DSC 495-004, Data Wrangling and Web Scraping (1h)

DSC 495-006, Data Science for Policy (1h)

DSC 495-007 Data and Ethics (1h)

DSC-495-008 Data Physicalization (1h)

Note: Students may take as many of the courses as they wish. Check the course descriptions
through the Enrollemnt Wizard.