



## "WHAT'S YOUR IDEAL PIZZA?"

Welcome, all, to a wondrous new term of **mathNEWS!**

I hope everyone has had a good start to the year so far. First years, if you're enjoying yourself: it won't last long.

Anyways, new year means new friends and all that clichéd jazz. Including at **mathNEWS** it seems, as we had a surprisingly successful disorganizational meeting ('cause we're too cool to be organized) and first production night, recruiting way more new writers than I thought was possible. Seriously, normally we get like 4 or 5, this time we got at least a dozen.

So what did these new writers do? Kill off all the old **mathNEWS** writers apparently, seeing as the only people who showed up to production night were either new writers or **mathNEWS** editors.

In all seriousness, what did the new batch of writers *actually* do? Produce an absolute fucking behemoth of an issue.

Within this *13-page* issue of **mathNEWS** are nearly 40 articles, mainly written by people who didn't have the faintest clue what **mathNEWS** was a few weeks ago. There is some good shit in there, I suggest reading them all carefully and paying attention to the names as well. I can already tell a few of them are going to become **mathNEWS** legends.

Though, one legend was already created at production night I fear. We've always gotten pizzas on the more interesting side for production night, but this week a certain gluten-intolerant new **mathNEWS** writer let the power of deciding his own pizza get to his head, making me order a 10-topping monster of a pizza. I almost had to console the poor operator on the other end of the line. If you're reading this: that pizza will haunt my dreams.

Adding to the list of new things this term are our new editors! Say hello to over-engineerED and confusED. They're still getting used to **mathNEWS** but will soon be ~~worked to the bone~~ treated respectfully as new members of the team.

That's about all I've got for this week. Have a good term, I'll see you in a fortnight.

swindLED  
Editor, **mathNEWS**

LOQUATIUS	Bacon, cheese curds, fries, gravy. Hold the normal cheese, sauce, and dough.
HAN	Oreo ice cream pizza.
LAYTH	All of all kind of cheese pizza on top.
FRUITBOY	Take a pizza. Add bacon. And add bacon. You can't see the pizza anymore. Add bacon. Your lungs begin to fill with bacon. Add more bacon. Don't stop until you drown in bacon.
CC	Vegetarian and not spice.
XAVIENTOIS	Gluten free, tomato sauce, extra mozzarella, prosciutto, bruschetta, pepperoni, artichoke, mushrooms, tomatoes, bacon, roasted red pepper, anchovies, hot peppers, sprinkled with parmesan, made with love. [Editor's note: he actually did this, the absolute #madlad]
SILLYCONE	Topped with \$2000 in cash, and boneless.
NOMORESUBGOALS	The kind that is free.
WHYOS	Nun pizza, golden beef.
HD	Pineapple pizza with extra pineapple.
TOTALLY-NOT-A-TRAITOR	Poisoned pizza to give to my enemies.
TWINKLEGAZEASTROPANTS	Mushrooms.
STAPLED	Thin crust Margherita pizza baked to perfection in a wood oven. Neither too crunchy nor too soft. It should be foldable in half without losing structure. If an Italian restaurant's Margherita is up to snuff, you know it's the real deal.
YCLEPED	My ideal pizza is the same as my spiritual state: one with everything.
OVER-ENGINEERED	My ideal pizza is quite simple. Some chicken, red peppers, onions. With a lot of cheese and hot sauce on it. I mean it when I say quite a lot.
SWINDLED	The GOGO special, invented by a previous <b>mathNEWS</b> editor. That shit is to die for.

## ARTICLE OF THE ISSUE

It was a tough pick, but this week's article of the issue goes to Fruitboy for the veritable anthology of articles he submitted this issue.

Not only did he give us an astounding amount of articles, he managed to perfectly capture many of the facets of the **mathNEWS** charm we all know and love: from nerdy math jokes, to writing the only one sentence article I've ever allowed, he hit it all. Congrats again to Fruitboy, swing by the **mathNEWS** office (MC 3030) to claim your prize!

swindLED

## Out with the old, in with the new

ANUJ OPAL, **mathNEWS** EDITOR FOR FALL 2018  
ALONG WITH NOSHERWAN AHMED, ESTHER AHN, JAMIE ANDERSON AND CLYDE BROWN

# mathASKS 138.1

FEATURING PROF. JOCHEN KOENEMANN

**OVER-ENGINEERED : WHAT IS THE MOST ELEGANT PROOF THAT YOU'VE ENCOUNTERED IN C&O BRANCH OF MATHEMATICS?**

Tough question ... there are many I like. The following innocuous variant of the easy minimum-cost spanning tree problem has kept me busy for the years of my PhD: find a minimum-cost spanning tree that has at most  $B(v)$  edges incident to each vertex  $v$  (where  $B(v)$  is a given integer for all nodes  $v$ ). This problem is NP-hard, and I showed in my PhD thesis that one can compute a tree whose cost is at most  $O(1)$  times that of an optimum tree, and the degree is at most  $O(B(v) + \log(n))$  for each node  $v$ . A couple of years later, a fellow student (Mohit Singh) achieved the ultimate result: a tree that costs at most the optimum, and degree at most  $B(v)+1$  at each node  $v$ ! The paper is just wonderfully clean and uses Kamal Jain's beautiful iterative rounding framework as well as the new technique of iterative relaxation. As I said, I could keep listing other impressive and wonderful results .... come and talk to me.

**TRAPEZOIDBERG: HOW LONG HAVE YOU BEEN PLAYING THE SAXOPHONE?**

I started when I got to Waterloo in 2004?! Chose this over knitting.

**STAPLED : WHAT DO YOU THINK OF EPIC SAX GUY?**

He was a close competitor in my pursuit of the job in C&O. He almost got me ... and look where he is now! I envy him a little bit.

**HOMER SIMPSON: WHO WOULD WIN A SAX PLAYOFF: YOU OR LISA SIMPSON, AND WHY?**

I play alto sax while Lisa plays a baritone. So really we wouldn't be competing but rather playing with each other! But ok: Lisa has been playing for a long while, and is hence pretty good, but consistently hampered by her stubby fingers.

**CODESHY: WILL WE HAVE TO CODE FOR C0456?**

No ... but now that you mention it....

**MILES DAVIS: DO YOU EVER JAM OUT WITH YOUR FELLOW FACULTY MEMBERS? WHO ELSE IS A MUSICIAN IN THE CO/ MATH FACULTY?**

Yes! I played quite a bit with Peter Nelson. Peter is a jazz pianist, and particularly good in covering up all my mistakes. Jon Yard plays drums, and we three have been meaning to get together.

**LAWREN MARIS: WHAT IS THE GERMAN WORD FOR OBTUSE ANGLE?**

Stumpfer Winkel! Oddly, the word 'stumpf' is also used in slang to refer to someone/something not so bright.

**VARIOUS PSEUDONYMS: DO YOU HAVE ANY ADVICE FOR STUDENTS WHO ARE TRYING OUT C&O COURSES AND FIND THEM INTIMIDATING?**

Well, you can always simply not take C&O ... and end up like epic sax guy. Kidding! Anyone intimidated should come and stop by my office for a chat and a coffee (well, maybe not all 6000 Math students at once)!

**SIGSEGV: HOW'S YOUR DAY GOING?**

Good. Yours?

**SWINDLED: IF YOU HAD TO TEACH A COURSE OUTSIDE THE MATH FACULTY, WHAT WOULD YOU TEACH?**

That one is easy: "Tapered, sliding dovetails in Period Furniture Construction"

**YCLEPED: WHAT ARE YOUR TOP 3 FAVORITE GAMES TO PLAY AND WHY?**

I show my age and interpret 'games' as 'board games'. I love playing 'Dominion'. We play it in my family, and have most of the expansion sets. The game doesn't lose its fun. The next game I play with fervor is 'Doppelkopf' (double heads), a German card game played with 4 players. Finally, who doesn't like building some Steiner trees in a game of 'Ticket to Ride'?

I also have Bill Tutte's Go Board in my office, and am dying to give it a whirl.

**MARSROVER: YOU CO-AUTHORED 'A GENTLE INTRODUCTION TO OPTIMIZATION'. WOULD YOU EVER CONSIDER WRITING A COMPANION BOOK CALLED 'A SEVERE FOLLOW-UP TO OPTIMIZATION'? WHAT WOULD SUCH A BOOK LOOK LIKE?**

Awesome suggestion. I will raise the topic with my co-authors, and the publisher promptly.

## Enjoying mathASKS?

# Thank Professor Furino. It was his idea.

A mathNEWS EDITOR WHO BELIEVES  
IN CREDIT WHERE CREDIT IS DUE

# C&O: OBSCURE AND OF LITTLE PRACTICAL USE

profTHOUGHTS 138.1

It must have been a few years ago, on a picture-perfect Sunday afternoon. My family and I were out-and-about attending the garden party at a friend's home. A well-planned, fun event that brought together people from a variety of backgrounds. Unsurprisingly therefore, I didn't know many of them. Engaging in small talk with perfect strangers, one eventually ends up at:

"So what do you do?"

One answer made me stop: "Oh nothing right now, but I did study at the University of Waterloo." Not a big coincidence, I suppose, if you are attending a garden party in KW. Well then, this obviously begs for a followup:

"Oh, interesting, what did you study?"

On this, the new acquaintance, let us call her Alice, smiled and simply said:

"Something in Math that you wouldn't know as it is pretty obscure and furthermore without much practical use."

Well, this sentiment may have been the root cause for Alice's unemployment. You likely guessed that I definitely needed to know more.

"Well, try me! I do have a certain connection to the Math faculty!"

Since I am unpacking this story in great detail here, you likely have guessed by now that Alice completed her studies at UW with an honours degree in Combinatorics & Optimization. You likely will also not be too shaken up when I tell you that my views differ slightly from Alice's. Let me explain!

I grew up in Northern Germany in a family of trades and crafts-people, where I was the first family member to pursue post-secondary education. I chose to study Computer Science in Saarbruecken, Germany, and my initial plans were fairly concrete: to focus on robotics, and maybe also compiler construction. Even well-laid plans change on occasion, as did mine. In my third term as a CS student, I took a class on Algorithm design from Kurt Mehlhorn, the director of the Max-Planck Institute for Computer Science (MPI), and honorary Doctorate recipient at UW.

I learned plenty of fascinating stuff on algorithm analysis & design, and in particular lots on sorting, hashing, priority queues, etc. I got to implement several of the algorithms and data-structures as well, as part of the LEDA (Library of Efficient Data Structures & Algorithms) project at MPI. Mehlhorn's lectures were so inspiring that I decided to enrol immediately for his followup class, on optimization.

It was in this optimization class, where I first learned about linear and integer programming, and where I heard, for the first time, about the Ellipsoid method and approximation algorithms. It was also during this class, where Martin Groetschel appeared as a guest speaker to talk about the use of Travelling Salesperson algorithms in chip design at the German hightech giant Siemens. My mind was blown away by the apparent beautiful Mathematics and algorithms in optimization and their impact in the real world. I needed to learn more! Thus, I decided to write my Diplom (equivalent to a Master's) thesis in optimization.

My Master's supervisor was Naveen Garg, who was then a long-term research associate at MPI, and is now a Professor of Computer Science at the Indian Institute of Technology in Delhi. My thesis work with him focused on the development of fast combinatorial algorithms for solving linear programs approximately. The algorithms we developed were simple yet so powerful that they efficiently allowed solving LP instances out of reach for exact methods to a high degree of accuracy. Such large LPs arise in many practical settings, e.g., in chip design; our algorithms are used at the Institute for Discrete Mathematics in Bonn in their chip design collaboration with IBM.

After completing my Master's work, I spent a 6 month interlude in the Operations group of the German Lufthansa AG, at the Frankfurt Airport. Airlines are obviously a great source of hard optimization problems, and this brief stint in industry only hardened my resolve to pursue further studies in the field. I eventually decided to pursue a Ph.D. degree in Pittsburgh, at Carnegie Mellon University in their Algorithms, Combinatorics & Optimization program.

During my time at CMU, I focused almost entirely on the design of approximation algorithms for NP-hard optimization problems. As many of you readers likely know, the class of NP-hard optimization problems is large, and its members are polynomial-time reducible to each other. None of these (literally 10000s of) problems are known to be solvable efficiently, and solving any one of them efficiently automatically would yield efficient algorithms for all other problems in the class. Such an efficient algorithm would also imply that  $NP=P$  and thereby deftly resolve one of the biggest open questions in Computer Science and Mathematics. So, nobody really believes in efficient exact algorithms for NP-hard optimization problems. Approximation algorithms that do not result in an exact solution appear to be the next best thing. In my PhD thesis, I focused on and developed methods for constrained optimization, with the degree-bounded spanning tree problem being the thesis' centre piece.

At the end of my time at CMU in 2003, luck had it, that Waterloo's Department of Combinatorics & Optimization was looking for a new colleague at the interface of Optimization and Computer Science. I applied, and the rest is history.

My educational journey through high school and university to the point where I joined Waterloo was clearly significantly influenced by my interest in Mathematics & Computer

Science and by the desire to apply the tools from Math to problems in the real world. Throughout my life, my family has asked me to explain what I do, and I provide explanations of different lengths. I believe that the work of my first Computer Science Professor (Kurt Mehlhorn at MPI), was inherently driven by application. The mission of the LEDA project, which was co-founded by him, is to translate pearls from theoretical Computer Science into tools that are usable by a practitioner!

After arriving in Waterloo, I continued my work on theoretical aspects of optimization and nurtured my interest into applying theoretical results to practice. Let me give you a couple of examples.

The first example dates back a few years, where I worked with a student for a Canadian mail-order distributor. The company had a large client pool and warehouses all across the country and they needed to solve optimization problems that determine how client demand gets satisfied optimally, given many side-constraints from its warehouses. Since demand and supply is dynamic in this particular setting, the company ends up solving rather large problems repeatedly, every half hour. The first thing that my student and I did was look through the company's existing code base. It turned out that the algorithm that was in use prior to our arrival had grown organically over the years. It was mainly 'greedy' in nature, and consisted of a series of loops. Needless to say that the outcome of the algorithm was hard to predict, and it was easy to see that its outcome was far from 'optimal' in many settings.

My student and I developed a linear programming formulation for the problem, strengthened it by additional constraints, and proved its optimum extreme point solutions to be integral. Using state-of-the-art LP solver libraries, we implemented the LP. It turned out that the resulting algorithm was by a factor of  $\sim 10$  faster than the old algorithm. In addition, its solution is provably optimal for the problem at hand. When I mentioned the optimality fact to the CEO, he stared at me: "Well, how do you know that? Surely, you must be able to do better?" The answer to this is of course: "No, there is a mathematical proof that you cannot do better!" Moreover, we showed them that we can garner information from the optimal "dual" solution to tell them how to improve their inventory and warehouse structure to indeed improve their bottom-line. Anyone with a C&O honours degree would have been able to tell the company this!

The second example is about ongoing work. A few years ago, my colleague Sivabal (Siv) Sivaloganathan from Applied Math knocked on my door to ask whether I knew someone that was interested in applied optimization; clearly: "I am!" Siv had been (and still is) working with doctors from Toronto's Sick Kids Hospital, and related to me a particularly daunting craniofacial reconstruction procedure performed by neurosurgeons at the hospital. The doctors were interested in improving the operation's accuracy. Here is what it entails: certain infants are born with severe facial deformations that affect their health dramatically, and need surgical attention within the first year of their lives. In  $\sim 70\%$  of all such cases, surgeons perform a so called bandeau surgery where a thin

strip of bone along the forehead of an infant is removed. Along this strip (the bandeau), the surgeons then perform incisions and insert mechanical hinges which allow the strip to flex and bend. Bending in turn allows the forehead of the infant to be adjusted to reach approximately normal position. The surgeons' question was simple:

"Where should we make the incisions, and how many do we need to achieve good results?"

What is meant by "good results"? Well, the hospital has a library of ideal skull shapes, and we interpreted this as finding a way of bending an infant's head so that the volume error between an ideal template and the bent skull is as small as possible. We then designed an algorithm that computes an incision pattern that best approximates the ideal skull. The entire project was supervised by my colleague Ricardo Fukasawa and myself. During the last years, several students were involved, and many of us did attend actual surgical operations where our data and algorithm output was used. It was quite gratifying to see the surgeons appreciating the output.

Since none of us Mathies had surgical training, we did not know (were not bound by) certain assumptions that are commonly made in the medical field. For example, the cut patterns produced by our algorithms are quite asymmetrical in general, and this is different from what surgeons do, who mostly choose symmetric cut patterns.

Today we are still working with Sick Kids, along with students in Engineering. We are in the process of designing an end-to-end system that lets surgeons interactively upload MRI and CT data into our algorithms. The algorithmic output is in turn fed to special projectors (designed by Waterloo Engineering students) that can be used in the operating room, and project cut patterns onto infant skulls.

The moral of this story should be clear: I believe that optimization (and the optimization we teach in Waterloo) is a beautiful sub-area of Mathematics with tremendous practical value. Optimization is everywhere. So all that remains to be said is: "Go out there and look for it!"

*Professor Jochen Koenemann*

**The mathNEWS Twitter:  
in case this issue  
doesn't fill your weekly  
nonsense quota.**

**THE SENTIENT BEING THAT IS  
@UWmathNEWS ON TWITTER**

# DEMYSTIFYING FEATURED INSTRUCTORS

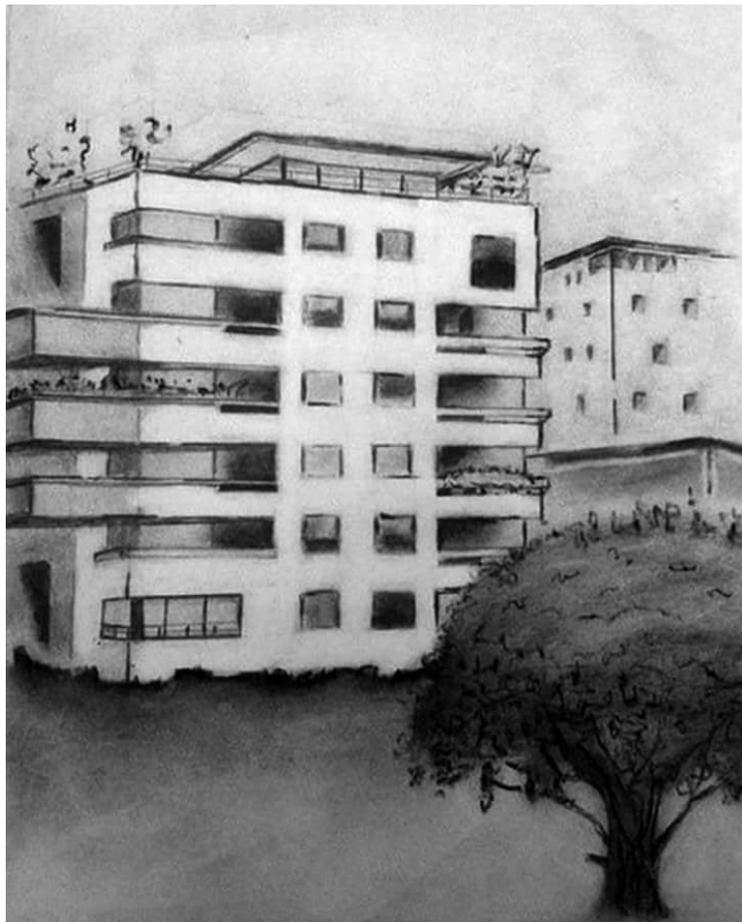
**mathNEWS** has been having featured instructors for a little while now, but it's become clear that we haven't explained how the feature works very well. To clarify some things for both students and faculty, I'll go over how **mathNEWS** featured instructors work in detail.

## THE AIM OF THE FEATURE

We get featured instructors as a mechanism for instructors to interact with students outside of a classroom setting, and for students to learn a bit more about the instructors in their faculty. Instructors can occasionally seem like scary eldritch creatures; we feature instructors so students can realize they're normal people passionate about teaching and research (so not THAT normal, but it's pretty close).

## mathASKS

**mathASKS** exists as a way to humanize instructors in the eyes of students. Whether this means asking them about their work or some silly question based on a pun, **mathASKS** is a space for students to learn more about the people hidden behind the title of professor or lecturer. A lot of instructors like to have fun with their responses which we encourage, whether that means cracking jokes, sassing the writer who asked the question, or launching into a story.



In the past, we've only sourced questions from whichever writers show up to our production nights, but we'll start mentioning who the featured instructor is in the reminder emails for production nights, so people who miss production night or are off-campus that term can still ask questions.

## profTHOUGHTS

The function of **profTHOUGHTS** is for instructors to talk about anything they want, much as the rest of **mathNEWS** lets students do the same (we've yet to have an instructor give us a shitpost, but I've got my fingers crossed). Whether it's talking about their research, general university matters, or something completely unrelated to their work life, anything goes. We've had some fun ones and some informative ones, both types we love.

## HOW ARE INSTRUCTORS CHOSEN TO BE FEATURED?

Some people might think there's a pattern or criteria for featured instructors. Actually, the majority of past featured instructors have been chosen simply because they've taught one of the **mathNEWS** editors. It's a lot easier to convince someone that one of us knows personally, and we're usually too socially awkward to approach profs we don't know.

Our goal is to eventually have every professor and lecturer in the faculty featured in an issue of **mathNEWS**. With how relatively young the feature is, we just haven't gotten around to asking many instructors if they'd like to be featured.

## CAN I SUGGEST ONE OF MY INSTRUCTORS TO BE FEATURED?

Of course! If you know an instructor you think would enjoy being featured, feel more than free to contact us and let us know. It can occasionally be difficult for us to find instructors who are interested in being featured, so any ideas help.

## I'M A FACULTY MEMBER. CAN I REQUEST TO BE FEATURED? DO I HAVE TO BE FEATURED IN ORDER TO WRITE FOR mathNEWS?

We've had a couple instructors who have requested to be featured in the past, and we've gladly accepted. If you're interested, just reach out and we'll pick an issue that works with your schedule. Additionally, you don't have to be the featured instructor in order to write a **mathNEWS** article; we love it when instructors send us articles. We don't receive them as often as we want, hence the impetus for introducing featured instructors. If you're an instructor who has something you want to share with students, please send it in regardless if you're the featured instructor for the issue or not!

Hopefully that clears up some questions people might have. Feel free to contact the editors at [mathnews@gmail.com](mailto:mathnews@gmail.com) if you have any other questions to ask.

# profQUOTES 138.1

mathNEWS SPRING 2018 EOT: DAN WOLCZUK

“ The upside is I can now mark in my underwear.

CO 485: DAVID JAO

“ Because we are doing cryptography, not philosophical paradox.

ECE 206: SEAN SPEZIALE

“ If you see this on a test, don't think "Speziale, what a jerk."

MATH 135: MARTIN PEI

“ Com-com-compound statements? Sounds like Kung Pao Chicken.

MATH 135: JORN VAN DER POL

“ We can assume all the flying pigs in here are red.

“ I keep coming up with examples about underage drinking and burning books. I'm going to get in trouble.

MATH 137: BARRY FERGUSON

“ Do whatever you want, send those terms over to Bermuda and it won't make a difference.

“ I dislike TLA's... Three Letter Acronyms.

“ If you mean the Opposite Angle Theorem, don't say OAT. I eat those for breakfast.

MATH 145: STEPHEN NEW

“ Student: You wrote two plus signs!  
Prof: That's not a mistake, that's just an unusual use of notation.

MATH 147: DAVID MCKINNON

“ I needed to pick a number, so I used the posterior extraction method.

STAT 231: MICHAEL WALLACE

“ I'm not a mathematician, I'm a statistician, which is better.

“ I didn't have many friends. I liked math. Those statements might be related.

“ If you see me around campus, I won't recognize you. That doesn't mean I hate you! Probably.

“ Data science is statistics, by the way, just not as good.

“ Where is it, where's the poutine? Ah, there's the poutine.

“ I refuse to accept the legitimacy of sweet potato fries poutine.

“ I'd have to say in my very scientific paper "sweet potatoes: no."

“ It's important for the real world, which I like to remember exists, sometimes.

“ Though really, diet affects everything. Eat healthy! Top tip.

“ I'm not very good at graphic design. Obviously; you've seen my lecture slides.

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## A DIFFERENT KIND OF ARTICLE

*[Editor's note: this article deals with topics of abuse and trauma.]*

I have debated writing about this for a while. My ex was abusive. When we dated he stabbed me with a kitchen knife and on another occasion broke my front teeth. He provoked me into emotional breakdowns and then acted like I was overreacting. I didn't consider him an abuser when it was happening, people generally don't, the cognitive dissonance is too great. Friends might catch glimpses of red flags, but abuse often happens when there are no other witnesses.

People sometimes wonder why I don't just leave. A person can have their feeling of worth taken away by repeated abuse. Disturbingly, the intense negative feelings brought on by abuse followed by an inkling of kindness can be so effective in convincing our brains that we don't deserve any better. I didn't think of myself as abused at the time, rather I thought he was right to blame me and lash out at me, because I must be intrinsically broken.

When I eventually came to terms with it and told some people about it, some insisted on me producing evidence that can prove it beyond a shadow of a doubt before believing me. They withheld their sympathies until I could produce an inordinate amount of evidence. I don't walk around with a video camera and I doubt anyone else does. I have dental records and hospital records. I have vague emails and chat messages referencing the trauma.

To those who think they're not taking a side, by insisting on proof beyond a reasonable doubt before believing someone was abused, you are taking the side of the abuser. You are enabling people like him to get away with his actions and harm again.

# MATH DEGREE FAQs

## ACTUARIAL SCIENCE:

- How many SOA exams have you done?
- How many SOA exams have you passed?

## AMATH:

- Aren't you just physics?

## CO:

- Whats the fastest way to McDonalds from here?
- So you basically count and draw things for a living?
- Those graphs look a lot like scatter plots amirite???

## COMPUTATIONAL MATH:

- So how many of you didn't get into CS?
- How good is supreme overlord Pei?
- Can you automate easy tasks like AMATH courses?

## DATA SCIENCE:

- What IS data science?
- So can you, like, help me mine Bitcoins?

## MATHEMATICAL ECONOMICS:

- Wtf is Mathematical Economics?
- This exists?

## MATHEMATICAL FINANCE:

- Are you all, like, the accountants of PMATH?

## MATHEMATICAL OPTIMIZATION:

- So you only do half of CO?

## MATHEMATICAL PHYSICS:

- So you're just physics for math?
- How many pages of integral calculations did you write for question 3b)?

## MATHEMATICAL STUDIES:

- So when's your next shift at Burger King?

## PMATH:

- When was the last time you saw a number?
- So what are your plans after graduation?

## STATISTICS:

- Can you help me with STAT231?

- What's the ranking of the easiest 300 level stat courses?

## BIOSTATISTICS:

- Aren't you a science degree?

## WATERLOO MATHEMATICS TEACHING:

- Is anyone even in this option?

## COMPUTER SCIENCE:

- What programming languages do you know?
- I have a great idea for an app -- can you write it for me for free?

## MATH CPA:

- So you're in AFM?

## FARM:

- Oh you weren't in pharmacy?
- Oh you weren't in agricultural?

## DOUBLE DEGREE:

- So which university do you belong to?
- Must be awkward attending Warrior vs Hawk events, isn't it?

Cris M.

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## N THINGS TO LOVE ABOUT GEESE

- Their friendly honks!
- The way they follow you if you get too close!
- The little decorations they leave! All! Over! The! SIDEWALK!!
- The number of times they make you late for class!
- \*hissssssss\*
- The lovely bite marks they give you!!
- The way they walk whenever, wherever they want!!!
- How they appear right in front of your face out of ABSOLUTELY NOWHERE!!
- Their beady eyes that stare disapprovingly into your soul

confusED

# LOOKING BACK AT MY O-WEEK

Seeing new students come in every year makes me feel old and each year's orientation makes me nostalgic about my time. There's so much you should appreciate about orientation that you won't. I didn't...not until second year.

There's all the fun and games, the introduction to the chants, and the friendly upper years. It's most probably the only time of the year where the University has music blaring from speakers all throughout campus. I didn't realize how much I missed the Math faculty dance till I saw it this year. There's all the team spirit and competition that fosters it. It makes you feel like you belong here...the people make you feel like you belong here.

One of the important things about Orientation is that you have to work to earn your tie. In hindsight, that's the most important lesson to take away.

But another important thing about it are our upper years. Once you are an upper year, the only contact you'll have with orientation is with regard to planning and preparation. The amount of time and effort that goes into it will amaze you. It's astounding how people keep up their motivation through all of O-week with all the work and how they still manage to generate hype. I guess it stems from their joy in welcoming others to the family. The best is done to ensure that your orientation will be a memory you'll cherish for years to come and perhaps something that will stir up nostalgia.

If there was one thing I noticed in my O-week leaders, it was how much they cared about us first years, how they answered our questions, advised us and managed to keep up the energy levels of the crowd throughout Orientation. They were able to bring us together as a team and enforce their belief that our team was the best. Those are qualities you want to emulate, but I don't know if that gets appreciated enough. There's no need for a grand gesture. I remember at the end of my orientation, I went to a couple of them and thanked them for making me feel a part of family. That seemed to make their day! I guess what I'm saying is most of the upper years (leaders and non-leaders alike) who help you, do so expecting nothing in return. But if it made a difference and helped you get rid of your homesickness even for a moment, then perhaps you should let them know you appreciate them.

I don't think I can appropriately express this in a one liner, but kudos to all upper years who in whatever role you play are role models to our freshmen.

*nostalgic non-freshman*

# PUZZLE: MOVIE MISQUOTES

These movie quotations have been rewritten using different words, but the meaning is still the same. Name the movie the unmodified quotation is from.

1. "These events will eventually fade away, much like how teardrops become indistinguishable from raindrops."
2. "Quick, look over there! Is that an alien I've spotted?"
3. "Verily, I am nothing more than a simple-minded rabbit."
4. "Perhaps this is not my departure, but my return home."
5. « Franchement, ma chérie, je m'en crisse. »

Solutions can be found on the next page.

*Loquatus*

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# N REASONS WHY BEING AN N-DIMENSIONAL BEING IS THE BEST!

0-D: Would stop needing to worry about my figure

1-D: My Personality would fit perfectly

2-D: 3 words. AUTHENTIC. FLATLANDER. COSPLAY

3-D: [DATA NOT FOUND]

4-D: Quaternions would make perfect sense

5-D: You can laugh at 4 dimensional plebs

6-D: You can laugh at 4 and 5 dimensional plebs

7-D: Octonions would finally make sense

8-D: You could finally see the world the way the geese do

9-D: My ego would finally fit although just barely

10-D: You are essentially getting to see the universe the way god had planned it, although the massive downside is you prove string theorists right

*Totally-Not-a-Traitor*

## WHY PICK MATHNEWS?

So, why should you continue to search after the newest copies of the school paper we all know is loved more? That's a good question. Now, I'm only paid in pizza-fuel to write these, so I'm in no way selling out in this article. In fact, this isn't even a for-profit paper, which is why the top editors can be considered certifiably nuts for spending pocket change to keep this thing afloat. BUT, as the Joker so elegantly put it, "It's not about the money, it's about sending a message".

Now what exactly might that message even be? If you opened this paper with the thought of actual news in mind, I should unfortunately refer you to our 'friends' over at Imprint, the 'official' school paper (unfortunately they define 'official' as some legal mumbo-jumbo, so we have to roll with it). So back to my original point, why should you keep hunting down the latest issues of **mathNEWS**, like the geese hunt down students to attack? Well, picture this: It's you, scuttling around MC to get to whichever lecture hall the schedule has in store for you today. You're stressed, because this is nothing like high school, you're tired, because your mom isn't in residence and can't tell you to stop playing video games until 3am. Things are looking pretty bleak for you, aren't they? Then, you spot it. A paper rack on the wall with shimmering, eye-catching colours spilling into your field of view. You gaze at the front cover, in awe of the selected cover image that was likely drawn by an upper-year student with nothing better to do. You pick up a copy, and are compelled by some other-worldly mathematical force, perhaps by the hand of Euclid himself, to open the booklet. You comply, and that's when you find them. The articles. These articles call to the very essence of math students. By us, for us. Whereas other papers report on what might be deemed 'important', **mathNEWS** redefines journalism by reporting on what those of us in Math/CS may actually be interested in.

"Hey," you think to yourself, "that article is bitching about limits, I hate limits too!" Or maybe, "Woah, that article just referred to that video game I play!" I don't see Imprint complaining about the newest updates, which we all know is what's really on people's minds. See, **mathNEWS** isn't just another outlet of fake news and updates about the government. Instead, **mathNEWS** is for sharing relevant information, encouraging thought and yes, shitposting as well. So I implore you to read through the shitposts here that people spent tens of seconds on, and maybe have a laugh or two. Then, come back in two weeks and repeat. It keeps you happy and keeps me full of pizza keeps me creatively writing.

Fruitboy

## I looooooove editing

A DELIRIOUS **mathNEWS** EDITOR

## CAMPUS CHAOS: SMOKE IN THE WATER

A short time ago, in a building near, near here, the campus was in turmoil. The evil Feridun empire conspired to end the Chad rebellion while the shadowy engineers plotted to reignite the geese wars. Meanwhile, after suffering a devastating attack from KW4Rent, the nonexistent action committee has retreated to reddit to recover. With no one to turn to, the students were scared and confused. However, a hero soon appears. Hidden by the admissions committee in geomatics, David Oies will soon find himself involved in the coming struggles.

The sun was out, a breeze was blowing but campus felt... dull, for a lack of a better word. There appeared to be less geese around while students hurried from class to class without having time to stop. The guitar player was busy with assignments and there has been a distinct lack of laughs and memes. Cutting through noise, was a sudden yell; "But what do you mean by Q2 is false?" Panning to the right, we can now focus on the STC building. Coming out of an impossible quiz, James and David try to recover from the quite questionable quiz they just had. After being ground to dust between long answers and incorrect statements, their minds were approaching sub atomic. It was term 1B and the grind has set in. Between looking for coop, assignments and geese watching, David had no idea where to find time or even borrow it.

However, a sudden honk soon interrupted their conversation. Recognizing the sound as of a nesting crackling goose, David quickly rushed over. However, by the time he got over, there is nothing left. The afterimage of a purple blur was just fading. David stopped and examines the mysterious scene left behind. Feathers and blood were everywhere. Just as he was about leave, he finally noticed that he was encircled by a line of geese. They slowly slid out of the surrounding whiles he was investigating. They stood there silently; finally the tallest one stepped forward and raised its head.

*Over procrastinating, under-studying and completely confused*

## PUZZLE: MOVIE MISQUOTES SOLUTIONS

1. Blade Runner
2. Toy Story
3. Zootopia
4. Gattaca
5. Gone with the Wind

Loquatus

# A FIRST YEAR'S FIRST OFFICE HOUR EXPERIENCE

## OFFICE MINUTES: A PLAY IN N PARTS

### DRAMATIS PERSONAE

**Me:** Me. Or maybe you if you're acting this out for some reason.

**T:** A fellow first-year friend in MATH n.

**Prof:** Our professor of the MATH n class.

### *The previous day of MATH n class*

**Prof:** Okay. Now, here are n short function questions for you to solve out of class. Have a good weekend!

**Me:** I could do that first question in my sleep; I'll just do these as soon as I get back lol.

### *Three days later, outside T's dorm room*

**Me:** Help! Help!

**T:** *[Opening the door]* What's up?

**Me:** Remember those questions we got? The easy ones in MATH n? The ones I forgot to do the whole weekend??? Did you see question (n - 1)???

**T:** Yeah. *[Pulling out a stack of papers with obscure mathematical symbols scrawled over it]* I printed off solutions posted by other students on Facebook, rewrote the solutions and wrote several pages of colour-coded analysis about each individual step, then scanned and photocopied that too.

**Me:** Great! Do you get any of it?

**T:** No!!? What the [EXPLETIVE] is this? They just [EXPLETIVE] take the inverse and [EXPLETIVE] it in  $f(\text{[EXPLETIVE]}x)$  and that's the [EXPLETIVE] answer!?

**Me:** AAHHHH!

**T:** AHHHHA!

**Me:** *[In tragic timbre]* Office hours?

**T:** *[With dread finality]* Office hours.

### *That afternoon, MC floor n*

**Me:** Where are we? I've never ventured this high before. It's so quiet. It's so eerie.

**T:** *[In awe]* Is that sunlight? Windows in MC? I thought that was just a legend!

**Me:** *[Tip-toeing]* These must be the halls of the professors. Shhhh.

**T:** *[Also tip-toeing]* Shhhh....

*[After a significant amount of map-reading and navigation, our intrepid adventurers finally make it to a closed door, marked only with a number, n. The number corresponds to the office number in the slides, which had been posted on LEARN, after the lecture.]*

**Me:** This must be it! There's another person here waiting. Office hours haven't started yet! *[Listening for a moment]* Ohmygoshohmygosh there's a person in the office right now! Shhhhhh!!!

**T:** *[The door opens]* The person ahead of us is heading in already? The person coming out looks scarred.

**Me:** *[After a moment of silence and contemplation, the door opens yet again]* Wait, the next person is coming out already? Oh crap, it's our turn.

**T:** You go in first. *[Shoving gently, then pushing harder]* YOU GO IN FIRST!

**Me:** *[Shaking]* H-hello P-Professor *[R-REDACTED]*...

**Prof:** Hello! Do you have a question?

**Me:** Y-yes. *[Dragging T in]* We were having some trouble with question (n - 1)? Why do we inverse this here?

**Prof:** Of course! *[Pulling out paper and starting to scribble faster than the eye can follow.]* You just take the inverse and sub it in  $f(x)$  and that's the answer!

**Me:** *[Quickly exiting]* T-thanks! Uh may I take this paper?

**Prof:** For sure. Have a good day, you two!

**Me:** *[Grabbing paper and clutching it desperately]* Thank you y-you too! *[Fleeing out of the office and down the stairs]*

### *A few minutes later, in the safety of the MC Comfy on floor n - 3*

**Me:** I got the paper! Let's take a look!

**T:** I still don't [EXPLETIVE] why they [EXPLETIVE] the [EXPLETIVE]  $f(x)$  inverse.

**Me:** Me neither. But after that? I think I'll just take the L.

*We eventually returned for clarification, but the office was still and cold, with no professor to be found, only the oppressive silence of the n<sup>th</sup> floor. We left soon after. There are answers there, in the mysterious high halls of MC. Next time, we'll get them.*

CC

## HOW TO ANNOY A MATHEMATICIAN : A COMPREHENSIVE FIELD GUIDE

- Topology: Call a Torus a donut
- Applied Math: "Oh so you aren't doing real math?"
- Statistics: Abuse Bayesian Analysis
- Complex Analysis: "Why would you want to study something imaginary?"
- Knot theory: Interrupt them with knot puns
- Graph Theory: Say the 4-Colour theorem was never realllllly solved
- Mathematical Physics : Remind them they are the unwanted bastard child of the Science and Math faculty
- Calculus: Wear a shirt that says "Newton > Leibniz"
- Geometry: "The fifth postulate is so obvious I proved for fun over the summer"
- Group Theory: Literally do anything

And if all else fails, just utter the magical phrase "Oh you're in math? I HATED math in high school!"

Totally-Not-a-Traitor

# WAR AND PEACE OR ZOOTOPIA FANFICS: WHICH IS MORE WORTH READING?

## ABSTRACT

Yes.

## INTRODUCTION

For the first-of-its-kind fluffy fiction file, this paper will examine four culturally important pieces of literature: Leo Tolstoy's *War and Peace* and three specimens of *Zootopia* fanfiction. This study will quantitatively determine the desirability, feasibility, profitability, and social value of reading *War and Peace* versus reading the aforementioned group of three *Zootopia* fanfics under various methods and contexts — in other words, should you read Tolstoy or *Zootopia*?

These three *Zootopia* fanfics are ones that I particularly like among the sea of creative garbage out there on the internet. (**Do not** think of that *Zootopia* fancomic.) I recommend them to anyone who felt that 100 minutes wasn't enough time to properly explore the setting of *Zootopia*. (Seriously, stop thinking about that comic.)

The first fanfic on my list is *Pack Street* by legendary internet storyteller The Weaver. It centres around the mundane life of Remmy Cormo, a sheep who moves into the almost all-predator working-class neighbourhood of *Pack Street*. It's a rare example of a fanfic that has only original characters but still makes them feel like they belong in the source setting. The characters are engaging enough that there's even a second-order "sub-fandom" for specifically *Pack Street*, featuring second-order fanfics and fancomics about the characters. An audio play adaptation is in production, but probably won't be finished. Although the full *Pack Street* story also includes Weaver's own illustrations, you don't read pictures, so those won't matter for the purposes of this study.

The next is *Guardian Blue* by Alps Sarsis. It's not one fanfic, but an entire series, spanning three longform "seasons" and several short stories. *Guardian Blue* Seasons 1, 2, and 3 chronicle Judy and Nick's continued adventures in both high-stakes police work and their friendship. The side stories generally focus on minor characters from the movie or on plot-irrelevant moments from the main stories. Among others, the side stories cover Judy reading crappy fanfics about herself, Duke quitting crime, and Nick searching for his mom (spoiler: he cries). Sarsis convincingly portrays the movie characters while squeezing in additional worldbuilding. Through his stories, we learn about fox culture, see Nick talk his way out of danger, and explore the inner workings of *Zootopia*'s climate management system.

Finally, we have *Kitsunegari*, by a person unpronounceably named 83j049733rfe4. It follows the hapless fox Owen Conrad Fuchs as he realizes that something is seriously wrong with the municipal government and gets swept up in a big social movement during the citywide crisis that occurs in the movie. *Kitsunegari* stands in a surprisingly uncommon position among *Zootopia* fanfics with its more extensive portrayal of the social strife during the crisis and exploration of the historical relationship between prey and predators. The author clearly spells out and justifies Owen's motivations and worldview in the middle of this turmoil and in an interesting characterization twist, sets Judy as a minor antagonist.

Together, these three stories will compare to *War and Peace*, a novel by Russian author Leo Tolstoy. It's known both for being the best thing he ever wrote and also for being insanelly long, at about 1440 pages in the English translation. It relates the experiences of several families of Russian aristocrats during the Napoleonic Wars.

## METHODS

An important factor that determines whether you want to read something is how intimidating it seems. This can be measured with word count, as it takes a higher amount of time dedication to finish a story if it's longer. Thankfully, the word count of the English edition of *War and Peace* is known and fanfiction hosting site Archive of Our Own displays the word counts of its stories.

Another factor that affects interest in reading a story is how difficult it is to read and understand. Of course, *War and Peace* is very difficult if you don't understand Russian, so this study only considered the difficulty of the English version. Both *War and Peace* and the *Zootopia* fanfics were analyzed with the Flesch-Kincaid readability test, where an overall easier score would be more attractive to potential readers.

In addition, the monetary cost to acquire texts can convince a potential reader to delay their purchase or not bother buying it at all. They may even resort to illegal activities, such as violating intellectual property laws, or worse, shoplifting.

The last factor considered in this study is the popularity of the stories and what your peers will think of you for having read them.

## RESULTS

In terms of word count, *War and Peace* counts in at 587 287 English words for the New American Library version. Currently, *Pack Street* has 157 949 words as of its 27<sup>th</sup> chapter, *Kitsunegari* has 208 728 words as of its 19<sup>th</sup> chapter, and all of *Guardian Blue* combined has 527 764 words across nine stories. Therefore the *Zootopia* fanfics are individually more attractive to read thanks to their shorter length. However, they're 894 441 words combined, a little over 1.5 times the length of *War and Peace*, making them closer to a *Ponniyin Selvan* than a *War and Peace*. (Thankfully, we won't need to worry about that one Super Smash Brothers fanfiction that's 4 million words long.)

Next is to determine readability. The Flesch-Kincaid reading ease score is higher for text that's easier to read. Because *War and Peace* is in the public domain, I grabbed a plaintext copy off of Project Gutenberg and pasted it into a Flesch-Kincaid readability tool. It was so long that the tool I used gave me a 413 error: Request Entity Too Large. I switched to a different tool that could handle extremely long text and got a score of 40.6 for *War and Peace*, putting it at around university-level difficulty. *Pack Street* scored an 84.1, or about what a grade 6 student could handle (disregarding the profanity and subject matter). *Kitsunegari* got an 83.4 and *Guardian Blue* an 83.1.

As of the present day, any costs related to getting access to these stories is negligible, assuming you want to read it digitally. *War and Peace* is now in the public domain and available at no cost on Project Gutenberg, while *Pack Street*, *Guardian Blue*, and *Kitsunegari* can all be found for free on Archive of Our Own. If we disregard costs that are the same regardless of story choice, such as the cost of owning a computer, having internet access, or having electricity, what remains only matters very slightly. A longer story like *War and Peace* will take longer to read, and so will cost marginally more in hydro fees to power the reading device, as well as cause a slight decrease in productivity as more time must be spent reading it.

A reader could be discouraged from reading something if their social circle deems it uncool or irrelevant, but encouraged if it's more socially relevant to them. *War and Peace* is mainly discussed and praised by literature snobs and Russian scholars, but **YOU** (yes, you, reading this article) are way more likely to have seen the movie *Zootopia* than be unironically interested in *War and Peace*. This means that liking *Zootopia* is more socially acceptable and thus encourages further interest in the topic.

## DISCUSSION

Each of these three recommended *Zootopia* fanfics take less time to read, have a lower reading difficulty, cost a very slight amount less to read, and are probably more relevant to your friends than 19<sup>th</sup> century Russia.

With this data, I conclude that it's more worth it to read *Zootopia* fanfiction than *War and Peace*.

(Shoutout to the person at production night who was joking about submitting a fanfic to **mathNEWS**. You inspired me to write this.)

Loquatus

# HOW TO GIVE TO YOUR ENEMIES WHAT THEY DESERVE

Conflict is an inevitable part of the human experience. When we are at odds with people, it can be tempting to get even with them. We all had moments where intense feelings of hurt and anger permeates our psyche, making them hard to ignore. But to give our enemies what they deserve, we must first determine what is it that they actually deserve.

We could think of how much they hurt us and what would make things fair, but I don't recommend this route. The truth of the matter is life is not fair and never will be. To try to make things fair is a futile endeavour that will lead only to frustration and pain. A more modest and reasonable goal is to make things better instead, since ultimately what our enemies deserve is kindness and empathy. This however is no easy task. It is far too easy to be cruel and sometimes you may not have the energy for kindness. Anger is exhausting and if you find yourself unable to muster the empathy, it is perfectly okay to just avoid someone. You never owe someone an interaction; the same goes for them.

I once read a wise Facebook image macro that said that to wish healing upon those who hurt you is to wish upon yourself. People's action and reaction towards you always says a lot more about their inner self than any reflection of yourself.

Conflict resolution is definitely an admirable goal but not always a reasonable expectation. We can acknowledge that someone is just a fellow human struggling through life; however, that doesn't mean seeing eye to eye is a feasible possibility. In peace conflict studies, they often talk about conflict management instead, which has the focus of containing and minimizing the conflict.

Nevertheless, if you are in a situation where conflict resolution is a possibility, these are some useful guidelines. When discussing a problem, use impact statements: for example, When you do ***I feel***. Resist the urge to blame or frame the situation as You vs. Them. Instead, view the situation as the both of you versus the problem. Focus instead on describing the problem and offer possible solutions.

And maybe don't refer to them as your enemies! That's actually not useful language for problem reduction. It just makes a great title, okay?

A Self-Reflecting Mirror

I basically only read the profQUOTES.

MOST PEOPLE WHO READ mathNEWS

# WHY SONIC ADVENTURE 2 IS THE BEST GAME OF ALL TIME

*[Editor's note: fight me]*

Disclaimer: this article is highly objective, well-researched, and absolutely represents the opinions of **mathNEWS** *[Editor's note: citation needed]*. Also, for this review, I will be considering the "Battle" DLC as a part of the game.

Sonic Adventure 2 was the last Sonic game for the SEGA Genesis, but even without considering the time constraints, this game blows any competition out of the water. Between its immersive plot, gameplay, multitude of in-game features, top quality voice-over, legendary music, multiplayer functionality, and high replay-ability for a single player game, Sonic Adventure 2 remains the best game of all time.

The main feature of the game is the variety between each level. The hero's story follows the titular character Sonic along with his friends, Knuckles and Tails (Amy being featured as a side character except for 2 player mini games).

Sonic features the typical fast-paced action seen in previous Sonic games, with a focus on completing levels fast with little backtracking as the main purpose is to... well, go fast. For this reason, Sonic's levels feature high energy rock music, including the memorable "Escape the City." Combine this with the upgrade progression to allow for levels to be enjoyed all over again, and Sonic levels remain one of the best for quick, fun action.

Tails levels are a change from previous Sonic games, where instead of Tails flying, he's in a massive airplane mech suit meant to destroy all in his path. On the warpath of robots and gears, the goal of these levels is to rack up combo meters to score maximum points. While it's true that these levels are much slower compared to the Sonic levels, it is coupled with more calming music that can be best described as "beach pop," complete with synths and steel drums. Overall, with Tails' upbeat, can-do attitude, these levels are a blast to play.

Knuckles' features classic treasure hunting as the core level design, as the disgraced guardian of the Master Emerald must seek to reclaim his honour by searching for the pieces of the broken emerald. These levels feature a radar system, with oddly calming rap music as the backdrop. The levels can be completed quickly or slowly, but there are hints throughout the level. The levels are closed arena style, but there are always hidden areas to explore. Between this and the randomly generated emerald shard locations, these levels feel fresh to play over and over again.

If the Hero's story's goal is to save the day, the Dark story is to gain power. Complete with old villains like Eggman, along with new characters like Shadow and Rouge, these act as the

evil sides of the good coin. These characters are cool and edgy, each with their personal flair.

Shadow, being the counterpart to Sonic, has similar fast paced action levels, with the main theme being unlocking the doors sealing his heart away, and cooperating with the other villains in the Dark story to meet their ends of world domination. Because of this, the levels are the same in fundamental concept, but differ in mechanics and in music (where Shadow has calmer rock music). Sky rail is also one of the most difficult yet rewarding levels in the game, as there are many different routes to complete it.

Eggman plants you back in the giant mech to blow stuff up. This time however, Eggman makes you feel like the boss instead of a leisurely walk in an exploding park. Complete with music that often borders onto metal (especially with his main theme), the main antagonist of the Sonic series is a terrifying presence as a playable character. Eventually, both Tails and Eggman get jetpacks to be flying engines of war.

Rouge levels make you feel like the spy. The infiltrator. The thief. The treasure hunter. Equipped with a similar skillset and level design to Knuckles, Rouge also features finding emerald shards to steal them from Knuckles. However, Rouge expands her ambitions to find keys and Chaos Emeralds for her various, mysterious objectives that temporarily align themselves with the Dark team. Her mysterious quality and allure is characterized in her songs, which can be described as soft pop with faint vocals.

A Sonic game, especially with such short notice, is bound to have a bug or two. However, the speedrunning community has used this to their advantage, namely the Super Bounce, which are now core skills and features to speedrunning the game that are necessary to go fast, one of the core attributes of a Sonic game.

The key is what links the two streams of games. There is a hidden ending after both stories are completed, where the two teams work together to tackle a threat larger than the both of their ambitions. It leads to teamwork, and character development.

But these aren't the only interactions between characters in Sonic Adventure 2. The boss battles, with some exceptions, tend to be facing the rival Dark character. They tend to be upgraded with stronger abilities and perfectly time their attacks to be tough, evenly matched battles. In addition, this is when a majority of cut scenes occur, which feature memorable lines and well-timed dialogue to add a comedic punch to otherwise more serious plot elements.

The game also has multiplayer functionality, namely with 2 player competitions in the various facets of the game. In addition to characters found throughout the game, it features new and old characters from the Sonic franchise, so that somewhat every minor character can get involved in gameplay and feature a minor role in the game.

But besides that, once the story is finished, what is there to do? Well, each level has 5 rankings, and 5 missions to accomplish, with each mission yielding emblems to show completion of the game (out of 180 total emblems). The missions provide variety like collecting 100 rings, or completing a harder version of the original mission, or finding a lost Chao (which are small baby/pet creatures I will discuss further). Obviously, this is important for a completionist standpoint on games, but the emblems have further functionality.

The Chao garden is a mini-game/pet raising special level in Sonic Adventure, playable by any character (although it must be unlocked by a Chao Key first before accessible at any time through Stage Select). Chao can be raised and trained to compete in various mini games, or can be sent to Kindergarten to learn special talents. Different worlds exist within this level which alter the Chao's traits, and although Chao have a fixed lifespan, they can respawn at the end of it if their happiness has been kept high.

For all of these sensational factors wrapped up in only 2 years of development from the first Sonic Adventure game, what can be said about this masterpiece except that there is nothing possibly that can top it? Sure, there might be other competitors such as Orcarina of Time, modern multiplayer games of Fortnite, or old classics like Pong, but nothing beats the versatility and sheer fun that is Sonic Adventure 2.

*i don't know da wae*

## SHIT SOFTWARE ENGINEERING STUDENTS SAY

We all know which program is at the top of the pecking order: software engineering. Here are some lines we have heard these students say:

- "I'm a bit of an engineer myself."
- "Patrick Lam, director of Software Engineering, personally teaches SE 101"
- *Flexes 8:30am-4:30pm schedule*
- "Let me grab my hard hat and pink tie."
- "Your co-op isn't in California?"
- "We have our own lounge."
- *Clinks iron rings together as a CS student walks by*
- "We need one more for our Hack the North team."
- "Don't take notes in linear algebra."
- "Mansour is a legend. Mansour is garbage."
- "Cali is overrated."
- "Switch to CS."

Han Wu

## N REASONS WHY CONES ARE THE BEST SHAPE

- Can hold ice cream
- Prevents dogs, cats, and your weird uncle from licking themselves
- Are good funnels, so you do not pour sodium hydroxide all over yourself when you're filling the buret
- Fits very well on top of heads
- Useful for directing traffic
- (did you know? Charles. P. Rudabaker invented the first traffic cone in 1914, which was made of concrete. They probably stopped making them out of concrete because then you couldn't put them on your head)
- Sometimes you want to fill one third of a cylinder, but you have nothing to measure with. Just pull out your cone with identical base radius and height!
- If your cone is silly, then it is a silly-cone, which means that it is a polymerized siloxane, a polymer that includes any inert, synthetic compound made up of repeating units of alternating tetravalent silicon atoms and oxygen atoms, combined with carbon, hydrogen, and sometimes other elements. They are typically heat-resistant and either liquid or rubber-like, and are used in sealants, adhesives, lubricants, medicine, cooking utensils, and thermal and electrical insulation. The global demand for silly-cones approached US\$12.5 billion in 2008.
- Some cones are good for your vision. for example, carrots are cones, and if you don't stick them in your eyes, you'll find that your vision will be a lot better than if you did.
- You can mail it to a random person, and they'll probably be thrilled. "Wow, I have received a cone from a random stranger in the mail! I love it when that happens!" They'll say, probably.
- Can hold a second ice cream when you finish your first

*sillycone*

**For the record, although I did once say "there is beauty in mathematics", I did not then add "and it is me".**

PROF. STEPHEN NEW

# I'M WRITING AN ARTICLE ABOUT A PROOF ASSISTANT

**ALTERNATIVE TITLE: ONLY 109<sup>1</sup> PEOPLE WILL UNDERSTAND THIS ARTICLE BUT I WANT PIZZA**

First year math students typically take three mandatory courses in their 1A term: MATH135, MATH137, and CS<sup>135/135</sup>. Each of these courses runs an advanced section, MATH145, MATH147, and CS145 respectively. Certain mathematically gifted students elect to take these courses. A number of other students, for whatever strange reason, also elect to take these courses despite their lack of extraordinary math ability. I fall into the latter category, and now find myself one of two situations at all times—I am either:

1. Working on the MATH 145 assignment, or
2. Thinking about the MATH 145 assignment.

This year, there are actually two sections for each of the advanced math courses, taught by two different profs. Professor David Jao, who teaches one of the MATH 145 sections, is using a software tool called Coq (pronounced Coke) to teach his class this year. Coq allows the formal expression of mathematical definitions and theorems and the proofs for those theorems, and, relevant to MATH 145, forces its users to write extremely rigorous proofs. The assignments for this section of MATH 145 heavily involve the use of Coq, and since, as previously stated, I am always either working on the assignment or thinking about the assignment, it has affected the scope of what I think about day to day.

So of course, in writing this article, I really could not come up with anything better to write about. Or anything else to write about at all, for that matter. Sorry.

Coq is a software tool used to for a variety of purposes including the certification of properties of programming languages, the formalization of mathematics, and teaching. The development of Coq began in 1984, supported by a whole slew of French universities and research institutes, and its initial release was in May of 1989. Today, it is used for many purposes and specifically as an educational tool in math and computer science. It is used internationally in many countries including France, Sweden, the US, Canada, Poland, the Netherlands, and South Korea.

The word "coq" means rooster in French. Apparently it is common practice to name research tools after animals in France. Coq was actually initially named CoC, after Calculus of Constructions, the typed<sup>2</sup> programming language that was implemented by Coq in its earliest days. In 1991, the name was changed from CoC to Coq, reflecting the new implementation of the extended Calculus of Inductive Constructions (also a typed programming language). The name Coq is also a reference to Thierry Coquand, a professor of computer science in Sweden who helped develop Calculus of Constructions and Calculus of Inductive Constructions.

There is quite an active online community surrounding Coq. Coq has a mailing list (though I haven't quite figured out what exactly is sent through that mailing list—perhaps now is the time to engage in some investigative journalism), an active subreddit (r/Coq), and is frequently discussed on Stack Overflow and Stack Exchange. Coq is also on Github where users report bugs and help fix issues, and the repository has over 100 contributors.

At this point I think I've exhausted all the information I could find and understand about Coq, which means it's time for me to stop writing about Coq and return to actually using it to (hopefully) finish this assignment. I hope this article was educational to those wondering why some of the MATH 145 kids are programming, and entertaining for those of us suffering<sup>3</sup> through it.

**nomoresubgoals**

1. This number will most definitely be inaccurate when this issue is published.
2. If you were actually interested: typed here does not mean typing on a computer. Typed refers to type theory, a mathematically defined system in which every term has a type and operations are restricted to terms of a certain type.
3. I kid! I love Coq, and I love this class. I am most definitely suffering though (help me).

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## ROOMMATE WANTED

I am currently looking for a new roommate in the area, and here are the following characteristics a potential roommate should possess:

- English-speaking is a must
- Should be quite familiar with Mathematics
- Have learned about Leibniz's contributions to calculus
- Fluent writer preferred
- Should have entry-level understanding of the laws of physics
- Understand the world is round and revolves around the sun
- Not a fan of common organized religion
- Knowledge of other languages (Latin, Greek) preferred
- Curly, white shoulder-length hair
- Have received a knight-ship from Queen Anne
- Be Isaac Newton

If you meet these criteria, please feel free to contact me in response to this ad. Otherwise, I don't believe you'll be a desirable roommate.

**Fruitboy**

# WHY MC 6<sup>TH</sup> FLOOR NEEDS TO BE UNRAVELED

Bear with me! Ever had your mind so full of questions you wanted to ask that everybody gave you dirty looks while you walked by muttering all of them to yourself? On top of that, all of your profs conspired against you to schedule their office hours at the same exact time down to the nano second (That is definitely a conspiracy involving not the Illuminati and I shall expose all of it one day, provided no sends a hit squad after me)? As if that wasn't enough, Lord Goose keeps MC under guard 24/7 with security so tight that The Domsday Seed Vault next to the North Pole feels like a convenience store around the corner of your house that you can rob.

Now, would you all like to have all your profs in the same room (or more realistically, in offices next to each other) so you can dump all your unfathomable questions in front of them? I know y'all are gonna say yes just like all the 'Muricans said yes to Trump, but Lord Feridun in consultation with Lord Goose on the third day decreed "Thou shalt place all thy profs on the loftiest perch in all MC, on the 6<sup>th</sup> floor". Now, the architect from beyond the ninth circle of hell, (most likely on/ against advice from Lord Feridun) decided to design a maze instead of a remotely sane floor plan.

Let loose, this architect decided to put so many turns on the single floor than the number of known digits of  $\pi$ .

The corridor design was copied and pasted more times than a student does that over the course of a single work term report. The lighting is much more suitable for an interrogation room rather than an educational institution. The room numbering system, if employed as a password generator, would be used by literally every single government. The layout of the floor lends itself to all those CS students, trying to polish their Dijkstra's algorithm and making it more "efficient", which makes it slightly useful (like around a femto useful-unit based off of an everyday building). Once on this floor, escape is impossible. Not even Ray Breslin from Escape Plan can break out of the 6<sup>th</sup> floor. He will dream about leaving this cursed place but he will stay there for all eternity until hell freezes over. All those floor plans that he smuggled in would not help him out at all. Instead, they would make matters worse. There are rumors that the architect placed a room that will hold the souls of all those poor people that managed to get lost in there.

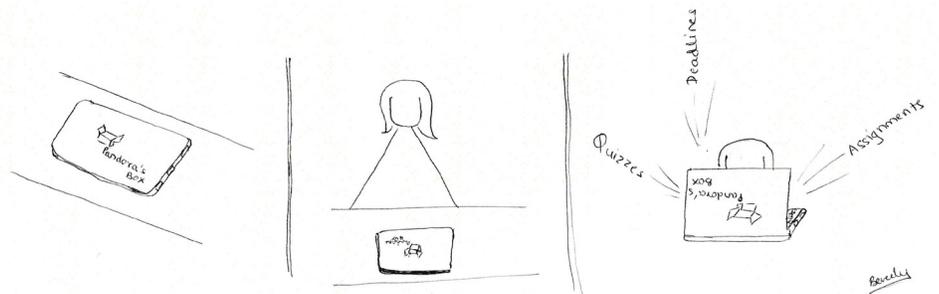
This might be obvious but all of these "features" of MC 6<sup>th</sup> floor does not make it suitable at all for obtaining any sort of help. In fact, by trying to get any help from this floor will actually help the building to keep the above-mentioned f full of happy souls. So there are only a few possible solutions to end this madness. One way is to strong-arm the professors from leaving the classroom until they answer all of your pending questions. Another option to seek the knowledge of the ancient Knights Who Say Ni on how to navigate the mysterious 6<sup>th</sup> floor. The problem with that approach is that their requests are really, really weird to be fulfilled by anyone. However, the most elegant solution would be to unravel the 6<sup>th</sup> floor by obliterating it altogether by any means necessary. Even if a nuke is required -- go for it (A slight piece of advice; don't contact Bombardier to help transport the nuke. Trust me, it will take ages. It may not even be delivered in this century). Then the floor should be rebuilt and make Doug Ford pay for it. Only this will bring peace to the Math Empire once and for all.

over-engineerED

## M REASONS I DIDN'T USE N TO NUMBER THIS LIST

- N could mean natural number
- I'm paying homage to MC, the home of MathNEWS
- If I got excited and shouted n! suddenly it's a factorial
- It looks a bit like aleph, an infinite cardinality ( $\aleph$ )
- N represents Newtons -- the physics students have had it too good for too long
- If you squint from far away, it kinda looks like pi ( $\pi$ )
- I've never seen the word 'nathenatics' before
- Only worth 1 point in scrabble (M is worth 3)
- I already use enough n's in my name already (My full name features 3)
- The letter n had intercourse with my wife on a rainy Tuesday in July, who then left me and took the kids DAMMIT KAREN LET ME SEE MY CHILDREN

Fruitboy



## WHAT IN THE THE WORLD IS LOOP?

Over the spring term, there was an exciting addition to MC Comfy: an elliptical pool table! For those who don't know what it is: imagine a regular pool table, except it's in the shape of an ellipse and there's only one hole. Also - there's only 4 balls.

The elliptical pool table was purchased by Huawei, the Math Endowment Fund and the Dean of Math office. The table is one of only a few in the world; in fact it's currently the only one in the Americas!

Now - what's so special about elliptical pool? Well, it has many connections to mathematics (in fact, it was invented by Alex Bellos, a mathematician!) As some of you might now, an ellipse has two focal points; on the elliptical pool table, one of the focal points is the hole, and the other is indicated by a black dot. A special property of an ellipse is that every point on the curve of the ellipse (and therefore the edge of the table) makes the same angle to each focal point.

The object of the elliptical pool table (or Loop) game is similar to regular pool: here are the instructions from the official Loop website<sup>1</sup>:

- The object of LOOP is to win by potting a colour ball and then the black ball.
- The starting position is illustrated above: the black ball is on the dot, with a red and a yellow on either side. The cue ball is positioned anywhere on the line between the black and the pocket.
- The first player names a colour that he wants to pot and the first shot must hit that colour. The other player must aim to pocket the other colour.
- The game proceeds like pool, with each player taking alternate shots until the first person has potted their colour and the black. A player who pots the black with his or her colour still on the table loses the game.

- The key to winning at LOOP is always to calculate the angles by considering the positions of the focus points.

There's an excellent YouTube video on how to play Loop on the Numberphile channel: <https://youtu.be/3WHB1PvK3Ek>

It's a lot harder than it looks and takes hours to perfect – my first game lasted 10 minutes! Or maybe I'm just bad at pool<sup>2</sup>.

If you want to play Loop, the cues and balls are located in the MathSoc office and can be checked out when the office is open. You'll need your Watcard.

MathSoc may be hosting a Loop tournament sometime during the Fall term (maybe even a competition between professors and students!) - keep an eye out for posters and like the MathSoc Facebook page so you can keep yourself updated!

Axel

1. From <http://www.loop-the-game.com/snoop/>.
2. Probably the latter.

## NEW COURSE - POTTY TRAINING GEESE

For those who don't know this yet, Waterloo is infamous for its geese. Though there are many annoying things about them, what gets to me the most is the obvious fact that geese aren't potty trained. For a university within an abundance of geese, that are present all throughout the year (why are you still here in winter?), I really think there's scope for a course that potty-trains geese.

Think about the good it'll do. No accidental stepping into goose-poo. No frozen green souvenirs on the road in winter. We can take things further by reserving areas for them to poop. That might get them out of our way for some time.

If you were wondering how would the geese benefit from this, then here's your answer. Apart from becoming more civilized, they'll be given the opportunity to become friends with us. I believe a forced interaction of four months will convince both parties to reconcile.

A friendship with the geese has its advantages. One, they're (hopefully) not going to chase and peck you. Two, since they're in Waterloo for pretty much the whole year, even if your dearest besties aren't in town for a co-op term, you will always be guaranteed to find a faithful friend in your goose friend (and their family).

So, here it is Waterloo, I've come up with the idea, it's up to you to take this "beyond ideas" now.

**Production Nights are every other Monday. We meet at 6:30 in the MathSoc Office.**

**Please come...**

A LONELY mathNEWS EDITOR

Beverly

# HOW THE DIFFERENCE OF ANY TWO ODD SQUARES WILL RESULT IN A MULTIPLE OF 8

**Question :** for any two numbers p,q which are odd, will it always be true that  $p^2 - q^2$  will always be a multiple of 8, where a multiple 8 is just  $8n$  where  $n \in \mathbb{Z}$ ?

**Examples :**

$$132 - 52 = 169 - 25 = 144 \text{ which } 144 = 36 \cdot 4$$

$$212 - 32 = 441 - 9 = 432 \text{ which } 432 = 108 \cdot 4$$

$$72 - 112 = 49 - 121 = -72 \text{ which } -72 = -18 \cdot 4$$

**Proof :**

You can construct p and q such that  $p = 2a + 1$  and  $q = 2b + 1$ , where  $a, b \in \mathbb{Z}$

$$\begin{aligned} p^2 - q^2 &= (p - q)(p + q) \\ &= ((2a + 1) - (2b + 1))((2a + 1) + (2b + 1)) \\ &= (2(a-b))(2(a+b) + 2) \\ &= (4(a-b)(a+b) + 4(a-b)) \\ &= (4(a-b))(a+b+1) \end{aligned}$$

The 4 in the final product it proves that the difference will have to be a multiple of 4.

Now, the last step is to look at the factors (a-b) and (a+b+1). We have exactly 3 possible situations: a and b are both odd numbers, both even numbers or one is even and one is odd. If both of them are odd, then (a-b) will be also odd since they could be constructed themselves by some arbitrary numbers m and n

$$[a-b] = [2n + 1 - (2m + 1)] = [2(m-n)]$$

which has a factor of 2 leading that 4 to become an 8

If we have an even and a even, then it is similar to the above since you can construct them with m and n as well.

$$[2n - 2m] = [2(n-m)]$$

which again has that factor of 2.

The final case where one is even and one odd. The even will be constructed with  $2n$  and the other with  $2m+1$ , respectively.

We can't use the [a-b] factor since it will spit out an odd number. Instead, we use the [a+b+1] factor

$$[2n + 1 + 2m + 1] = [2n + 2m + 2] = [2(m+n+1)]$$

which -- what do you know! -- has that nice factor of 2.

Next time you are out with friends, amaze them with this interesting fact.

Totally-Not-a-Traitor

# N THINGS THAT HAPPEN WHEN TRAVELLING SOMEWHERE NON-ANGLOPHONE

- So. Many. Stares.
- No one cards you... ever!
- Walking 10 km to see that monument is easy and even enjoyable
- ... but walking any amount of km in your hometown is unthinkable
- Downing (tequila) shots and passing around a fat cigar (from Varadero) after dinner with your hostel buds
- Everyone you meet is one of: Australian, German, Dutch, or British
- Bonus points for seeing those groups from a certain area in a huge continent that take pictures of everything
- Blowing your budget buying pretty trinkets
- ... but getting discounts on them because you are CANADIAN and not American (yeah!)
- The locals know you can't speak the language; they'll speak as fast as they can anyway
- Nodding to everything they say, whether they answered your question or not
- Temporarily bonding with the Anglophones in a non-Anglophone setting
- Someone asks to take a selfie with you
- Feeling at one with the locals by participating in a community event
- Playing with the possibility of losing your passport to stay in the country forever...
- ... but realizing hostels suck and you miss your bed
- ... and you can't speak the language
- ... and you'd be an illegal alien
- ... and you ate and bought your money through
- crap
- The weather here sucks anyway
- crap

# I DESPISE CELERY

Celery? More like piece of shit vegetable which has no place on either the breakfast or dinner table, and should be especially avoided at luncheons. Hark! For all ye who partake in the consumption of this devil's stalk, there may yet be hope to save your soul and taste buds. Now, some of you might be wondering where my absolute hatred for this derelict plant comes from. Well, dear reader, bear with me while we explore the cons, downsides, and faults of this awful plant.

For those of you fortunate enough to not be acquainted with celery, it is a marshland plant in the carrot family. What a shame that such a noble family as that of carrots and parsley has its name dragged through the mud by one such as apium graveolens. The cultivar with which many of you will be the most familiar, Pascal celery, is known for its long fibrous stalk which tapers into leaves at the ends. It is predominantly used for cooking, but the seeds have been used as a spice and even as an ingredient in herbal medicine.

I, myself, have quite a lot of trouble understanding why anyone would willingly consume any celery based product. The first of my reasons for placing celery on my personal blacklist of ingredients is the flavour. "What flavour?", you might ask. Exactly! With a plethora of diverse ingredients to choose from, I fail to grasp why one would choose celery. Not only does it taste like the sink water from washing other vegetables, but the receptacle for this gross water is about as unpleasant as it gets. It is somehow simultaneously like a handful of string and as hard as a rock. The mouthfeel is as unpleasant as chewing on hair and it goes down just as smoothly. You could just as well add a handful of wet grass to your recipe and get a similar tasting end-product. I honestly want you to take a moment and ask yourself whether you have ever found yourself craving celery, or whether you have ever been satisfied after taking a big bite out of a stick of celery. The last time I had something that long, hard, and wet in my mouth, at least there was someone in the room enjoying

themselves, and that would have been far more satisfying to crunch into. [editor note: brushing teeth, right?] If we were to judge this despicable stick on the experience of eating it alone, I can say, without a doubt, that we would banish it to the depths of the abyss.

Now, many of you are probably wondering why, if it is such a godawful food, do we even eat it at all. Let us take a trip down memory lane, to the origins of celery as we know it. Since the plant originates in the Eurasian continent and was especially abundant around the Mediterranean, the peoples of antiquity around this region found various uses for it. Starting way back in ancient Greece and Egypt, wild celery was used as ornamentation, condiment, and for medicinal purposes. This was a particularly bad idea, not only because celery tastes bad, but because in its wild strain, it is slightly poisonous. It was first used as a vegetable around the 16<sup>th</sup> century, but it really took off 19<sup>th</sup> century when a French gardener known as Henri Pascal discovered what we now know as Pascal celery. In 1884, he is known to have written:

*"It was in pulling out my solid golden white celery in order to blanch is that I recognized that certain stalks were superior to others. I found them excellent for cooking, they are good besides, and well formed."*

Despite the fact that he lied to the naked taste bud, the new strain spread across the world. Since then, numerous varieties have come into being, one as recently as 1922. It astounds me that after the first variety, they decided to make more, but ever since then, some people have carried on the tradition of defiling good food with celery.

My primary reason for despising celery, however, is something that many people are already aware of. It is common knowledge that celery is a "calorie-negative" food. This is because more energy is expended to digest the celery than the vile plant actually provides. This widely held belief is actually completely false! While this fact was the source of my original motivation to write this article, the myth surrounding it is even more reason to oppose this evil weed. As the old saying goes, a vegetable is only as good as its reputation. This vegetable has such a duplicitous nature that its very reputation is a lie. This food was designed with the sole purpose of deceiving poor, unsuspecting souls. Not only is its nature deceptive, but it is also one of the few foods capable of inducing anaphylaxis. This repugnant rod is nothing more than pure despair embedded into the fruit of the earth.

My sole hope in writing this cautionary piece is to warn any unsuspecting individuals to the dangers and malicious aspects of celery. Take heed, poor soul, as the vegetable of death has already permeated our culture and cuisine. Ere it is too late, I implore you to destroy all celery in your possession and to disavow it entirely from your life. Only then may you be spared. Goodspeed, dear reader. May the fibrous stalk never overcome you.

**Have something you want to publish in mathNEWS? Drop it off in the mathNEWS blackBOX by the Math C&D or send it to [mathNEWS@gmail.com!](mailto:mathNEWS@gmail.com)**

**A mathNEWS EDITOR WHO WANTS MORE WORK FOR THEMSELVES**

Xavientois

# YOUR MATHEMATICAL HOROSCOPE

For this horoscope, you don't even have to remember what star sign was most visible in the sky at the time of your birth, because this special horoscope is based solely on math. To begin your horoscope, simply choose a value,  $x \in \mathbb{R}$ . Now, enter your chosen value into the following equation:

$$y = \left| 50 \cdot \left( \sin^2\left(\frac{50x + 14}{2}\right) + \cos\left(\frac{x + 2}{4}\right) \right) \right|$$

Now, take your output value and refer to the list below to reveal your horoscope:

- $0 \leq y \leq 10$ : Tension mounts. With your strengths and capabilities, you will walk right through any problems that aren't the geese. Your finances might be prone to ups and downs. Take precautions, and don't unnecessarily worry.
- $10 < y \leq 20$ : Close relating with a flock produces a strong sense of togetherness. Your willingness to reveal more of what is going on within yourself adds to these geese's comfort. As a result, they will start revealing more with you.
- $20 < y \leq 30$ : You could be more open to change than you realize. You recognize your moodiness, but you know that it doesn't indicate a long-term change. When greeted with a serious goose attack that could evoke a change in the status quo, you likely will make the right choice.
- $30 < y \leq 40$ : You might be more mellow than you think. The unexpected occurs, likely a goose attack. You might want to make a change, but how, and in what direction? Look at your daily schedule and decide how to renew your interest in various areas.
- $40 < y \leq 50$ : Tension mounts, as does your ability to get past a problem, probably on the goose front. You might want to schedule some downtime for reflection and re-evaluation. Your efforts will be appreciated beyond your expectations.
- $50 < y \leq 60$ : You might be dealing with recent extravagances. On the other hand, you also might be creating a valid and workable budget. Your serious attitude carries you far from the geese. Remain sensitive to those around you.
- $60 < y \leq 70$ : You could breeze through the day with considerable ease, though you might be overly serious at some point. Someone near you attempts to lift your spirits. The unexpected occurs with you and the geese. Your openness could make or break this bond.
- $70 < y \leq 80$ : If you play it low key, you won't be unhappy. You have the ability to change your mind and head in a different direction, hopefully away from the geese. Your flexibility surprises people who look to you as an authority figure. Be more direct in how you deal with a problem.

- $80 < y \leq 90$ : You could be surprised by what you hear. Your choices might feel limited. If you apply your imagination, however, workable solutions around the geese appear. Your discussions could be quite animated.
- $90 < y \leq 100$ : Can you hear them? The flapping of wings and the pattering of feet? Can you hear the honking? The geese. So many geese. They're coming, and they're angry. You've been cursed, there is no escape. You can't get away; you can only get a head start. Start running.

Fruitboy

## N WAYS TO USE YOUR LANYARD

1. Carry your keys, your WatCard, your paperweights, etc.
2. Proudly proclaim which residence you reside(d) in, provided you have a residence lanyard
3. Lasso a goose
4. Measure exactly  $44.7 \pm 0.1$  cm
5. Realize it's a Möbius loop and do Möbius things with it
6. Lasso a flock of geese
7. Investigate the wonders of angular momentum, followed by scrambling away from whatever object you broke when you accidentally let go
8. Wear it around your neck along with a dress shirt, clipboard, pen, and badge to gain access to pretty much anywhere
9. Lasso a flock of a flock of geese
10. Is a flock of a flock of geese the power set of a flock of geese?
11. Strangle your worst enemy (or best friend)
12. [REDACTED]
13. Can the power set of a flock of geese be called a power flock? Is power flock even valid mathematical terminology?
14. Feed it into a Turing machine
15. Take it on a date
16. Lobby your local mathematician to use "power flock" in their next paper
17. Hang on a hook and forget it exists

Terry C

**MORE profQUOTES!!!**

THE ENTIRE mathNEWS READERSHIP

# N<sup>2</sup> WAYS TO DELAY APPLYING FOR CO-OP JOBS

1. Work on the backlog of assignments due in a few days that you haven't started yet
2. Read the textbooks that cost over \$100 that you'll open maybe twice throughout the whole term
3. Pretend to study for midterms early, even though none of what you read is being understood or retained
4. Stress over minute details on your résumé that nobody other than you will ever notice
5. Clean your room for once, you filthy animal
6. Feed your addiction to social media. Examples, for your procrastinating pleasure:
  - a. Facebook
  - b. Instagram
  - c. Twitter
  - d. Snapchat
  - e. Reddit
  - f. Google+ (if you're really desperate) [*Editor's note: Uh aren't you forgetting MySpace??*]
7. Find a baby that's crying for no reason and cry with it
8. Get stuck browsing Wikipedia, finding obscure articles such as those about the List of Eiffel Tower replicas, the Dancing Plague of 1518, Hexakosioihexekontahexaphobia, and, who could forget, our very own boy John le Faker
9. Play Avalon - or any other game - till 6 am, then wake up the next afternoon filled with self-hatred and wonder about your purpose (or lack thereof) in life
10. Get stuck watching YouTube videos, replaying such timeless masterpieces as "history of the entire world, i guess," "Hurricane Florence PROVES Flat Earth," and, of course, "supa hot fire vs b bone"

11. Write a cover letter for all the employers that will reject you anyway
12. Rant about how crappy WaterlooWorks is
13. Start a S I D E P R O J E C T and ensure that it's unimaginative, useless, and utterly dysfunctional (like me!) (AND LIKE WATERLOOWORKS)
14. Eat your friends (but ask for consent first!)
15. Write a list of ways to delay applying for co-op jobs
16. Eat free food while you get the list published in **mathNEWS**

- $\pi^2/6$

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## mathNEWS DISORG TL;DR

If you didn't already know, **mathNEWS** had its termly disorg in MC Comfy on Thursday September 13<sup>th</sup>. In the event you missed it, which is highly probable since only 9 people showed up, I've compiled a quick summary of events that includes what was said and what they meant by it. Enjoy~

"What is **mathNEWS**?" -> A math student run newspaper that features pieces from alumni and students alike

"What do we publish?" ->Reddit shitposting irl

### HOW TO CONTRIBUTE

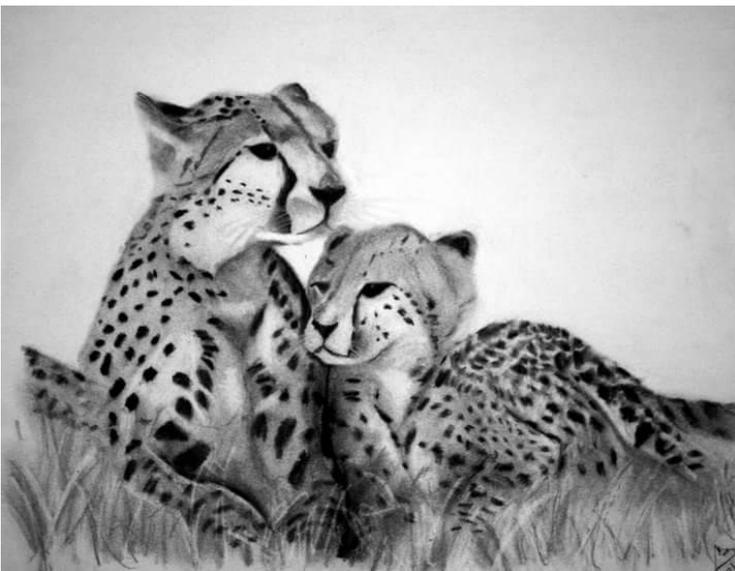
"Come to production nights!" -> Join us write articles while pizza drunk and sleep deprived

"Send us **profQUOTES**!" -> We need to beat the plagiarizing Facebook page

"Don't write anything that will get us sued." -> Don't write about Imprint

"Free food!" -> We'll bribe you for your services ;)

Cris M




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## IS mathNEWS ACTUALLY NEWS?

According to Feds Student Council: yes!

At the most recent Feds Student Council meeting, there was a successful motion to invite **mathNEWS** to Feds Student Council meetings as a major news group!

We did it!

Axel

## LOCAL mathNEWS EDITOR GRAVELY INJURED

Earlier this week, new **mathNEWS** editor confusED wrote an article entitled "N Things to Love About Geese," which was met with some violent reaction by UWaterloo students.

Though the article was intended as a joke, the 21 year old editor awoke to the loud honking of three adult geese in his bedroom. confusED managed to call animal control, but unfortunately he still suffered two broken arms, a fractured rib, and countless bites and scratches.

The assault comes just days after confusED was trampled by a mob of students demanding more **profQUOTES** in volume 138. confusED is expected to make a full physical recovery.

*definitelynotconfusED*

## N REASONS TO SUBMIT profQUOTES

1. We love hearing about the best excerpts of your lectures!
2. The readership will revolt if we don't appease them
3. Your profs enjoy knowing that you think they're funny!
4. It's an easy way to contribute to **mathNEWS**!!
5. The readership will revolt if we don't appease them!
6. Issues with a lot of **profQUOTES** get more attention, helping to clear out our inventory!
7. It's satisfying to see 2+ pages of **profQUOTES**!
8. But seriously, the readership wi
- 9.

*confusED*

## N REASONS FORTNITE IS THE BEST GAME IN HISTORY

- Put simply, it isn't
- You should've seen the look on your face!
- Classic prank, you actually thought I was going to spark that debate?
- Everyone knows that 'Minecraft Hunger Games' is the best Battle Royale anyway

*Fruitboy*

## CALL TO ARMS

While Hack the North was on full blast, not far away, in the muted basement lights of QNC, **GooseCTF**, an assembled team of first- and second-year students, fought for UW's honour in the annual CyberSecurity Awareness Week (CSAW) capture-the-flag competition.

Though this was our debut, we secured **19<sup>th</sup> place** among undergraduates in North America.

Knowing our weaknesses now, we are confident we will advance to world finals next time we compete.

**We hereby invite everyone** with background in cryptography, reverse engineering, forensics, web and binary exploitation, or any other facet of cybersecurity to join forces with us.

Together, we will learn from each other and become strong.

We will combine our knowledge, and win CTF glory again and again, like no proper subset of us ever could.

With the incredible talent Waterloo attracts every year, it is only a matter of logistics for us to be an undisputed leader in cybersecurity in Canada and have international recognition.

The crucial missing piece in the puzzle could just be you.

Contact us at [goose.ctf@gmail.com](mailto:goose.ctf@gmail.com) for details or to join.

**GooseCTF**

## ISSN 0705-0410

**UW'S BASTION OF ERUDITE THOUGHT SINCE 1973**

**mathNEWS** is a normally fortnightly publication, funded by and responsible to the undergraduate math students of the University of Waterloo, as represented by the Mathematics Society of the University of Waterloo, hereafter referred to as MathSoc. **mathNEWS** is editorially independent of MathSoc. Content is the responsibility of the **mathNEWS** editors; however, any opinions expressed herein are those of the authors and not necessarily those of MathSoc or **mathNEWS**. Current and back issues of **mathNEWS** are available electronically via the World Wide Web at <http://mathnews.uwaterloo.ca/>. Send your correspondence to: **mathNEWS**, MC3030, University of Waterloo, 200 University Ave. W., Waterloo, Ontario, Canada, N2L 3G1, or to [userid.mathnews@gmail.com](mailto:userid.mathnews@gmail.com) on the Internet.

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# GIVE YOUR gridCOMMENT A TITLE

## gridCOMMENT 138.1

Greetings all! For those that missed the orientation issue, or are otherwise uninitiated in the ways of **mathNEWS**, This is the **gridWORD**, the crossword puzzle that appears in every issue.

The publication of a new crossword begins a contest where you can submit a completed grid for a chance to win a \$5 gift card to the Math Coffee and Donut shop (i.e. the Math C&D). The contest's deadline is the next issue's production night, usually at 6:30 PM the second Monday after. To break a tie in case of multiple correct submissions, we pose a **gridQUESTION**

and hint that we seek the answer that is silliest, sunniest, sappiest, saddest, etc. We retrieve your crosswords and answers from the **BLACK BOX** on the third floor of MC, beside the Comfy Lounge, so drop them off there!

The first **gridQUESTION** of the term is "How can we control the speed at which lobsters die?"

Happy puzzling!

swindLED

### ACROSS

- 1. E.g. shell, bubble, cycle
- 5. River near Ulm
- 10. Another example of 1A
- 14. Heed
- 15. African antelope
- 16. Math prize name
- 17. Eagle + Horse
- 19. Hummus holder
- 20. Took off like a rabbit
- 21. Lathers
- 23. Elephant-goad
- 26. American \_\_\_\_
- 27. Superlative ending
- 28. Crows
- 29. Cosmic radiator
- 31. Famous Canadian hockey player
- 32. English
- 34. Failed music service
- 37. Cat sound
- 40. R to Samsung Galaxy
- 41. Presentation component
- 42. Swiss city on the Rhine
- 43. Tower site
- 45. Smoke
- 46. This upgrades to a mercenary in Dominion
- 48. Sterotypically evil feature
- 51. A vector
- 53. Aquarium denizen
- 54. Man + horse
- 55. Outdoor stone seating
- 57. Casual attire
- 58. Hokkaido native
- 59. Camelot feature
- 64. Yuletide drinks
- 65. Tracked by NORAD
- 66. Indian bread
- 67. Censor's target
- 68. Lock
- 69. Found on 57D

- 12. Used when short on spirit?
- 13. Great time
- 18. Brewer's kiln
- 22. Staff symbols
- 23. E.g. fat man
- 24. Water Ferris wheel
- 25. Last issue's theme + Human
- 26. Wine bottle bottoms
- 29. Dragon + antlers + hooves
- 30. Afflict
- 33. Student
- 35. It may be bid
- 36. 1960 Nobel Prize laureate
- 38. Done, for Donne
- 39. Sore spot

- 44. MathSoc is supposed to send these out ahead of their general meetings
- 47. The real Citizen Kane
- 49. "Don't bet \_\_\_\_!"
- 50. Souls
- 51. Edible seeds
- 52. E.g.  $\varphi \rightarrow (\psi \rightarrow \psi)$
- 54. Some change
- 56. \_\_\_\_ bunny
- 57. Arrakis
- 60. Sounds like 31A
- 61. Sheep sound
- 62. \_\_\_\_ party
- 63. Eliminate

### DOWN

- 1. Trig. mnemonic
- 2. It's a wrap
- 3. Gym unit
- 4. Feverish malady
- 5. Niantic's other game
- 6. Instruments traditionally made of turtle shells
- 7. Deposited
- 8. Helps 65A
- 9. Basket material
- 10. Family head
- 11. Roman's incidental remarks

1	2	3	4		5	6	7	8	9		10	11	12	13
14					15						16			
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55			56				57							
58					59	60						61	62	63
64					65						66			
67					68						69			



# lookAHEAD

SUN SEPT 23

MON SEPT 24

TUE SEPT 25

WED SEPT 26

THU SEPT 27

FRI SEPT 28

SAT SEPT 29

Deadline to apply to first round co-op jobs at 9 AM

Last day to drop a class with 100% tuition refund

Drop penalty 1 period begins, WD assigned for dropped courses

Final exam schedule released  
All second round co-op postings released

Deadline to be removed from the interview process at 12 PM

SUN SEPT 30

MON OCT 1

TUE OCT 2

WED OCT 3

THU OCT 4

FRI OCT 5

SAT OCT 6

mathNEWS 138.2 production night. Meet at the mathSOC office at 6:30 PM

Co-op interviews begin

Inter-continental bring the mathNEWS editors food day

Deadline to apply to second round co-op jobs at 9 AM

mathNEWS 138.2 published

## PMC SEZ

Do you like math? Are you interested in learning, discussing and being overwhelmingly exposed to math in its most theoretical form? Then we might be the club for you!

The Pure Math, Applied Math, and Combinatorics & Optimization Club (PMAMCOC for short, PMC for even more brevity) is a social club for people interested in theoretical mathematics!

We run the best math contests, events where proofs give talks about something interesting in their field, events where students give talks about something they find cool, and events where we just hangout and eat pizza! Also, we have a club room where members hangout and do work. If you're interested, come check us out at MC 3033!

The PMC team

p.s. we have 50 cent pop. If that's not tempting, then we don't know what is.

## MATHSOC UPDATES

- Elections are happening NOW - voting ends today (September 21<sup>st</sup>) at 11:59pm EDT! There's an election happening for both first-year rep and for Math/Business rep positions on MathSoc Council!
- Pink ties are \$2 for ONE MORE DAY (today, September 21<sup>st</sup>)! They will be returning to their \$5 regular price starting next week.
- MathSoc execs AMA incoming. Stay tuned.
- As always, there's free candy in the MathSoc office! We're also taking candy suggestions.

Have any questions? Just want to chat? Email [mathsoc@mathsoc.uwaterloo.ca](mailto:mathsoc@mathsoc.uwaterloo.ca), or stop by the MathSoc office (MC 3038). We're here for you!

Thank Mr. Goose,  
Alex Lee  
MathSoc Prez

## LOOP TABLE UPDATE

Someone broke it. It's now on an angle.

We're working on fixing it.

Apologies.

Alex Lee  
MathSoc Prez

## IMPORTANT UPDATE ON SLC CONSTRUCTION

Shit's still broken.

Fruitboy