

MATH DAY 2018

Schedule subject to change

TEACHER SCHEDULE

SCHEDULE AT A GLANCE

8:00 am - 8:55 am	Check-in: Kane Hall, 1 st Floor Lobby
9:00 am - 9:10 am	Welcome Address: Suzanne Hawley, Professor, Astronomy, UW
9:10 am - 9:55 am	Plenary Address: <i>Autocorrect Fail? The Math Behind Why Smart Phones (sometimes) do Silly Things</i> , Steve Klee, Assistant Professor, Mathematics, Seattle University Live in Kane 130; streaming in Kane 110 and Kane 120
10:15 am - 10:55 am	Session I – Field Trips leave from outside Kane Hall (facing Red Square) at 10:05 am
11:15 am - 11:55 am	Session II – Field Trips leave from outside Kane Hall (facing Red Square) at 11:05 am
Noon - 1:10 pm	Student Lunch: We recommend that students bring lunch. The HUB on campus has a limited number of eateries open for purchasing lunch.
Noon - 1:10 pm	Teachers' Lunch: Mary Gates Commons, 1 st Floor of Mary Gates Hall Activity: <i>Math Games Worth Playing</i> , Dan Finkel, Founder & Director of Operations, Math for Love
1:20 pm - 2:00 pm	Session III – Field Trips leave from outside Kane Hall (facing Red Square) at 1:10 pm

Cutting Edge Topics in Mathematical Science Presented by Top Faculty and Professionals

Students do not need a ticket to attend the talks and activities listed below.

SESSION I: 10:15 - 10:55 AM	SESSION II: 11:15 - 11:55 AM	SESSION III: 1:20 - 2:00 PM
Billiard Balls and Laser Beams <i>Daniel Finkel, Founder & Director of Operations, Math for Love</i> Location: Guggenheim 220	The Wonderful World of Graphs: What Do Soccer Schedules and Coloring Maps Have in Common? <i>Monty McGovern, Professor, Mathematics, UW</i> Location: Guggenheim 220	Sharing Cakes with No Headaches <i>Wing L. Mui, Chair, The Overlake School</i> Location: Guggenheim 220
Bitcoin, Blockchain, and the Boogeyman Behind It <i>Sara Billey, Professor, Mathematics, UW</i> Location: Kane 110	Keep it Up: How to Juggle Numbers <i>Adam Kapilow, Graduate Student</i> Location: Kane 110	How to Catch a Liar : From Games to Coding Theory <i>Ioana Dumitriu, Professor of Mathematics, UW</i> Location: Kane 110
Donuts and Coffee Cups (and other Mathematical Surfaces) <i>Kristin DeVleming, Graduate Student, Mathematics, UW</i> Location: Kane 120	It's All Fun & Games Until Somebody Becomes a Mathematician! <i>Allison Henrich, Associate Professor, Mathematics, Seattle University</i> Location: Kane 120	Symmetry, Topology and the Nobel Prize <i>Johathan Beardsley, Professor, Mathematics, UW</i> Location: Kane 120
Perplexing Simply Stated Problems <i>Jennifer McLoud-Mann, Professor & Chair, Division of Engineering and Mathematics, UW Bothell</i> Location: Bagley 131	How to Be Extremely Good at Dots and Boxes <i>Jonah Ostroff, Lecturer, Mathematics, UW</i> Location: Bagley 131	Never-ending Fractions, Herds of Cattle, Riddles & Cryptology: A Tale by Diophantus <i>Amos Turchet, Acting Assistant Professor, Mathematics, UW</i> Location: Bagley 131
Really, There's New Math? <i>Andrew Berget, Assistant Professor, Department of Mathematics, WWU</i> Location: Savery 260	Humans and Robots <i>Sam Burden, Assistant Professor, Electrical Engineering, UW</i> Location: Savery 260	Information Session: UW Admissions <i>Hear from a UW Admissions representative about the ins and outs of the UW Admission process.</i> Location: Savery 260
Panel Discussion: Undergraduate Life <i>Undergraduates will discuss courses, activities, and will answer questions.</i> Location: Savery 264		

FIELD TRIPS & ACTIVITIES – TICKETS REQUIRED

Students must have a ticket to attend. All groups leave with a volunteer guide from outside Kane Hall lobby at the times below—

Session I at 10:05 am * Session II at 11:05 am *** Session III at 1:10 pm.**

Latecomers should not expect to participate, even with a ticket.

Questions about ticketed activities? Look for the Math Day staff member in the **bright yellow vest** at the standby line.

SESSION I: 10:05 - 10:55 AM	SESSION II: 11:05 - 11:55 AM	SESSION III: 1:10 - 2:00 PM
Applied Physics Lab Location: Henderson Hall	Applied Physics Lab Location: Henderson Hall	Applied Physics Lab Location: Henderson Hall
Campus Tour Location: meet guide outside Kane Hall	Campus Tour Location: meet guide outside Kane Hall	Campus Tour Location: meet guide outside Kane Hall
Computer Science & Engineering Tours Location: Paul Allen CS & E Bldg., Main Atrium near Reboot Café	Computer Science & Engineering Tours Location: Paul Allen CS & E Bldg., Main Atrium near Reboot Café	Computer Science & Engin. Tours Location: Paul Allen CS & E Bldg., Main Atrium near Reboot Café
How to Count the Hairs on Your Head Location: Savery 132	How to Count the Hairs on Your Head Location: Savery 132	
	Knights & Liars Location: Savery 138	Knights & Liars Location: Savery 138
Mathematical Card Tricks Location: Savery 136	Mathematical Card Tricks Location: Savery 136	
Mathematician Scavenger Hunt Location: Padelford C-306	Mathematician Scavenger Hunt Location: Padelford C-306	
Paper Origami Location: Savery 130	Paper Origami Location: Savery 130	Paper Origami Location: Savery 130
Planetarium Location: Physics/Astro. Bldg., Rm 220	Planetarium Location: Physics/Astro. Bldg., Rm 220	Planetarium Location: Physics/Astro. Bldg., Rm 220
Plasma - The Fourth State of Matter Location: Aerospace Eng. Bldg. Rm 130	Plasma - The Fourth State of Matter Location: Aerospace Eng. Bldg. Rm 130	Plasma - The Fourth State of Matter Location: Aerospace Eng. Bldg. Rm 130
	Problems and a Piece of Paper Location: Savery 131	Problems and a Piece of Paper Location: Savery 131
SAGE Computer Lab Location: Communications B-027	SAGE Computer Lab Location: Communications B-027	SAGE Computer Lab Location: Communications B-027
Seismology Lab Location: Atmospheric Sciences/Geophysics Building	Seismology Lab Location: Atmospheric Sciences/Geophysics Building	Seismology Lab Location: Atmospheric Sciences/Geophysics Building

HAVE SOME FREE TIME?? NOT SURE WHAT TO DO??
VISIT THE ALL-DAY DROP-IN PUZZLE ACTIVITY IN KANE HALL LOBBY
Drop in any time today!

Problem-Solving Strategies with Puzzles (All Sessions) – Investigate some math challenges in tessellating, spatial reasoning, and interactive problem-solving. Puzzles are provided by Math 'n' Stuff (8926 Roosevelt Ave. NE, Seattle, 206-522-8891).

Free Wireless Access while on Campus for Math Day- after opening your browser, when prompted enter:
UW NetID: event0201 * Password: Mathday2018**

Lecture Abstracts - Tickets NOT Required

** Session I – 10:15 – 10:55 am **

Billiard Balls and Laser Beams - Imagine lighting a candle in a room made entirely of mirrors. Would the entire room light up, or would parts of it remain in darkness? To find out, we will need to explore the fascinating world of reflective geometry. Come take a tour that includes solar power, ships on fire, juggling, elliptical billiard, eavesdropping at a distance, and unsolved problems.

Bitcoin, Blockchain, and the Boogeyman Behind it - Bogeyman (usually spelled boogeyman in the U.S.; also spelled bogieman or boogie man; see American and British English spelling differences), pronounced /bʊɡimæn/ or /boʊɡimæn/, [1] is a common allusion to a mythical creature in many cultures used by adults to frighten children into good behavior. This monster has no specific appearance, and conceptions about it can vary drastically from household to household within the same community; in many cases, he has no set appearance in the mind of an adult or child, but is simply a non-specific embodiment of terror. Parents may tell their children that if they misbehave, the bogeyman will get them. Bogeymen may target a specific mischief—for instance, a bogeyman that punishes children who suck their thumbs—or general misbehavior, depending on what purpose needs serving. In some cases, the bogeyman is a nickname for the Devil. Bogeyman tales vary by region. The bogeyman is usually a masculine entity, but can be any gender, or simply be androgynous. [2]

Donuts and Coffee Cups (and other Mathematical Surfaces) - You're probably familiar with surface as an English word, but mathematically, what does it mean? Is a surface a thing? Does it have to be the surface of something? Does it have to have a certain number of edges or sides? We'll explore a field of mathematics known as topology while answering these questions with lots of examples. We'll even address the classic donut = coffee cup problem and try to turn a sphere inside out. We'll scratch the surface of surfaces and learn some things along the way.

Really, There's New Math? - A common refrain when someone first meets a mathematician is, "really, there is new math?" Indeed, there are many things mathematicians do not fully understand within mathematics, and every day small steps are made towards greater understanding. Every once in a while a great leap forward is made. In this talk I will give some interesting and accessible examples of old, new, and unknown areas of mathematics.

Perplexing Simply Stated Problems - Childhood fascinations and adult curiosities prompt mathematicians and non-mathematicians to tinker with the some of the most perplexing simply stated mathematics problems. This talk will focus on some stories surrounding such problems and will likely generate a spark in you to contribute to the beautiful world of mathematics.

Panel Discussion: Undergraduate Life – Come hear undergraduates discuss their classes, activities, interests and life at UW.

** Session II – 11:15 – 11:55 am **

The Wonderful World of Graphs: What do Soccer Schedules and Coloring Maps Have in Common? - The answer is graphs, not the ones of functions that you know and love, but rather sets of points in the plane, some pairs of them connected by edges. I will sketch some of the many applications of these remarkable objects, ranging from cartography to matchmaking to social networks.

How to be Extremely Good at Dots and Boxes - Dots and Boxes is a pencil-and-paper game that you may have played before: draw a square array of dots, take turns drawing lines between them, and try to complete more boxes than your opponent. The rules are quite simple, but the math is remarkably complicated! We'll learn a few layers of strategy you can use to astound and humiliate your friends, and then discuss how variations in the rules can affect this strategy.

Humans and Robots – Humans excel where robots fail: people effortlessly traverse tricky terrain and distinguish photos of dogs and ostriches, whereas their robot counterparts routinely fail at both tasks. Interestingly, the opposite is true as well: robots communicate, compute, and construct with inhuman precision and productivity. In this talk we'll shed some light on the mathematics underlying this disparity in ability, and discuss the potential for humans and robots to team up and accomplish more together than either can alone.

It's all Fun and Games until Somebody Becomes a Mathematician! - PLAY is something we all have a desire to engage in—it is a key aspect of human flourishing. For mathematicians, play is perhaps even more important because it is essential for building mathematical intuition. The world of knots in the mathematical field of topology provides many great examples to help us understand this connection. In this talk, we will see how the theory of knots can reveal the “magic” behind rope tricks while exciting us to learn more.

Keep it up: How to Juggle Numbers – In this talk we'll explore the mathematics of juggling, described by some as finding the hardest way possible to do the unnecessary. Over the past few decades jugglers have inspired new and interesting mathematics. On the flip side, jugglers have used math to discover and learn new patterns. In this talk we'll take a first look at this connection by exploring siteswap notation, a way to represent juggling patterns with numbers.

** Session III – 1:20 – 2:00 pm **

Never-Ending Fractions, Herds of Cattle, Riddles and Cryptography: a Tale by Diophantus - In ancient times it wasn't uncommon for mathematicians to challenge each other: in the 17th century it was re-discovered a challenge that Archimedes proposed to Erathostenes regarding counting cattle. Archimedes might have cheated a bit, since a full solution of the problem was not found until computers were available! Surprisingly the problem is related to approximations of square roots, which in turn are related to never-ending fractions! I'll show you how riddles, triangular numbers, and encrypted messages fit together in this story that, not so surprisingly, began in Ancient Greece.

Sharing Cakes With No Headaches - When two or more people all want a piece of a cake, how can we make sure that nobody leaves unsatisfied? When it comes to sharing cake (or any other thing that needs sharing) people can get pretty picky and hard to satisfy. It turns out that there's a cool theorem that says that it's always possible to cut a cake in a way that leaves everyone wanting cake somewhat happy, and in order to prove this theorem we have to go explore a mysterious cave full of trapdoors and false walls. It's going to be an adventure!

Symmetry, Topology and the Nobel Prize - Several physicists, including one from UW, recently won the Nobel Prize in Physics for their study of the mysteriously named “topological phases of matter.” In this talk, I'll describe how the usual phases of matter we're familiar with, like gas, liquid and solid, are related to the amount of symmetry in a material. When the temperature gets low enough, many new kinds of symmetries arise that we don't see in everyday life, and these lead to so-called topological phases. I'll give a gentle introduction to the main ideas of topology and describe how a number called the “genus” of a surface (which is really just how many holes it has!) controls the possible.

How to Catch a Liar: from Games to Coding Theory. We all love playing games and asking questions. But can you trust the friend who answers? And if you can't trust them, can you figure out the truth anyway? The answer to this last question turns out to be “yes”, at least in a mathematical setting called “liar games.” We'll explore a bit, play around, and learn some connections to coding theory.

Information Session: UW Admissions – Hear from a UW Admissions representative about the ins and outs of the admission process.

Field Trip and Activity Abstracts — TICKETS REQUIRED

Applied Physics Lab (All Sessions) - The North Polar ice cap has thinned by 30% in the last 20 years. Internal bleeding can be stopped, tumors can be “cooked,” and kidney stones can be pulverized—all with ultrasound. An underwater glider literally glides untethered through the ocean without a propeller and can remain underway for up to six months collecting oceanographic data, traveling from the west coast of the United States mainland to Hawaii. A new project is underway placing fiber optic cables and oceanographic and geophysical instruments on the small tectonic plate off the coast of Washington and Oregon called the Juan de Fuca plate enabling anyone to look in on the ocean and seafloor off our coast. The science, engineering, and mathematics behind these discoveries and devices will be presented and/or demonstrated. Topics covered will depend on the availability of personnel and equipment.

Campus Tours (All Sessions) - Tour the University of Washington campus.

Computer Science and Engineering Tours (All Sessions) - Explore the CSE building! Take a tour with one of our students, learn what it's like to study computer science and engineering in this top-ranked department, and see where students spend their time.

How to Count the Hairs on Your Head (Sessions I & II) – We'll see how to estimate some very large physical quantities that one may want to know, such as the number of hairs on your head, fish in the ocean, and aliens in outer space. Then we will consider some record-setting quantities in nature, like lengths of the world's longest rivers and heights of the tallest giraffes. Finally, we will use a similarity between making big estimates and measuring record-setters to get an easy test to tell bogus from real data.

Knights and Liars (Sessions II & III) - During the lecture, students will work on the collection of logical problems of increasing difficulty about liars and knights, princesses and tigers, and so on. We'll be using these problems to explore certain aspects of mathematical logics: elements of Boolean algebra, logical operators, truth tables.

Mathematical Card Tricks (Sessions I & II) - Learn how to impress your friends and family with a deck of cards and your brain. No sleight of hand is necessary, just some clever math. The ideas involved are based on a relatively young field of mathematics called Combinatorics. Combinatorics is the study of discrete objects, counting arrangements of objects, and optimizing their properties.

Mathematician Scavenger Hunt at the Mathematics Research Library (Session I & II) - Search for mathematicians and their books while learning great biographical information and how to use a college library. Working in teams, you will search the book stacks and computers to find the works of selected mathematicians from around the world!

Paper Origami (All Sessions) - The class will introduce students to a process that allows us to fold spherical models from one sheet of paper. Students will fold two to three models depending on time and skills.

Planetarium (All Sessions) - Come explore astronomy at the UW planetarium! Learn about the night sky, stars, galaxies and the planets in our solar system. Get an up-close look at nebulae and galaxies, or zoom out to the farthest edges of the universe, all on a 30-foot dome with an all-digital system powered by Microsoft's WorldWide Telescope.

Plasma – The Fourth State of Matter (All Sessions) – Plasma is a super-heated gas that has unique electromagnetic and fluid properties, which make it relevant to fusion energy, and advanced space propulsion, photolithography, and astrophysical jets. The ZaP Flow Z-pinch experiment at the University of Washington explores an innovative plasma confinement concept that uses the JxB force to compress and a sheared flow to stabilize an otherwise unstable plasma. Because the plasma temperature easily exceeds 1 million degrees, highly advanced instruments must be used to make measurements without perturbing the plasma.

Problems and a Piece of Paper (Sessions II & III) - What really is mathematics? We will attempt to answer this question by exploring the history of origami, and by creating our own conjectures through a hands-on paper folding activity.

SAGE Computer Lab (All Sessions) - SAGE is built out of nearly 100 open-source packages and features a unified interface. It can be used to study elementary and advanced, pure and applied mathematics. This includes a huge range of mathematics, including basic algebra, calculus, elementary to very advanced number theory, cryptography, numerical computation, commutative algebra, group theory, combinatorics, graph theory, exact linear algebra and much more. It combines various software packages and seamlessly integrates their functionality into a common experience. It is well-suited for education and research. Visit sagemath.org

Seismology Lab (All Sessions) –Visit the home of the largest seismic network in the United States outside California. The Pacific Northwest Seismic Network (PNSN) operates a real time network of 250 seismometers in Washington and Oregon monitoring earthquake activity and the Cascade Volcanoes as a partner agency of the Cascade Volcano Observatory.

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