

Fall 2017

Newsletter

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Congratulations to Dr. Duca!

"Dr. Duca's faith in me is a huge reason I'm still in the math department today. Having negligible experience in proofs, I don't think I would have survived MA 225 if I didn't know that she believed I could do it." -Geneva Collins

"Dr. Duca always cares about me as a person, not just as another advisee that takes up her time. She helps me find ways to pursue my goals and passions."
 -Jason Thompson



"Dr. Duca has always given valuable support to SUM Club and its efforts to connect undergrads and get them involved." -Karl Schneider

Dr. Alina Duca, Director of the Mathematics Department's Undergraduate Programs, was honored as an outstanding faculty member at the recent College of Sciences Donor

academic advisor and advocate for her students, an inspiring and enthusiastic professor in the classroom, and a source of endless encouragement, Dr. Duca has made a huge positive impact

"Dr. Duca is incredibly caring and supportive every time I meet with her and always goes out of her way to help me succeed in any way she can. I am so grateful for everything that she has done for me throughout my time here." -Beth Mikovitz

Recognition Dinner. Students were asked to nominate a professor who especially mentored, inspired or otherwise made a positive difference in their time at NC State. As an

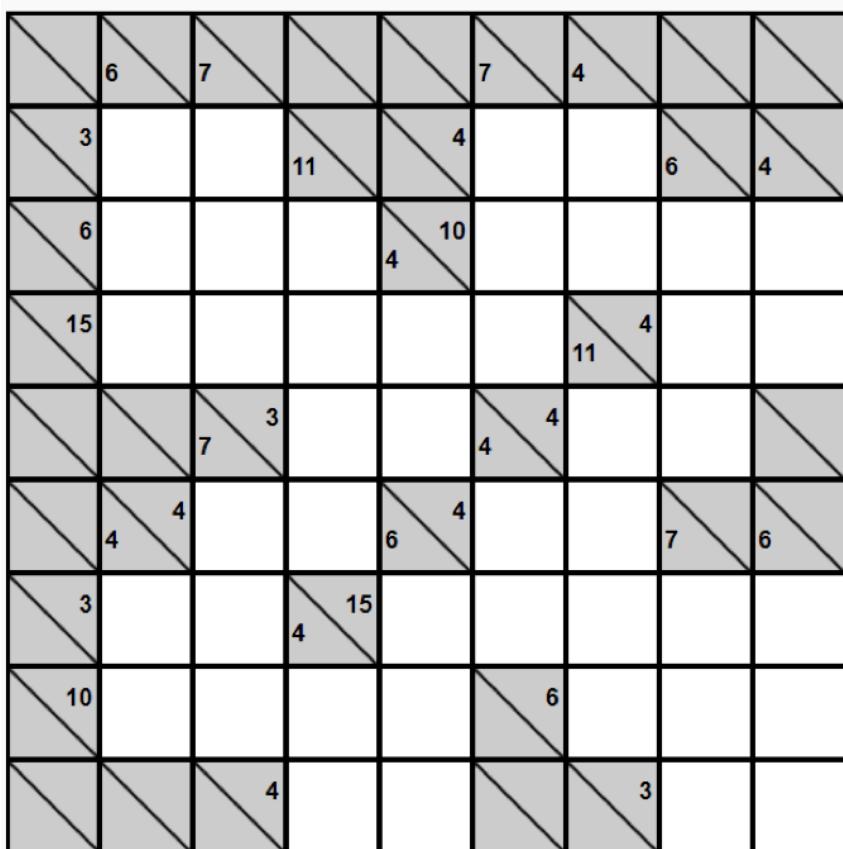
on the Mathematics Department. Congratulations to Dr. Duca and thank you for all you do to support undergraduates studying mathematics!

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. The club encourages students to share ideas and complete research projects on any topic related to sports statistics.

Members of the club have worked on the Kaggle March Madness contest, attended the NBA Hack-a-thon in NYC, and won the American Statistical Association's Statsketball Challenge. Currently the club is working on football, basketball, and soccer research projects as

well as working with the NC State Baseball team. If you are an NCSU student and you enjoy sports or statistical analysis, then this is a club for you! Interested students should contact Jason Thompson (jrthomp8@ncsu.edu).



Kakuro is like a crossword puzzle with numbers. Each "word" must add up to the number provided in the clue above it or to the left. Words can only use the numbers 1 through 9, and a given number can only be used once in a word.

Mathematical Insights 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 meet every third Thursday of the month! We hope to see you there! Email MIC.ncstate@gmail.com to join.

Actuarial Club

If you are interested in applying math and statistics in a business setting and having a career in which you control your own promotions, consider becoming an actuary and attending Actuarial Club meetings! Actuarial Club hosts local actuaries, discusses current industry trends and events and shares information for actuarial job and internship opportunities.

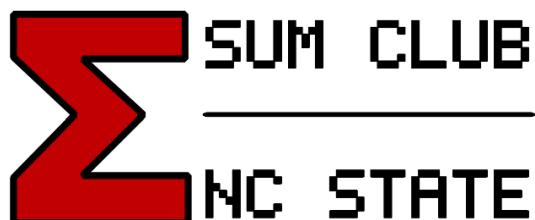
An actuary is a business professional who uses and creates statistical and mathematical models to measure and manage risk and uncertainty.

Usually working for insurance companies, actuaries calculate the probabilities and financial severities of car accidents and injuries, property fires and floods, financial investment returns, life insurance payouts and mortality rates, health related insurance claims and more!

Actuaries take a series of exams throughout their careers instead of requiring a graduate degree or other certifications before starting work, though students should look to take an actuarial exam or two during college to be competitive for

internships and entry-level positions. With many possible fields to focus on, many insurance companies offer rotational development programs for entry-level actuaries that gives you a chance to rotate between three or four teams and actuarial focuses for a few years before decided where you would like to focus.

Feel free to contact Kelsey Shevlin (ktshevli@ncsu.edu) to join the email list for Actuarial Club or ask any questions!



The Society for Undergraduate Mathematics (SUM Club) is a student organization for students with a passion for or professional future in 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 first Thursday of every month to get to know one another, do math puzzles, play games, learn together, and plan outreach. The club

hosts undergraduates, graduate students, and professionals to share their experiences and knowledge, so that we can learn. 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 questions or to be added to our email list.



SUM Club at NC State



Mathematical Contest in Modeling



The Mathematical Contest in Modeling (MCM) is a five day, international math competition that challenges undergraduate students in teams of three to apply their mathematical knowledge to real world problems. Past questions have included modeling the

government of a Martian colony and assessing potential damage from an asteroid striking Antarctica. Last year, two teams from NC State competed in the challenge and were awarded Meritorious Winner and the top prize Outstanding designation.

Jaye Sudweeks, a junior in applied math, and Graham Pash, a junior in mechanical engineering and applied math, participated in MCM last year. "Despite the incredible challenge, the reward is well worth it," as Graham describes, "You spend 5 days working around the clock absorbing all of the material that you can on the topic you chose, so it's extremely rewarding to see

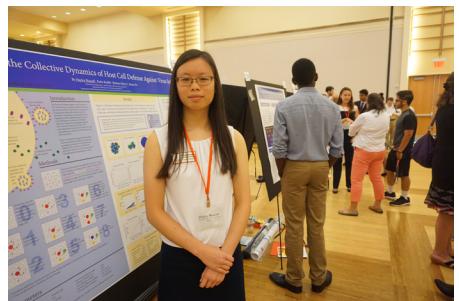
it all culminate in this nice paper that you feel proud of and can show off." Jaye says: "[T]he most important thing that I've learned about myself by participating in MCM is that I can do difficult things - there's so much power in being able to say that. I also learned that I can be creative and innovative, and those skills are not reserved for other people."

Both Graham and Jaye intend on competing in the MCM again this year, and the Math Department is interested in sponsoring more teams for the contest February 8-12, 2018. Interested students should contact Jaye (jcsudwee@ncsu.edu) or Graham (gtpash@ncsu.edu).

Undergraduate Research Opportunities

The State of North Carolina Undergraduate Research and Creativity Symposium (SNCURCS) is November 4, hosted at Campbell University. All undergraduate students enrolled in North Carolina colleges, universities, or community colleges, and high school students who have completed a mentored research project through an accredited university or other Summer Ventures or research program are eligible to participate in SNCURCS. Presentations include Poster, Oral, Exhibit, and Performance options. Please do not pay the registration fee when submitting your abstract. The Office of Undergraduate Research (OUR) will cover the \$35 registration fee for all NC State undergraduate students who are presenting at SNCURCS. Information can be found at <http://sncurcs.org/>. Abstracts must be submitted by October 18th at 11:59pm.

Abstract submissions for the National Conference on Undergraduate Research (NCUR) are open through Tuesday, December 5. The University of Central Oklahoma warmly invites you to make connections with other undergraduates involved in innovative research. Please go to https://www.cur.org/ncur_2018/ to create an account and submit your abstract. Those selected will be notified starting Tuesday, January 23, 2018 and continuing through the middle of February.



The Office of Undergraduate Research through the Division of Academic & Student Affairs (DASA) will provide research grants up to a maximum of \$500 to undergraduate students for research projects for the Spring 2018 semester. Proposals are reviewed by faculty and post-docs within the home college of the mentor. Head to <https://undergradueresearch.dasa.ncsu.edu/our-grants/spring-only-spring-2018/> for information.

Advanced Mathematics Courses

MA 792 Special Topics C/C++/Python for Mathematicians

4:30 pm - 5:45 pm MW

Instructor: Erich L. Kaltofen

The course is intended to cover 3 widely-used programming languages from a language semantics point-of-view, that is, covering most C and Python language constructs and 75% of the C++ constructs with a smattering of the C/C++ standard libraries and selected Python libraries. Note that Google internally uses C++ and Python for its development and Intel supplies a C compiler with every new processor release. The relation of C/Python programs and the mathematical definition of an algorithm will be explained. Prerequisite: an introductory knowledge of (imperative) computer programming (arrays, conditionals, loops, procedures, I/O).

MA 513 Introduction to Complex Variables

10:15 am - 11:30 am TH

Instructor: Tim Kelley

This course is about differentiable functions of a complex variable $z = x + iy$. This is a very different proposition from differentiability in x and y separately. The results and methods we cover in this course are amazing and the course itself is accessible to anyone who is good (really good) at calculus.

MA 518 Geometry of Curves and Surfaces

12:50 pm - 1:40 pm MWF

Instructor: Dr. Curtis Porter

Curves and surfaces in 3-dimensional space are fun to study because they are easy to visualize and you can understand quite a bit of the formal theory using only the tools of multivariable calculus and some linear algebra. This is foundational for applications involving 3D movement and modeling, such as mechanics, computer imaging, robotics, aerodynamics, astronomy, etc. On a more abstract level, the techniques address modern research questions in advanced differential geometry, algebraic geometry, and theoretical physics subjects like general relativity and gauge theory. This class is essential for fans of shapes and motion.

MA 544 Computer Experiments in Mathematical Probability

11:45 am - 1:00 pm TH

Instructor: Jack W. Silverstein

The intent of the course is to reveal to the student the virtues of using the computer to gain insight into mathematical behavior. Examples will be chosen from topics in probability theory which are either not typically covered in courses, or do not have a complete mathematical treatment at the present time. For further details go to www.math.ncsu.edu/~jack/ma544.html and/or contact the instructor.

This course satisfies the writing and modeling requirements.

MA 493/591 Special Topics in Geometry and Topology

11:45 am - 1:00 pm TH

Instructor: Radmila Sazdanovic

What is the shape of the universe?

How do DNA molecules fit in such a small volume?

How can we extract information from high-dimensional data?

What are the possible gaits that the robot Rhex can use?

Answers to all of these questions hinge on the notion of shape, which is the central notion of the mathematical fields of Geometry and Topology.

In order to get the answers we will build a set of mathematical tools and understand ideas from these areas such as curvature, homology, and category theory. We will encounter such objects as braids, simplicial complexes, and knots.

MA 451 Methods of Applied Mathematics II

1:30 pm - 2:45 pm TH

Instructor: Professor Michael Shearer

Applied mathematics relies on techniques that apply to many aspects of science and engineering. In this class, and the companion MA 450, students learn and use a variety of methods in the context of fluid mechanics and elasticity. The text by Mark Holmes can be downloaded from the library or can be purchased from the bookstore. The class uses material from the prerequisites: MA 242 and MA 341.

Potato Launcher Logic Puzzle

Whistler County just held its annual “Potato Launch” contest, wherein different teams build home-made contraptions and each tries to shoot colored potatoes as far as they can. Using only the clues below, determine each team’s best distance (in feet) and match up the type of device each used and the color of the potato they launched.

Clues:

1. The contestants that launched the blue potato used the hybrid sling.
2. The Yukon Bolds didn’t use the catapult.
3. The contestants that launched the black potato didn’t use the trebuchet.
4. The contestants that launched the white potato went 15 ft farther than the contestants that used the hybrid sling.
5. The Super Tubers didn’t have a best distance of 150 ft.
6. Of the group that made it to 180 ft and the group that made it to 165 ft, one used the orange potato and the other was the Mad Mashers.
7. The team that used the catapult went 15 feet farther than the group that launched the orange potato.
8. The Yukon Bolds didn’t have a best distance of 150 ft.
9. The team that used the water cannon was either the contestants that made it to 195 ft or the Spud Chuckers.
10. The team that made it to 135 ft used to the trebuchet.

| | Flying Eyes | Mad Mashers | Spud Chuckers | Super Tubers | Yukon Bolds | air cannon | catapult | hybrid sling | trebuchet | water cannon | colors |
|--------------|-------------|-------------|---------------|--------------|-------------|------------|----------|--------------|-----------|--------------|--------|
| distances | | | | | | | | | | | black |
| colors | | | | | | | | | | | blue |
| devices | | | | | | | | | | | orange |
| 135 ft | | | | | | | | | | | red |
| 150 ft | | | | | | | | | | | white |
| 165 ft | | | | | | | | | | | |
| 180 ft | | | | | | | | | | | |
| 195 ft | | | | | | | | | | | |
| black | | | | | | | | | | | |
| blue | | | | | | | | | | | |
| orange | | | | | | | | | | | |
| red | | | | | | | | | | | |
| white | | | | | | | | | | | |
| air cannon | | | | | | | | | | | |
| catapult | | | | | | | | | | | |
| hybrid sling | | | | | | | | | | | |
| trebuchet | | | | | | | | | | | |
| water cannon | | | | | | | | | | | |



Mathematics Honors Program

Currently we have 31 students participating in the Math Honors Program and we will extend our invitation to more students in the future. Every year a little less than 20% of math graduates complete the Math Honors Program and about 90% of those students go on to excellent graduate schools or find excellent jobs. Schools they have attended include Berkeley, Princeton, Stanford, MIT, Cornell, NYU, and UCLA. Math honors students have received 22 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 either at NC State or in a summer REU Program (Research Experience for Undergraduates) nationwide. More than 30 students have completed a study abroad program focusing on Mathematics, either at the Budapest Semesters in Mathematics (BSM) Program or the Math in Moscow (MiM) Program.

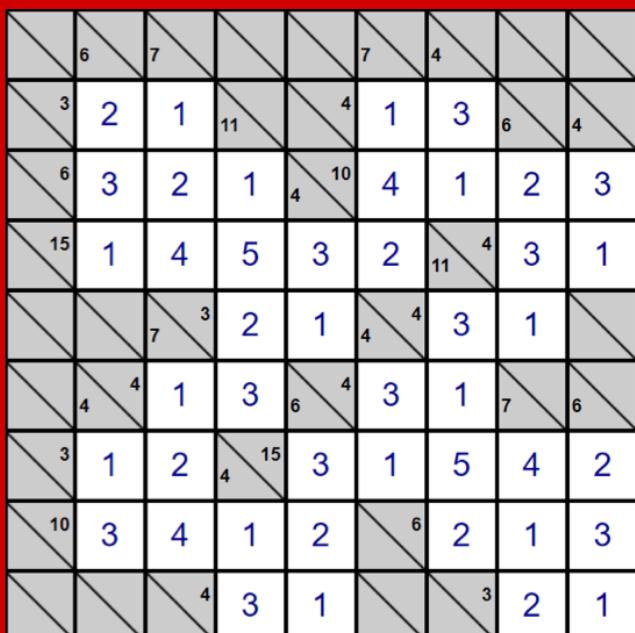
Participation in REUs, BSM, MiM and other similar programs has helped greatly in the success of honors students getting accepted into numerous excellent graduate schools. Dr. Min Kang is happy to talk to any student interested in undergraduate research opportunities in Mathematics - stop by her office in SAS 4114 or email her at kang@math.ncsu.edu for an appointment. More information about the program can be found on the Math Honors website at <http://www.math.ncsu.edu/honors>

Graduated Spring/Summer 2017

| | |
|------------------|------------------|
| Ephraim Bililign | Gareth Johnson |
| Colton Bradley | Kevin Kristensen |
| Joshua Cook | Diya Sashidhar |
| Taylor Gornowski | Prem Shah |
| Trevor Gasdaska | Isaac Sunseri |
| Daniel Harper | Sam Weber |

New Students in the Honors Program

| | | |
|---------------------|-----------------|----------------|
| Grant Barkley | Adithya Kasali | Beverly Setzer |
| Erin Beaton | Timothy Milowic | Jaye Sudweek |
| Bryan Chu | Carter Pape | Kasey Todd |
| Jonathan Dunay | Conor Perks | Olivia Trogdon |
| Alie Falastein | Walker Powell | Benjamin Wendt |
| Madgleidys Figueora | Hayley Russell | |
| Noah Johnson | Kylan Schatz | |



Puzzle Solutions

| Distances | Teams | Devices | Colors |
|-----------|---------------|--------------|--------|
| 135 ft | Yukon Bolds | trebuchet | red |
| 150 ft | Flying Eyes | hybrid sling | blue |
| 165 ft | Mad Mashers | air cannon | white |
| 180 ft | Spud Chuckers | water cannon | orange |
| 195 ft | Super Tubers | catapult | black |