



"HOW ARE YOU PLANNING ON CELEBRATING LUNAR NEW YEAR AND/OR VALENTINE'S DAY?"

Hello **mathNEWS** readers! In case you were wondering what was our answer to the **mastHEAD**, we had planned to attach red pockets to this issue to woo you on a date with me thank you for your readership. Unfortunately, printing this *absolute unit* of an issue ate up all our budget, so the best we can offer is a stupid pickup line and a ripped dollar bill from the 70s.

In **otherNEWS**, this Lunar New Year the administration decided that holding classes and giving out exams was not an appropriate celebration of cultural values, and instead called a snow day! Oh, a snow day! What joy! Hell must have frozen over, except that was last week.

However, unlike the many slothful slackers who stayed home that day, we **mathNEWS** editors are a devoted folk dedicated to the craft of producing the best publication on campus — weather be damned, we'll *skate* to campus to finish the issues if we have to. Yours truly made the treacherous trek on the fine unsalted sidewalks of Waterloo, slipping and sliding all the way, discovering new ranges of motion in the human spine that he had never known existed before. By some stroke of good luck, he reached the safety of the **mathNEWS** office with nary a scratch, just in time to send this issue off to print.

So to you, dearly loved reader, we present to you our actual **mastHEAD** answer: *Crawling on all fours in slick and sleet, just to finish a 36 page source of heat.* Please enjoy the fruits of our labour, preferably not in the fireplace.

terrified
Editor, **mathNEWS**

ARTICLE OF THE ISSUE

Congratulations to Finchey for their life-changing column, [Your Definitive Guide to Getting a Date this Valentine's Season!](#) We plan on following your advice to the letter, and if that doesn't work out, at least we'll still be around to let you pick up your prize in MC 3030.

itorED
Editor, **mathNEWS**

- SANDWICH EXPERT** | At the UW Drag Club show at 9PM at Wilf's on Valentine's Day.
- WATER** | Integration.
- FINCHEY** | I don't know about Lunar NY, but I'm gonna be Netflix and chillin' with my hunny in MC Comfy on the 14th. You're free to join if you want ;^)
- UW UNPRINT** | Reading **mathNEWS**. No, I was not paid for this message.
- THEODORE BEAR** | Since it will be the year of the pig, I'll be celebrating with Porkzilla, the greatest pizza ever made.
- ZETHAR** | Apparently, hanging out with Raziell.
- NOTEPAD** | Working on time travel to fix my life choices.
- DIOYENES** | Non-romantic dinner with my really good platonic friend. Also making spring rolls to satisfy the void in my heart that can never be filled.
- LICENSE2DERIVE** | On Valentine's Day Eve I will try to forget that the next day is Valentine's Day and hence not feel bad about being single.
- FRUITBOY** | For the turn of each Lunar NY, I am contractually required to sacrifice the animal corresponding to that year. Years like rabbit and pig are quite easy; year of the dragon proves more difficult. For Valentine's, probably dinner with my goth GF.
- TILLOW PRINCESS** | For Valentine's Day, I intend to cry over my lack of relationship experience and regret how I tried to make up for it.
- EPSILON SCREWN** | My mother culture does not observe Lunar NY, but I have been assimilated into one that does. I will spend Valentine's proofreading my math assignment due the 15th.
- DAWDLING** | Cooking by myself, alone and without love.
- ODSZCZEBRESZYNU** | Covering all my bases and going on a date with a pig.
- A CUTE ANGLE** | Going home for a day just to receive red pockets.
- VARIOUS PSEUDONYMS** | Going on a date with best grill: the cheapest scotch the LCBO has.
- HERBIE** | Midterms.
- CONFUSED** | Ritual sacrifice.
- ITORED** | I already celebrated Lunar New Year in advance over the weekend by eating communal-style hot pot with a number of friends. This is because on this day, actual Lunar New Year, I am working on the **mathNEWS** layout like a good editor!!! I am definitely not burnt out and also having a lot of fun. For Valentine's I'll be on a plane.
- STAPLED** | Deleting FB, hitting the gym, lawyering up!
- TERRIFIED** | Hot pot with pork and \$11.57 of napa as my date.

The 红包 is a lie.

TERRY CHEN, **mathNEWS** EDITOR FOR WINTER 2019
ALONG WITH ESTHER AHN, JAMIE ANDERSON, MICHELLE ZHU

mathASKS 139.2

FEATURING RICH DLIN

CONFUSED: WHAT IS YOUR FAVOURITE COURSE TO TEACH?

That's like asking who my favourite student is. They are all excellent. That said, all math is excellent, but I have the best time when I am thinking about and teaching calculus. Now don't ask me who my favourite student is. But I'll give you a hint. Their name in English begins with a letter that could be encoded using ASCII values between 65 and 90, inclusive.

STAPLED: ARE YOU AMBIDEXTROUS?

Let me see this was typed using my right hand only ...
 'This was typed using my left hand only'

Apparently I am not. Or am I?

DAWDLING: HOW DOES ONE PRONOUNCE YOUR LAST NAME?

That is an excellent question! Here is the best way to make that happen:

Visualize a calm lake on a cool fall day, just before sunset, and imagine that you are in a rowboat, in the middle of the lake. In the distance, you hear the gentle call of a loon. You decide to name the unseen loon Pascha. As the sun sets, a gentle westerly breeze picks up, bringing with it the smell of lavender ... and is that a hint of nutmeg? You begin to get hungry, and realize you want to get back to shore and bake an apple pie in a stone hearth. You move to pick up the paddles, when you realize there are none. You wonder, "How did I get to the centre of this lake in this rowboat? Was I, in fact, born in this rowboat in the centre of this lake, and have always been here?" But that's silly. Suddenly, an otter breaks the surface of the lake, and uses its snout to push you back to shore. You name this otter Veronica. Upon reaching the shore, you thank Veronica warmly, and she twitches her whiskers in reply, before swimming off. Now you proceed to the stone hearth, but there is no fire, and you have no apples. Momentarily sad, your mood is lifted with the arrival of a small chameleon and a lemur. The chameleon has been collecting apples, and at first you do not notice the chameleon, thinking only the apples are floating toward you, but then you realize that the chameleon is there, only camouflaged as the apples he is carrying. The lemur has brought with him some obsidian and flint, which is perfect for making fire. The lemur also has nutmeg. The nutmeg scent! You decide to name the chameleon Po, and the lemur you name Nuuanu. After bidding tearful farewells to Nuuanu and Po, you bake the most delicious apple pie. Once it has cooled, Pascha, Veronica, Po and Nuuanu return to partake, and swap stories all evening about times from their youth. Suddenly you realize that you left a steel baton in the hearth, and it is about to melt, so you reach for it instinctively, whereupon Po shouts "You don't want to be handlin that!" in a Jamaican patois.

Now read the 6th word that Po said, but don't say the first syllable out loud.

EPSILON SCREWN: WHAT IS YOUR FAVOURITE EXAMPLE OF A MATHEMATICAL OBJECT OR PATTERN IN A WORK OF VISUAL ART?

I am guessing you mean a specific work that I have seen that actually incorporates some mathematical concept, however if that is the case then the answer is I don't have a favourite per se, but I am fascinated by the use of mathematical constructs in architecture and always look for it. Another way to answer your question is with one word: cylinder. In drawing the human form, almost everything is either a cylinder or a sphere, and mostly it's cylinders or cylinders on spheres. Understanding the cylinder and how often it appears transforms the way you see a lot of realism art.

ZETHAR: WHAT IS YOUR ADVICE FOR STUDENTS WHO ARE STRUGGLING ACADEMICALLY?

I find that academic success breaks down roughly into two aspects: Natural ability, and time management. If they are willing to think about it, most people can honestly score themselves in each category, say from 1–10. A student who has 10 and 10 will pretty much always be successful, but most humans don't fall into that category. Often a high score in one category can offset a lower score in the other, so that if you can manage total of, say, 12 or higher, you would probably observe what could be considered "academic success".

So for students who are struggling, a good place to start is to honestly score yourself in both categories. In my experience it's usually the time management category that is low, but not always, and often in a way that the student is unaware of it. So strangely, many people who feel they are struggling often underestimate their natural ability score, and overestimate their time management score, likely because they are using the external evidence of their grades instead of their own intuition about their natural abilities. These students often decide the issue then is the natural ability category, especially if they feel they have been working hard. That can feel pretty hopeless because time management feels correctable, while natural ability feels absolute.

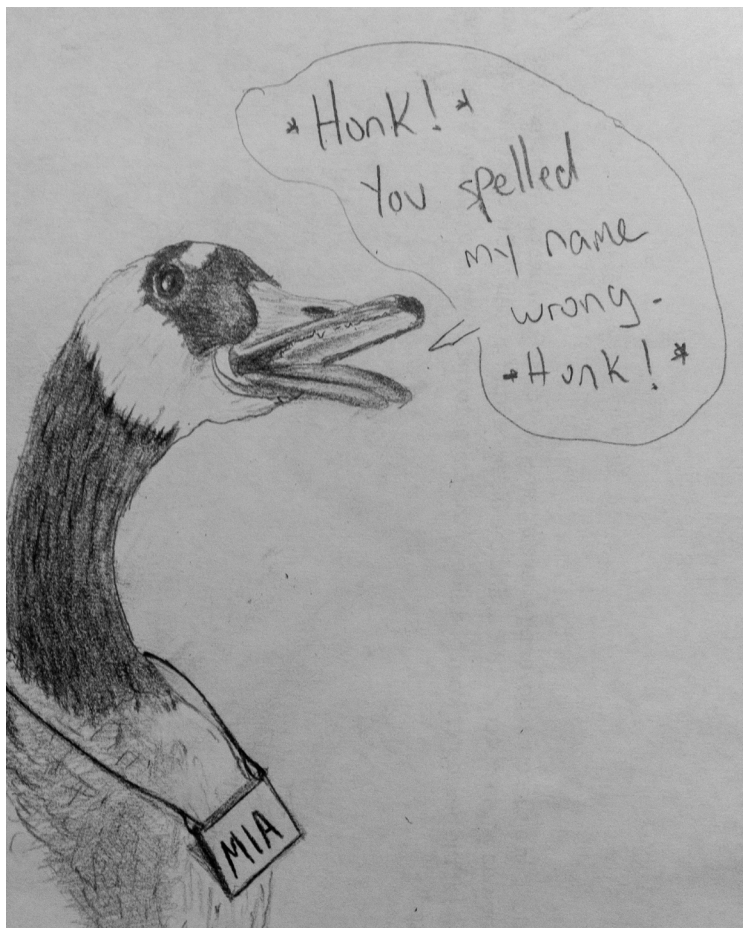
I can't stress enough that it often only seems like the natural ability is low. For students in that situation, I always recommend that they speak to a trusted prof in the subject area, because the prof can determine through conversation a more accurate picture of natural ability, and often demonstrate to the student that the issue has more to do with their approach to the subject than their ability in that subject. Very commonly I find that a student who believes they are working hard is in fact doing a lot of work, but not channeling that effort in the best direction, something a subject expert can usually detect. I call this an issue of time management, and it is totally correctable once identified.

In either case, whether the issue is time management, ability, or both, talking to an expert in the field you are studying is always helpful!

VESICA PISCIS: WHAT IS YOUR PREFERRED PRONUNCIATION OF "SUP": "SUP?" OR "SOUP"?

I prefer to sup on soup if it is pea or chicken. I guess beef and barley is ok, in a pinch. But always while I am saying "seek x" — not "seck x" — when working with the secant function, because it is not the seckant function.

CIX: CAN YOU DRAW ME A GOOSE?



SEVDALIZA: I USED TO TAKE ART LESSONS, BUT HAVE STOPPED. I PROBABLY SUCK NOW. HOW CAN I EASE BACK INTO ART (GRAPHITE FOR NOW)? ARE THERE ANY EXERCISES YOU RECOMMEND?

Watch YouTube tutorials! They will help you remember concepts like value, tone, and perspective. Drawing/shading cylinders and spheres is always fun, but it gets boring pretty quickly, so I always prefer to work on something challenging, then when I meet a challenge in the drawing that I struggle with, move off to some other paper and practice, either with YouTube tutorials or on my own. And remember that every artist has hundreds of bad drawings in them, and the only way to get them out is to draw them. Also, I doubt you suck.

A CUTE ANGLE: HOW ARE YOU? HOW IS YOUR DAY?

I am well thanks! My day is decent, although I am not looking forward to driving home in the snow.

TERRIFIED: WHAT'S YOUR FAVOURITE BITMOJI OUTFIT?

The bulldog t-shirt.

ANON.: WHAT'S YOUR FAVOURITE EVEN PRIME THAT IS GREATER THAN 4?

Umm ... blue raspberry?

No, wait ... Optimus!

Wait ... I got this ... it's HEX FF0000, which is significantly greater than 4, is red, and red is a primary color

WHILD: DO YOU OWN A MOTORCYCLE? WHO IS YOUR FAVOURITE SUPERHERO?

Motorcycle? No. Why do you ask? ☺ But I bet I'd look really cool on a Harley. Maybe in a gang of Hell's Angles. My gang name would be pi-by-13. But my adjacent angles would call me pb-13.

Favourite superhero? My mother. But since you probably mean from comics or movies, Thor is my top pick, followed closely by Wolverine, Punisher and Groot, in no particular order.

IRENE: WHAT MOTIVATED YOU TO TEACH AT THE UNIVERSITY YOU STUDIED AT?

It has actually been a dream of mine since I was in grade 12 to teach math at Waterloo. I came here for my undergrad because ... hello! MATH! Where else would I want to go for that? But the dream to teach here actually came first.

QUANTUM GOOSE: WHAT JOKE/VISUAL GAG ARE YOU PROUDEST OF?

That's like asking what student I am proudest of. Oh, no, wait. It isn't like that. I taught my son in grade 11 math, grade 12 Advanced Functions and grade 12 Calculus and Vectors, so ... yeah. Ok. I once taught an entire class with a chair on my head because I thought the topic was really important and I wanted the students to remember the lesson. Then I spent the rest of the day with Chair Head.

**mathNEWS isn't a cult.
We just lure people in
with free pizza and trap
them in our office. Come
by to get a taste!**

A mathNEWS CULT LEADER EDITOR

WHAT STUDYING MATH HAS TAUGHT ME

profTHOUGHTS 139.2

“When am I ever going to use this? What is it good for?”

As a high school math teacher for 15 years, this is one of the most common questions I received. When I began lecturing at UW, I was surprised to find that I still sometimes get asked variations of this question. I suppose it’s a good question, if the idea is that at some point someone will say to you

“Determine $\int_{\pi}^{\sqrt{13}} 2xe^{3x^2} dx$, and have your answer on my

desk by 5pm today, and don’t get any funny ideas about using WolframAlpha!”

Because the truth is, that rarely happens.

I often give a joking answer, and say flat out, “You won’t,” and then go on a rant about how math doesn’t need to be good for anything, because it is just *good*. Nobody ever stood in the Sistine Chapel, staring at the ceiling, asking what it was good for! They just appreciate the inherent beauty, because it speaks to their soul. Math is the same.

I think that’s a perfectly good answer, to be honest. But in a more serious light, I find the answer to the question is actually another question: “When are you *not* going to use this?”

Of course, there are direct applications of many branches of math. But those tend to be very specific, and these days depend heavily on software to do the heavy lifting, so I tend not to think of those. Instead, consider that football players perform bench press as part of their training, to the point that the ability to bench press 225 pounds for as many reps as possible is tested at the NFL combines. Yet not once have I ever seen a football player perform the bench press during a game. Why do they do it then? Couldn’t they just practice the skills they will *actually use in a game*? I can promise you that at no point during a football game does a player think “oh, this situation is just like bench pressing 225 pounds — I will apply that same skill now.” And I imagine there are very few football players who complain while lifting weights that they will “never use this in real life”. Of course, we know that the reason they train the bench press is that it increases strength and power, so that when the time comes that they need it, it will be there without consciously calling upon it.

Studying mathematics is the same. Math teaches so much if we are awake to the lessons. Here are some things I have learned, continue to learn, and apply regularly from my math studies, along with some examples of how they have impacted me personally.

SCALE SIMPLE SOLUTIONS TO SOLVE LARGE PROBLEMS

It is almost always the case that large problems can be effectively solved by breaking them into smaller problems, or by developing scalable solutions to simpler problems. For

example, about 3.5 years ago I decided I wanted to learn to draw, so I took a piece of white printer paper and a mechanical pencil and drew a superhero-esque muscle man. It sucked. Like a lot. But I was not discouraged in the least by that. I was fueled by it. Why does this suck so much? I know how I want it to look, why can’t I make it look that way? I was excited by the fact that I could recognize how much it sucked, and by the prospect of working to slowly strip away the suckness. I spent hundreds of hours, solving small problems that were contributing to the suckyessence, and slowly scaling them up. Want to draw a heavily muscled arm? Learn to draw a cylinder. Then learn to draw little cylinders that lie on the main one. Then learn to draw “twisted” cylinders and tubing that changes diameter as it twists. Learn anatomy. Now put it all together. I intuitively understood platonic solids and how they interact with and reflect light. I applied these understandings to understand the types of skills I needed to hone with the way I held and manipulated pencils. I started looking closely at things I never paid attention to before. I still do this, and at no point during this process do I ever consciously say “Oh, that’s just like <fill in math course here>”, but at every point I feel *exactly the way I feel when I am working on difficult math problems*.

BEING RIGHT ALSO MEANS PROVING YOU ARE

Math is really never about just “getting the right answer”. It’s about *proving* that an answer — or a result — is correct. The emphasis on proof is critical. In the real world, being right is rarely enough if you can’t convince others that you are. Careful, methodical, and audience-appropriate explanations are invaluable in this regard. Developing and writing proofs in mathematics is as much an art form as it is a science (perhaps even more so), and my studies in mathematics immeasurably improved my approach to constructing an audience-appropriate argument or explanation. This has had a profound impact on my communication skills, as well as my approach to confrontation. I have used this skill in more ways than I can list, but some examples are: when I worked as a negotiator for three consecutive collective bargaining agreements, when I deal with sales people when buying big-ticket items (and even when I bargain at markets), when I find myself moderating arguments between friends, family, colleagues or students, and when I used to work as a personal trainer and had to motivate and justify the kinds of exercise and diet choices I wanted my clients to make. In every single one of these situations, and more, I am really constructing proof. In fact, I would say that proof dominates almost all my communication.

EMOTIONAL ATTACHMENT TO A BELIEF IS IRRELEVANT

Not wanting to be wrong about a belief, especially if it has been long-held, is normal. It is, however, illogical and possibly even dangerous in the face of proof to the contrary. Mathematics trains us to seek, understand and ultimately accept proof on its own merit, and not on any emotional yearning. It also trains us to be grateful when proven wrong, since it makes little sense to want to be wrong for even one

moment longer than necessary. My training in math has led to a much more open-minded approach to new thoughts and ideas, and after careful consideration — which involves listening to argument dispassionately, asking relevant questions and weighing evidence — I find myself either happily embracing a new thought, or else more confident in the one I already had, having had the opportunity to test it rationally against a differing viewpoint.

CREATIVITY AND MATH ARE NOT MUTUALLY EXCLUSIVE.

Not even close. Deep study of mathematics reveals and refines a strong creativity that aligns with and is mutually supportive of logic. This fusion is relatively rare, and people who have it are prone to what seem to be exceptional accomplishments. In truth, the exceptionality of it is not the accomplishment itself but the relative scarcity of people who can do it. One of my favourite examples is Leonardo da Vinci, who most people think of as a great artist, but who was also an accomplished mathematician and scientist, and who did not consider these as separate pursuits or modes of thinking. I find the same is true in my own life, although there are many people who wonder how a mathematician could be artistic.

CLARITY LIVES JUST ON THE OTHER SIDE OF CONTEMPLATION

The journey math students regularly take from being completely mystified and often intimidated, to understanding and comfort is a lesson in overcoming that serves us well in all the challenges the future can bring. It instills a confidence that says, "I may not understand this right now, or even feel like I ever could, but I know I can do it." General wisdom suggests that "easy" might seem gratifying in the moment, but true satisfaction comes from overcoming a challenge. Many people shy away from challenge for fear of failure, but studying mathematics teaches us that we can tackle large problems, even if they seem overwhelmingly daunting at the outset. An example that makes me laugh is the time I purchased a large and intricate piece of exercise equipment for my home gym (a functional trainer/smith machine combo). I bought it used, so it did not come with any assembly instructions, and perhaps embarrassingly, it didn't occur to me to use Google. When I picked it up the seller had already "helpfully" disassembled it into n pieces, where n is large. I was completely baffled at how to reassemble it when I got it home. But I was not daunted. I laid all the pieces out on the floor, shuffled them around into sensible groups, and slowly assembled sections that made sense. I made mistakes and discovered them when they led to chaos. I backed up, took a different approach, and eventually put it together. The process was not "clean" — I hurt my hand trying to brace a nut while tightening a bolt, and cursed myself for not taking the time to get a wrench to hold it in place. But the result looks like it was assembled by a pro. I've had it for many years now, and it still works perfectly. I am fully aware that my engineer friends would consider this a trivial exercise, but for me it was a hard-fought and well-earned victory. This type of approach has stood me well time after time.

YOU DON'T ALWAYS HAVE TO SEE THE WHOLE PATH TO THE GOAL

How often have you been working on a difficult proof or problem, not really knowing if you were getting anywhere good, nevertheless continuing to take small, logical steps — always forward, occasionally pausing to reorient yourself to see if the direction made sense — when suddenly you found yourself having completed the entire thing? Some mathematicians call this the "follow-your-nose" principle of proof. A leads to B which leads to C etc. This might be the most important lesson of all. If you have a long-term goal that seems incredibly distant and perhaps overly ambitious, consider that if you just point yourself in the right direction and take small steps, occasionally reorienting yourself, you do eventually get where you want to go. Plus, the journey is so rewarding. In my life I have used this principle I learned from proof over and over and is in fact how I ended up lecturing at the University of Waterloo, something that has been a dream of mine since the 12th grade.

And that concludes my very long answer to the common question! I hope you found something of value.

Rich Dlin

NEW MATH BUILDING TO BE SHAPED LIKE MC, BUILT IN EXACTLY THE SAME SPOT AS MC

WATERLOO — The University of Waterloo Board of Governors announced today their plans for the long-awaited new mathematics building, intending to "respect the long heritage of the Mathematics faculty here at the university by making the new building exactly identical in every conceivable way to MC."

The Board made clear that no expense would be spared during this reconstruction project. Millions of dollars will be spent on concrete to ensure no natural light reaches the interior of the building. The size of the lecture hall desks will be made completely accurate to their original size: 2 inches wide.

The plan received mixed reception from students. "Isn't this just demolishing MC and rebuilding it again?," said one student. Another student weighed in, "Wait, why are they even doing this? Is this just saving space for another Engineering building?"

As for when this new building would be operational: "We learned our lesson from SLC. This is going to be done in like 35 years."

THE mathNEWS STYLE/SUBMISSION GUIDE

We've gotten a few articles lately that have given the editors a hard time, so I thought I'd take the time to define some best practices. **These are not hard rules that must be followed.** They are suggestions to make the lives of the editors easier, and ultimately make a better paper. So without further ado:

GIVE US AS LITTLE LATEX AS POSSIBLE

Many people think we use LaTeX to build **mathNEWS**, which admittedly is a reasonable assumption since we are about math after all. However, as the majority of our content is text, we have been using Adobe InDesign for nearly 6 years. LaTeX should be used for individual formulae, not for entire articles or your authorial sign-off.

USE THE WORDPRESS

Email and physical submission of articles will always be accepted, but if you write articles often, please submit via Wordpress. It is the easiest platform for us to proofread and organize submissions. If you do not have an account on the **mathNEWS** Wordpress, send an email to mathnews@gmail.com and we will create one for you.

SAVE AND TAG YOUR ARTICLES

All articles submitted through our Wordpress should be saved as drafts and tagged with that issue's tag in the format `v###i#`. Tagging helps us identify which articles are completed and intended for an issue, rather than abandoned half-finished drafts.

ARTICLE LENGTH

We prefer articles to fit on a single page. This is equivalent to a word limit of roughly 850 words, not including title and author sign off. We occasionally allow multi-page articles, but usually only for **profTHOUGHTS** articles and other significant articles that deserve the extra space.

FORMATTING

The **mathNEWS** issue template supports a variety of rich text features such as subtitles, headings and sub-headings, lists, footnotes, quotes and more. For the most part, just format your article the way you want it to look and we'll figure things out.

SPECIAL FORMATTING

The look and feel of **mathNEWS** is ideally consistent across all submitted content. Unless there is an extremely good reason for it, we will not allow special formatting like custom fonts or right-aligned text. Small requests such as the location of an image are often fine. Other formatting requests we will honour are ones concerning poetry or blocks of code.

SUBMISSION DEADLINE

Articles and other submissions should be completed with all edits by 9 AM Eastern the Tuesday after production night. Building an issue of **mathNEWS** is a time consuming process, and we have less than 48 hours to do it in order to ensure the issue is printed on time. As such, if you submit an article or edit your article after the deadline there is no guarantee we will be able to get your submission into that week's issue.

WHAT mathNEWS WILL PRINT

To summarize the purpose of **mathNEWS** as defined in our constitution, **mathNEWS** exists to do 3 things. First, inform readers about events put on by MathSOC/FEDS/Faculty of Math/University of Waterloo/etc. Second, entertain readers through a variety of media, in a humorous or serious, fictional or non-fictional manner. Third, provide a platform for students of the Faculty of Mathematics to express themselves.

We will print your comics. We will print your artwork. We will print your political editorials. We will print your movie reviews. We will print your poetry. We will advertise your campus event. We will advertise your co-op info session. We'll print nearly anything, really, with only a few exceptions.

WHAT WE WILL NOT PRINT

The main constraints on what we will print are either determined by legal issues, or by the fundamental nature of **mathNEWS** as an official Math Faculty publication. We will not print anything that risks legal ramifications, most commonly copyright issues or defamation. We will not print anything that is not relevant to undergraduate Math students, such as events put on by other faculties. Despite what many local start-ups seem to believe, we do not do paid advertisements (it's only ever companies with names ending in .ai somehow). Apart from those, we will screen your content to catch anything unnecessarily offensive or low-effort.

swindLED

**We crowdsource articles
in exchange for pizza.
It's a damn good deal,
until they make you
Editor.**

A DISILLUSIONED **mathNEWS** EDITOR

profQUOTES 139.2

MATH 138: PATRICK ROH

- “ I know what you're thinking. I can read your mind.
- “ When you're on tinder and you meet someone nice and you say you study calculus and they go “what the heck is that?” What do you say?
- “ Hopefully this makes sense, and Professor Roh isn't completely crazy.
- “ If someone walks up to you on the street and says “functions are integrable”, you have my permission to smack them across the face.
- “ You'd need a pretty good knife to cut up a point.
- “ Your prof probably said you would need this again and you went “naaaah”.
- “ It's back! Like the stalker that will never go away...
- “ None of you remember? Who's your 137 profs, after class they're getting a beatdown for not hammering this into you!
- “ On the next episode of 'Game of Calculus', we'll learn part 2.
- “ What did your profs say? Epsilon-delta proofs? *mouths 'motherfucker'* You didn't see that...
- “ Anyone like arcsin? Ok, nobody put their hands up because we're reasonable human beings.
- “ I love polynomials! And I don't like trig functions. Don't tell anyone I said that.
- “ People don't like cos functions. They're 'cos-icsts'. Racists to cos.
- “ If you don't know what else to do: draw. Get an Arts degree! No, wait.
- “ Now don't go and smoke a bunch of pot over the weekend and forget everything I just said.
- “ Oh, I forgot C! AHHHHHH!!
- “ You know how to factor this, right? Just checking. We have a new government, they don't believe in education apparently.

MATH 138: JORDAN HAMILTON

- “ The b's cancel out and make 0, which coincidentally is the mark you'd get if you did this on the exam.

CS 136: ALICE GAO

- “ Usually I listen to country music, but a student recommended 'Banana Man' and it kind of grew on me.

MATH 148: LAURENT MARCOUX

- “ I'm going to let you all feel really good with easy examples, then I'm going to crush your heart. In more ways than one.
- “ If we're captured by the enemy, we know exactly what to do: we give them our name, rank, serial number, and the definition of continuity of a function.
- “ I say it's not a great theorem — well, it's a good theorem, I think it's great. I'd love to have my name on it. I don't! I'm not bitter about it, mind you.
- “ Suppose that we're given a β . We don't know where we got it from. Maybe our dealer gave it to us. We've got a pretty nerdy dealer.
- “ We better put that beer back in the fridge.
- “ It's great, but not wonderful. Kinda like what my wife says about me. I think she prefers the Fundamental Theorem of Calculus.
- “ There is no substitute for the substitution rule.
- “ We're getting an extreme amount of value out of this Extreme Value Theorem.
- “ I really suck at integration.
- “ On the exam, if you have any extra time — like that's going to happen
- “ I sound like a rapper. "What was u?"
- “ Once you accept to Axiom of Choice, you've got some big apples to worry about.
- “ But if you don't accept it, then there are no vector spaces or bases, and life isn't worth living anymore.
- “ There are some people who don't accept it. We just keep them in the corner and laugh at them.
- “ The constants don't impress us much. We're a bit like Shania Twain that way.
- “ Now we've ended up right back where we started. Or have we? Yes we have. Oh, no we haven't!
- “ Apparently, I want to do one more. Dang!
- “ It's the ghost of Professor Willard!

MATH 138: RICH DLIN

“ Really, just small chuckles? I made a joke about pee!

MATH 146: ROSS WILLARD

“ You cannot just pull facts out of your ass and say “You know what? I declare that this cannot happen.”

“ I will ask you what linearly dependent means, and you will all obediently say, “Well, sir, the definition is...”

“ Do you agree with me that this is what you'll get? ... Your job is to nod your head obediently at me.

“ We're all worried there's a vector space with 2 bases of different cardinality. We've been losing sleep at night for weeks, and we're this close to just packing up and giving up on mathematics.

“ You should all be worried that I haven't proved this yet, but do not worry. You will suffer through the proof.

“ We can prove this. In fact, I will prove this if somebody offers me \$250.

“ I will, from now until the end of the term, bash Western repeatedly.

“ Did I ever tell you why I bash Western? No? That's because there is no reason.

“ Ah! This is child's play!

“ I think Western students can do that.

“ You all know what this mean right? You are not students from Western.

“ You learn this in kindergarten. Students at Western *might* learn this in grad school.

“ Western is known for its, well I don't know, relatively wealthy students — and relatively vacuous brains.

“ Just to be anal about it, you all know how much I love to be anal...

“ I have EYES!

“ And now I look with my eyeballs at yonder equation... and I see with my eyeball that at least one of the scalars is nonzero. This contradicts something.

“ Does anyone know the theorem? Because I don't.

“ I should apologize...but I won't.

“ This is only a problem because of the magic of subtraction.

“ At Western, hands will go up — “uh, sir, can you explain that?”

“ Do you have any other questions you would like to inflict on me?

“ As 3 exists...in my mind...as an intention...

“ I put on clean clothes today!

“ Let's do something spicy.

“ If p was 0, then p would actually be 1. This is important for cultural development.

“ I should have skipped highschool. It would have been better for me!

“ Size matters.

“ [on linear combinations] Western students would be trying to parse, “What chemical compound is $0 \cdot v_1$?”

“ If you're at Western, you give up now.

MATH 136: DAN WOLCZUK

“ The dot product is NOT MULTIPLICATION! Whenever you do dot product, you MUST. WRITE. THE DOT!

“ Give me a second, I have to tie my shoes. (Ties shoes.)

“ Did you just say 'times'? (Sobs.) I'm going to have nightmares.

“ Do I say the words 'MATH 235' a lot? It's because it's an awesome course.

“ I'm going to take off so many marks. you're going to be back in kindergarten.

“ (Asks class) Yay? (Class half-heartedly says 'yay!')
ALRIGHT!!!

CO 353: CHAITANYA SWAMY

“ At least [the midterm] isn't on the 14th!

MATH 148: ZACHARY CRAMER, TA

“ You'll have to get a copy of **mathNEWS** and take a look.

MATH 148: ANTON MOSUNOV, TA

“ I'm not so fast as Marcoux. I can't write that fast... and I'm not as good looking.

“ Don't trust WolframAlpha because WolframAlpha is wrong.

MATH 146: JUSTIN LAVERDURE, TA

- “ It's like proving every poodle is a dog. You don't need to prove it, it's just true.
- “ You'll use these facts every day of your life. That's how you're gonna meet your wife.
- “ Do you guys remember the Pigeonhole Principle? It's about animal abuse.
- “ Animal abuse is okay if you do it in math class.
- “ I'm full of shit. Don't listen to me.

CS 146: BRAD LUSHMAN

- “ It's update time.
- “ If it weren't for C++, we wouldn't have this problem.
- “ What is a book? I don't know.
- “ [on memoization] But more importantly, if I just call it memorization, I lose the opportunity to make up a word.
- “ But that shows a level of commitment to the postfix operator that is downright unhealthy.

CLAS 104: DAN HUTTER

- “ Taco Bell is not good food. You don't buy it, you rent it. But that's a story for another time...
- “ Titanic was too long and boring. I wish the ship would just sink faster.
- “ In Titanic, Rose wins. DiCaprio dies so she doesn't have to marry him.

HIST 111: TROY OSBORNE

- “ You won't find this interesting. But you should read it, suffering builds character. We'll be better people in the end.
- “ Did you know we only have one kind of banana? I guess I don't need to eat a banana, screw bananas.

PMATH 340: MICHAEL RUBINSTEIN

- “ We're still at 1, which is kind of a miracle. Praise Apollo.
- “ *after writing down Wilson's Theorem* Every time I write that down, I always imagine Tom Hanks running after that ball, calling Wilson's name...
- “ All these numbers buddy up... just like what happens in real life.

PMATH 352: MICHAEL RUBINSTEIN

- “ Please don't drink and derive.

MATH 136: MUKTO AKASH

- “ What is a vector? *a cereal* ...It is, I didn't think of that one.
- “ When I say obviously, it's not that you should be able to see it, you should just... be able to see it.
- “ You take a pen, you take a pineapple, and you put them together, you get a pineapple pen.
- “ This variable K is already used. You should pick a different letter, or you could use a symbol of a banana. Just not K.
- “ I'm a poor artist. Financially poor and artistically poor.
- “ There's like 4 light settings. Which one seems better? I feel like an optometrist.
- “ He's a, what, 500 year old man? He's a young guy!
- “ As a great philosopher once said, "Ain't nobody got time for that".
- “ If you didn't get this solution, one of us is wrong and I don't think it was me.
- “ If you see a puddle with matrices in it, row reduce them.
- “ I had a friend in high school that proved $0=69$, then he got a 69 on the paper. We had to tease him, he got a 0 on the paper!

PMATH 334: BLAKE MADILL

- “ The subgroup test almost killed me, but this is fine.
- “ I'm from Manitoba, so curling is our favourite sport.

CO 789: DAVID JAO AS SUBSTITUTE

- “ [referring to Ajtai] Why do we have to have proper pronunciation at all? We don't do this for Chinese names. For example, if we do the proper Chinese pronunciation 张 we don't know who we are talking about. But if you say "Zhang" (in an English pronunciation), everyone knows. I guess we only do this for Hungarian games.

Send more profQUOTES.

THE ENTIRE mathNEWS READERSHIP

JOB ID: 96420 — SOFTWARE APPLICATION ENGINEERING ANALYST BIG DATA SCIENTIST MACHINE LEARNING INTERN CO-OP QUALITY ANALYST

Telsa Electric Solutions - Tweed

Work Term: 2019 - Spring

Job Type: Co-op Main

Job Title: Software Application Engineering Analyst Big Data Scientist Machine Learning Intern Co-op Quality Analyst

Employer Internal Job Number: 8476

Number of Job Openings:

Job Category (NOC): 2173 Software Engineers and Designers

Level: Junior | Senior

Region: Tweed - ON

Job - Address Line One: 1 Innovation Drive

Job - Country: Canada

Work Term Duration: 4 Month work term

Job Summary: Situated in the Top Startup Locale, (the *New Silicon Valley*), our company is based out of Tweed, the next hot tech hub in North America. Our creed is Innovation, and we Live, Eat and Breathe it.

Will the names of your children be Cloud, AI, and Blockchain? When you close your eyes at night, do you count lines of code? Are you sad when you finish a feature because you lust to write more software? Can you use cutting-edge technologies to accomplish bleeding-edge tasks? IF SO, TELSAS IS LOOKING FOR YOU!

Telsa was founded by a group of forward-thinking University of Toronto Entrepreneurs in 2018, who believed in the power of leveraging electricity to power blockchain-enabled internet-of-things applications to enhance the productivity of everyday workers in big tech.

Here at Telsa, we believe in working hard and playing hard. We host weekly team-building events: join us in employee barbecues, make some new friends at our corporate retreats, and test your Super Smash Brothers skills in the employee lounge. We're always looking for new challengers! In addition, our workplace features catered Bubble Tea on Mondays.

[editor's note: Melee or Brawl tho??]

JOB RESPONSIBILITIES:

You will be responsible for maintaining the entirety of our enterprise grade software solution, Telsa Sigma. You will write code for the front-end and back-end of our stack. In addition, you will research new potential avenues for utilizing electricity to power our AI Engines. There is plenty of opportunity for innovation by prototyping new software using the latest technologies that could evolve into a real production application. Be ready to learn technologies and take full responsibility during the entire process of bringing your software to life; help is offered when needed.

As we are a diverse, multifaceted team, you will also be required to take part in our marketing division, managing our various social media accounts on platforms such as LinkedIn, Twitter, Facebook, Reddit, Instagram, and Tinder. As we are a dynamic company, our social media accounts must be active ²/₄, and you will assist in making our company's image a reality.

REQUIRED SKILLS

- Minimum 3rd or 4th year Computer Science or related degree
- Must be a Python Ninja, Java Genie, and HTML Hero
- Deep understanding of R, C++, C#, C, C--, C*, D, Machine Language, JavaFX script, JavaScript, Ruby, Unity, Unreal Engine, Fortran, PHP, swift
- Ability to work in a team
- Ability to work alone
- Ability to communicate
- Ability to complete tasks in a timely manner
- Knowledge of Object-Oriented Programming Principles
- Assets include some knowledge of Racket, MATLAB, and LaTeX

ADDITIONAL APPLICATION INFORMATION:

Compensation: \$15/hr

As part of our application process, please create and submit a Plum Profile via this link: <http://bit.ly/...> **This will help us determine if this position is a fit for you and help us ensure that you will be happy and fulfilled. If you have already created a Plum Profile, simply click the link to enter your Plum login credentials to associate your Plum Profile to this application.**

YOUR DEFINITIVE GUIDE TO GETTING A DATE THIS VALENTINE'S SEASON

What's up, you oedipal motherfuckers? By the time this article reaches your fresh, virgin eyes, it'll be Friday February 8 at the EARLIEST! You know what that means? THE DAY OF RECKONING IS ONLY A QUARTER OF A LUNAR CYCLE AWAY! Awooooooooooooooooooooo!

Listen. I know my audience. I know you. Who you are. I see all, hear all, *know* all that goes down in these hallowed halls. And what do I know? There's a crisis. Of massive, ginormous, *fucking cyclopean* proportions!

A crisis... of love. Or, perhaps more appropriately, the lack thereof.

But you know this too. I do expect some modicum of intelligence from my readership, after all. I'm not here to bombard you with the facts 'n' stats — if you're such a keener, just give a call up to the nice folks at StatCan and they'll give you the rock-bottom, dirty-dougie lowdown on the numbers. Anyway, the simple fact of the matter is this: Valentine's Day is coming up real, *real*, soon. And yet, almost *no* UW mathie has got a hunny to share it with! *FUCK!* It's a goddamned Sophoclean tragedy I say! I can't take it anymore! If I'm not absolutely besieged by the sight of couples doing cutesy, saccharine, tooth cavity-causing shit ALL DAY next Thursday in MC, I'm dropping out of this miserable, loveless shithole to live as a hermit rummaging for 'shrooms in the woods of Muskoka. You have my word.

I'm not just invested in this to fulfill my own debatably voyeuristic tendencies. I do have a heart, you know. If you're one of the unfortunate many who longs, without end, for a romantic sweetheart to call your own, to take care of you when you're at your lowest, to lift up your soul and love you unconditionally — I feel for you. I really, really do. And I wanna help you — just follow the instructions in this guide and you'll snag yourself a hunny, just in time to avoid being crushed by debilitating, existential loneliness next week! I swear on the rotting corpse of my grandma, six feet under in the wheat fields of Bavaria.

Without further ado, I present to you: Finchey's Definitive Guide to Getting a Date this Valentine's Season.

1) PROJECT CONFIDENCE.

This is the most important step. You know that dumbass meme, "just b urself"? I hope you know its LIES. ALL LIES. It should be, "just b urself, but like 10x more confident". Can never have too much confidence, I always say.

"But Finchey!", you protest. "I don't know where to get this confidence!" Yeah, I'll concede to that. Unlike pecans or almonds, confidence doesn't grow on trees. Just like peanuts.

But, ever heard of "fake it til you make it"? It's gospel truth; word of God. A motto to live by every day. So fake that confidence first, and the rest will come with time. How do you fake confidence? Easy. Just copy people who are confident themselves! Like car salesmen. You ever seen a wimpy car salesman? I thought not. Thrift yourself a suit from Value Village and hang around the Economy Lube on Weber for a couple of hours (to get the car smell on you, obviously). You can thank me later.

This step should only take one afternoon. Don't dally!

2) BE DIRECT.

It's now the weekend. With the irresistible pheromonal aroma of motor oil on you, you radiate with self-assurance and sex appeal. Everyone turns their head when you walk by. You command their attention; you are a show-stopper. People who knew you now see you in a different light... including that one special hunny-in-waiting who you've always fancied, but could never get the chance to talk to. Perhaps it was because you lacked the courage in a past life. But, my dear reader, with your pre-loved suit and newfound confidence in tow, you have a new lease on fate. It is YOU who now steers your destiny! Let not the shackles of who you *once* were bring you down, for if you have heeded my instructions so far, you have undergone a metamorphosis of immeasurably Kafkaesque proportions.

Like a roach, spread your wings and fly without fear — the moment is yours to seize! Do not waste your time! What's the lifespan of a roach anyway, one week? The clock is ticking. Go up to that special one you fancy, and don't even bother trying to introduce yourself, let alone make conversation. Directly *tell* them that you have decided to go out with them (do you think you have the time for *asking*?). It would be ideal if you owned law-enforcement-grade handcuffs that you could slap onto you and your sweetheart, to further clarify your interest in a lifelong attachment with them. Nonetheless, duct tape, or even a firm grip around their wrists, will work well too. And by the way, congratulations on your first relationship milestone! Already holding hands — it's so sweet and adorable, I want to vomit.

Don't worry if your hunny doesn't seem to match your enthusiasm. They're just flustered! It's not often that someone comes along who's as direct and honest about their wants as you. Such admirable qualities that are unfortunately lacking in today's society. But chivalry's not dead yet — all thanks to you, my little Casanova.

3) GO ON DATES — THE RIGHT WAY.

It's still the weekend of the 9th–10th. The moon will be in its waning crescent. Less than seven days til the Day of Reckoning. My sources tell me that most couples become "official" by at least three months into their relationship, or

roughly after ten dates. **You do not have this time.** Ergo, you will have to go on approximately two dates *per day* if you wish to be all caught up by the 14th. With so little margin for error, you do NOT have the option to fuck any of this up. Keep the following tips in mind to guarantee success over the next few days:

- For the first date, go out for coffee. It's a tried-and-true technique that never fails. Since it's so low-key and chill, it's a good way to ease into some light chit-chat and show interest in your hunny. Hell, you may even want to ask them things like, "What's your name?" — trust me, they're sure to appreciate your efforts to go beyond the surface and *really* get to know them.
- After the first date, you've got more freedom in where you and your sweetie choose to hang out. Show off your adventurous side and have spaghetti 'n' meatballs at East Side Mario's while wearing a white t-shirt. Better yet, take your partner out spelunking in the city's underground sewer system, all the while monologuing about how it's always been your dream since you were five years old to be Leonardo from the Teenage Mutant Ninja Turtles (blue was your favourite colour, after all). Anything that shows off how fun-loving, exciting, and unique you are.
- In the short periods of time between your dates, you'll want to maintain constant — and I mean CONSTANT — online contact with your partner. If you're not giving them a play-by-play, accurate to the millisecond, of every goddamn shit you take while you're on the loo, then it's just not love. Forget about sleep as well (if you think you might have trouble with this, make sure you go to the Math CnD for your first date and buy their whole inventory of those caffeinated chocolate bars. Orally administer one per hour or as needed. Or just shoot up ground-up modafinil mixed with water up your arm, I don't really care about the particulars).

This step takes the longest of all, all the way to Valentine's Day. It won't always feel easy. It might take a lot out of you. But, my dear reader — with great patience and persistence comes great reward.

4) JUDGEMENT DAY

The clock strikes 11:59 PM on Thursday, February 14. A great pang suddenly seizes your 13-chamber cockroach heart and you fall off a couch with a muted crash onto the floor, surrendering yourself into the warm and velvety embrace of the MC Comfy carpeting. You were on a date with your hunny. Your true love. The light of your life.

They call out your name, but you can already tell you're too far gone. The world swirls into nauseating spirals in front of your eyes as it grows darker and darker. A familiar, lovely voice cries out far away in the distance, but it's so indistinct and muffled,

you can't make anything out. *Is this what it's like to drown?*, you think. The only thing that really strikes you is the pervasive odor coming off your suit jacket that you haven't washed since you bought it from Value Village: a combination of B.O., raw sewage, dead old man smell, and the interior of a dodgy auto repair shop.

A pair of hands grab, then shake your shoulders as you lay prone on the ground. A face appears before you. It's them. It looks like they're saying something to you, but you can't hear anything. And what's this? They're crying too.

What a sight. It hurts. So much has happened in the past week, you can hardly believe it yourself. Just last Friday were you as down on yourself as usual, on the verge of giving up hope of ever finding love in this mortal life. You thought you couldn't be saved. But then came along a peculiar little article in your favourite biweekly student-run Faculty of Mathematics publication. You thought the author, "Finchey" or whatever, was out of their fucking mind. First off, who the hell cared so much to write such a long piece when they could've saved three hours by writing a half-column listicle that would've gotten the same jokes across anyway?! But you digress. Although the author's purported "advice" was clearly ridiculous when taken at face value, you thought it had some nuggets of truth hidden within it.

And so you ended up following Finchey's instructions. Down to the letter. *So what if it amounted to nothing?*, you thought. At that point, you had nothing to lose.

But now, you do. They're right there — the person weeping right in front of you.

Your vision grows blacker and blacker. You only have seconds left. Summoning the remaining iotas of your strength, you reach out your hand to stroke away the tears off their face. Your heart's fluttering. Is it because of the caffeine? Or what you're about to say?

"I... had a great Valentine's Day with you today... I'm so happy I got to be with you... I'm sorry I never got to say this earlier... but..."

The clock strikes 12:00 AM.

"...I love you."

It's Friday, February 15. You lie prostrate in the soft carpet's caress. Lifeless underneath the light of the moon.

Finchey

13 doesn't exist.

ROB HACKMAN

A SOCIOLINGUISTIC INVESTIGATION OF AN ESOTERIC PROGRAMMING LANGUAGE

ABSTRACT

While there is a breadth of research on the *syntax* and *semantics* of programming languages, there is a relative lack of *socio-linguistic* analysis of programming languages. Sociolinguistic approaches such as Labov's variationist methodology allow one to correlate natural language variables — such as the realization of /-in/ as [-in] (Labov, 1972, p. 239), use of the intensifier "so" versus "really" or "very" (Tagliamonte & Roberts, 2005), or the presence of vocal fry (Abdelli-Beruh, Wolk, & Slavin, 2014) — with social variables, including social class, age, ethnicity, religion, and gender. Furthermore, a variationist methodology also allows us to evaluate ongoing change in natural language (Tagliamonte, 2011). However, only recently has the application of sociolinguistic principles to programming languages been probed (Naz, 2015, among others), and this study seeks to extend this research to Brainfuck, an esoteric programming language currently under-represented in linguistic research.

BACKGROUND AND RELATED WORK

Despite believing that I was very clever and original, the topic of programming sociolinguistics was previously investigated in a series of publications (Naz, 2015; Naz & Rice 2015; Rice, Genee, & Naz 2014) that analyzed the presence of keywords, operators, comments, brackets, and loops in C++ programs to find correlations between programming-linguistic variables and the gender of the developer. However, although the findings in Naz (2015) focus on future research using machine learning techniques, they neglect to comment on ramifications that this research may have in our understanding of sociolinguistic principles. Since I'm a Humanities major and not qualified to do machine learning for real (Job Applications, Nov. 2018 – Feb. 2019), this article investigates whether a sociolinguistic analysis of a programming language will conform with Labov's *principles of linguistic change*.

Labov (1972) established a number of findings that have held true for natural languages. The variationist methodology first identifies a linguistic variable — a single token that can exist in multiple forms. For example, the "-ing" suffix in English can be pronounced as [ɪŋ] (e.g. "working") or [ɪn] (e.g. "workin"). When variables undergo change, they tend to follow a sigmoidal pattern of spread in a linguistic community, with one variant quickly overtaking another until it is the dominant form used in the language. Sociolinguistics hold that this is the active mechanism by which language changes, from the smallest sound changes to major shifts in lexicon and syntax.

Sociolinguists have also established a number of sociological correlations for this kind of language change. First, we distinguish *change from above* and *change from below*. *Change from above* is where a variant is first seen among upper classes or

elites, and disperses through the middle to the lower-middle classes. These changes tend to be associated with some degree of prestige and are often a prescribed "correct" way to speak. On the other hand, *change from below* begins in the lower-middle class and spreads upwards, and is associated with a kind of *covert prestige* — change from below includes language seen as "cool." In both cases, women tend to lead linguistic change; that is, they more frequently use a new linguistic variant than men when language change is ongoing.

METHODOLOGY

This study will attempt to extend the methodology of Naz (2015) to a case study of Brainfuck, to investigate the following questions.

1. Can we identify any stylistic differences in Brainfuck that constitute a sociolinguistic variable?
2. If so, are these variables undergoing change per Labov's description?
3. In addition, do these variables obey sociolinguistic principles of change?

To probe these questions, I've opted to take a *diachronic* approach and look at change *over* time. By virtue of working with a written (rather, typed) medium, we have access to historical documents through which change in the language might be tracked. Read: I searched through old Brainfuck repositories on Github and tracked down authors' info on any linked social media platform to tabulate sociological factors related to their language use.

RESULTS AND ANALYSIS

Before proceeding, it was necessary to identify a linguistic, stylistic feature which could indicate an ongoing change in the Brainfuck language community.

And this is where I spent three hours after production night banging my head up against a wall.

I considered the stylistic variables in the sociolinguistic investigation of C++ from Naz (2015). Let's go through the features they considered and see why this was a disaster to do for Brainfuck. Surprise, this is a listicle now.

- The frequency of various keywords, primarily having to do with variable declaration, operators, and brackets. All of this is kinda out of the question for BF because of how limited the syntax is.
- The frequency of comments overall. I tabulated this, but because comments in BF are pretty much mandatory to understand anything, there isn't any

statistically significant variance from speaker to speaker.

- The type of comment tags used. I considered evaluating how users structured their code and comments: comments above the line, beside the line, in blocks or individual lines, whether code was indented or not. And then I realized that if I wanted to be manually counting tabs and spaces all night, I'd go learn Whitespace.

So here's our answers:

1. Can we identify any stylistic differences in Brainfuck that constitute a sociolinguistic variable?

Absolutely not.

CONCLUSION

Just stick to C++, it's not *that* bad.

odSzczebrzeszynu

(P.S. See you next article, where I'll be developing a critical narrative analysis of beginner Python tutorials!)

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UWATERLOO JUNG PERSONALITY TEST

I'm sure many of you are familiar with the Jung Personality Test, or at least the concept of it: A personality test, where your answers are compiled into letters that each hold their own meaning. Not that anyone knows what they mean... Anyway, today I've devised my own, UWaterloo version used to organize everyone based on knowledge and habits.

For each question, check which answer applies to you and write that letter at the bottom. The resulting series of letters describes your personality.

Q1: Where are you from?

Asia: A

Canada: B

Elsewhere: C

Q2: How do you feel about the campus geese?

They're ok: A

I'm not a fan: E

ALL HAIL MR GOOSE: I

Q3: How do you feel about dressing for the weather?

Oh, it's only -20, I can still wear shorts!: T

Woah, it's into single digits, better bundle up: U

I will never stop wearing jeans until I die: V

Q4: 日本語が話せますか?

はい私は日本語を話します: C

...wut: D

Q5: Do you do editing for **mathNEWS**?

I can barely read this book, how could I edit it: G

Yes, I commit my time to this and other useless activities like sweeping gravel roads and watering oceans: H

No, but I contributed! Look mom here I am!: I

Now, you have your 5 letter personality type, which is directly associated with who you are internally. Compare with your friends like trading cards!

HOW DO YOU OBSERVE NUMBERS?

Well, that's a strange question to ask, Sheet Musics Man. Aren't you supposed to be making fun of trombonists for being perverts or something?

JULIAN CIANCIOLO

We grow up learning of numbers as a way to denote quantity, a way to communicate isomorphisms, to count, measure, and label. But the notion of a number has changed with time, starting out only from what the modern-day mathematician would call natural numbers through a progression of centuries of new demand for new types of numbers, to our modern-day complex numbers and entire classes of number systems.

Of course, just as the notion of a number has evolved through history, so do we find variance in those very notions today. While numbers are an extraordinary tool for basically every modern academic and practical discipline, the way they are used, the purposes they are used for, and their very conceptions and behaviours behave as a function of one's background. How do you observe numbers?

In the more **concrete** parts of **mathematics**, numbers fulfill their original purpose: as some measure of quantity. These fields are or are derived from the earlier, more applicable fields of math, where numbers — and concepts — were never really all that abstract and were absolutely used to measure quantity. Geometry, statistics, dynamical systems — if not for applications in measurement, what would these fields even be about? Modern-day chaos theory is one of these too, as a still-emerging field that brings new tools to describe and measure how simple systems change in complex ways. And of course, we can't forget measure theory — measurement's in the name, after all!

Though concrete mathematics tends to regard numbers in their original purpose, **abstract mathematics** makes a quick departure from measurement and never returns. By taking properties of the numbers we're more familiar with and extending their properties into abstract number systems, fields like number theory and algebra have completely removed the notion of measurement from numbers. Instead, these disciplines observe numbers as mere objects in systems of those objects, and the loose ideas of measurement merely inform the construction of some of these systems. More interesting than the idea of using numbers for measurement is the idea of finding properties of numbers themselves; or even absconding from numbers entirely to deal with bare conceptual ideas.

From the perspective of **foundational mathematics**, though, a number is just a set. A set of what, you ask? Well, more sets, of course. These sets set up the set of all numbers, which itself is a set of sets, and the setting upon which the sets are set is the set to set all sets. Though there's more detail to get into, that's really all that needs to be said.

Arguably, the closest non-math discipline to math is **physics**. In physics, numbers do indeed fill the purpose of measurement — but only to an extent. Physicists' strange ideas about “degrees of precision” has led to the notion that there are four types of numbers. There are the normal, everyday, reasonable numbers, the ones that kids get taught in elementary school; or, if you go to Western, what you get taught about in general. These numbers — 2, 17, π — are the *small numbers*.

Then there are the *large numbers* like 3×10^8 or 1.5×10^{11} ; these numbers have the extraordinary property that when you add a small number to it, you get the very same large number you started with back! Add as many small numbers to the large ones as you like. It will change nothing unless you subtract that large number back out.

But that's not all — oh, no no no. There's an even more powerful force lurking. What could it be? What horrors lay beyond? Why, it is the *very large numbers*. These fantastically gargantuan numbers carry a truly monstrous quantity. Mutated beyond belief, they have immunized themselves against not only against addition, but also multiplication. Multiply them by any of the other classes of numbers, and you will find a truly terrifying sight to behold, as the number... resists. Cold in the face of the diagonal +, these numbers hold out.

And yet, there remains one more monster lurking in the dark, hiding out of sight. Even turning on the lights, they still remain invisible. There's only one candidate here: *extremely small numbers*. These freaks of nature, on the opposite side of the wavelength spectrum to the VLNs, not only have the ability to nullify other numbers through multiplication, they also have the very unique and threatening property of looking *different* every time you observe them. It's an unbelievable sight to behold — if you can even catch that much. In other words, go outside and take a walk; you may need a dose of reality. You don't want to go loopy from numbers.

Otherwise, you might start seeing numbers the way **accountants**, the money-mathematicians, do. It's always reassuring to know that the numbers you're working with are restricted by the filthy laws of transactions safely bounded in the comforts of reality. No ridiculousness here, no sirree. Not un— WHY ARE WE THREE CENTS SHORT ON THE LAST INVENTORY CHECK??! WE'VE HAD 3500 PURCHASES MADE TODAY AND IF I CAN'T FIND WHERE THESE THREE CENTS HAVE GONE SOMEBODY IS GOING TO BE OUT OF A LIV— oh sorry, I got a bit carried away there. Where were we? Oh right, the relaxation afforded by reality. As I was saying, it's always nice to know that nothing will ever have more than two decimal places, and that computers have been invented, so that numbers are rarely more than an alternate medium of information. It's a relief...

To a **carpenter**, the only numbers that matter are dyadic: integers and rational numbers whose denominator is a power of two. At least, those are the only numbers that need to be

expressed. If the length of the board lies between two ticks on the number line represented by your measuring tape, round up to be safe — measure twice, cut once. Mind you, the dyadics are dense in \mathbf{R} , so at least these woodworkers have more potential when taken to their limits than **engineers**, who follow a similar rounding principle, but prefer to blow away measurements by at least a factor of ten.

In the wonderful land of **chemistry** and all of its discrete glory, most numbers are integers. Atomic numbers, ionic charges, stoichiometric coefficients; all are nice, peaceful, no-decimal-nonsense integers. Positive, even, for many of them. So rarely does a number contain a decimal point, that the few that do are given special names. They think themselves quite fancy because of it, unfortunately, and have since grown quite the ego. Is that you, Avogadro's number? What's that you say, Rydberg constant? Can I get some love for Faraday's constant, or perhaps Coulomb's? And who could forget the h-k brothers, Planck and Boltzmann? \mathbf{Z} is the chemist's friend, and those numbers that do not bend to the will of Zahlen have to be subjugated with names and forced into the chemists' heads. Only then will they be able to realize what possibilities await beyond the last letter of the alphabet.

A wise **politician** once said that ninety percent of statistics are fabricated. Indeed, a cunning politician cares not about the meaning of a number but rather the personal utility it can bring. What's the difference between an "increase of 25%" and an "increase of 25 percentage points"? Doesn't matter, as long as it makes them look good. As long as these look like how I want them to, right?

Though they work in a field of math, **computer scientists** habitually recognize types of numbers not by the properties that mathematicians use but rather by their bounds. An experienced computer scientist recognizes two types of numbers in implementation: integers that follow the normal arithmetic axioms but for their bounds and floating-points which don't at all follow arithmetic axioms. Programmers know by heart that $(0.1 + 0.2) - 0.3$ is twice the value of $0.1 + (0.2 - 0.3)$ and that $32,767 + 1 = -32768$. More abstractly, though, computer scientists really only concern themselves with basic functions in their asymptotic analyses. Indeed, computer scientists are completely unconcerned with numbers themselves, disregarding their sole existence in asymptotic analysis with the justification that they're just a "hidden constant multiple."

Musicians, however, have the most interesting take on numbers. Like carpenters, musicians understand dyadics — but only up to a degree, at which point most would probably stop being too concerned with absolute precision and start approximating rhythms just like how the physicists approximate their measurements. But musicians don't only understand dyadics — the case is often made that they can understand all sorts of "simple" fractions, whether in rhythmic tuplets and compound time, or in frequency ratios in melody and harmony.

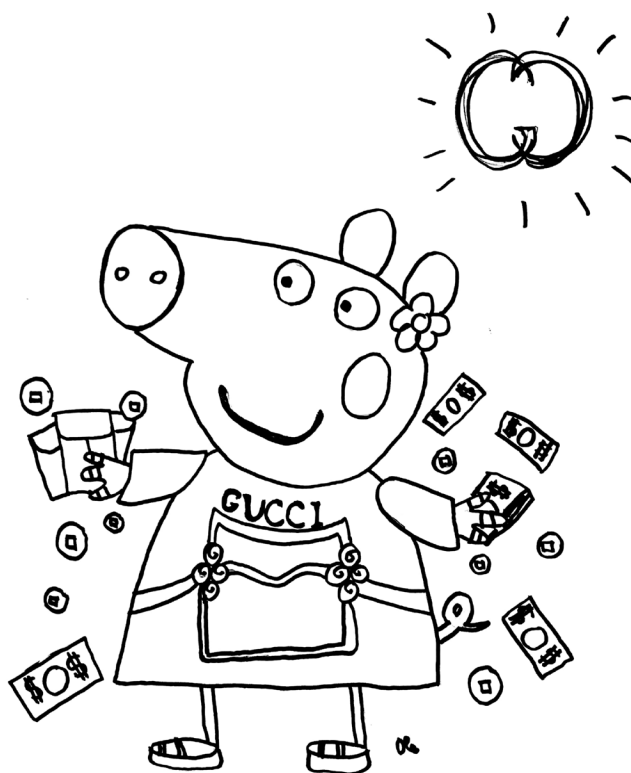
This notion of "simple" numbers extends too to how musicians "count" time: subdivisions of "simple" numbers and beat-keeping from one to four are common and easy to work with, but as soon as five or seven come up the world starts to crash and burn. Indeed, musicians consider "simple" ratios like 2:3 or 3:5 between harmonic frequencies as "consonant" or nice-sounding but "complex" ratios like 16:17 as "dissonant." Musicians are careful to ensure these ratios come out nice and precise.

Yet another complication arises, however, with equal-temperament tuning: where intervallic ratios used to be integral ratios, they now differ instead by various roots of two for which those integral ratios are... approximated by? There's no such thing as a "precise" tuning to the twelve-sevenths-root of two, and yet these strange creatures still demand precision in tuning. So in sum, musicians observe simple fractions and twelve-nths-roots of two well, but cringe at more "complicated" fractions. Interesting indeed.

This article is of course not a comprehensive summary of how all people from all disciplines observe numbers, but we have certainly noted how modern notions of numbers differ. How do you observe numbers?

dawdling, Epsilon Screwn,
The42ndRombiDodecahedron

Postscript: When consulting with [REDACTED], we learned of an entirely new perspective on the observation of numbers. His unconventional standpoint is best summarized in his own words: "I don't observe numbers. I eat them." We're still unsure of how exactly such an operation would be performed, but of course we can't dare to question his words.



HMWCAWCCIAWCCW

I'm sure you are all super smart and can determine from the title what this article studies, but for those who don't quite get, I'll rephrase this. The article you are currently reading pertains to the answer of an age-old question: *How much wood could a woodchuck chuck if a woodchuck could chuck wood?*

Seeing as I couldn't think of anything else to do, I decided to tackle the common tongue twister analytically. Math knows no rest here at **mathNEWS**, only hopeless sidetracking.

During this study, I shall from here on refer to them by their more common English terminology, the groundhog. I will also be assuming that this is your average groundhog (weighing approximately π kg and measuring around 60cm long), with no unique additions to its physique which would make tossing lumber easier for it. Based on the term 'could' used in the rhyme, I will assume that this woodchuck will be throwing as much wood as possible.

I will also be assuming that this groundhog throws the maximum amount of wood in its entire life. Groundhogs are born in March, become mature in June and hibernate in October, then come out of hibernation in February. We will assume this particular groundhog lives in its parents basement, so won't be taking any time to dig its own burrow. However, it will still need to eat, sleep and hibernate, so those will be factored in.

Subtracting the periods of maturation and hibernating, we can assume (if this groundhog dies during hibernation of its 4th year) that this groundhog will be eating, sleeping or hurling logs for a total of 29 months. But, the important question is: How much wood does that mean?

The current largest groundhog den that has been found was estimated to a total of 700lbs of dirt. Young groundhogs spend the period after their weight gain period from August to October digging their burrow for the winter. Considering that this period includes their needs of eating and sleeping, these variables will already be included in further calculations.

Assuming this 700lbs of dirt was moved over the three month period, this leads to an average movement of $233\frac{1}{3}$ lbs of matter per month. In total, we can multiply this by our 29 months of activity and receive a grand total of $6766\frac{2}{3}$ pounds of wood, moved over an average lifetime. This converts to around 3069kg. (Nice.)

However, I am not completely satisfied with this result on its own. You cannot simply imagine what >6700 pounds of wood looks like, so I need to expand this into a more reasonable measurement.

I will assume that the wood in question being thrown is Red Maple, considering it is the most populous tree in North America, the habitat of groundhogs. The density of a maple tree is about 44lb/ft³, calculating to around 154ft³ over a lifetime. A log of red maple is around 4 feet in diameter,

meaning over its entire lifetime, the groundhog could throw one log of red maple that measures about 12.25ft long. For those of us that use real measurement systems and not freedom units, that's a maple log 1.21m wide and 3.73m long.

On one hand, for a creature that's only 60cm long, that's quite impressive. On the other hand, I've seen Scottish guys throw more wood around in five seconds, just for the hell of it. So, don't go and hire any groundhogs for your next construction project. That's my warning for the week.

Still, you can't be too hard on the little guys. Look how cute they are!



Fruitboy

THE DISCIPLE

Yesterday, I was out walking on King Street. I had just finished stopping for discount winter boots, an errand three months overdue at the Payless in Conestoga Mall. I had meant to walk back southwards towards my apartment, Columbia 1. You wanna know why it's called Columbia 1? Because it's on Columbia Street. Jesus Christ, you're such a dumbass.

Well, anyway, I was out walking on King Street yesterday at 12:35 PM. I was hungry. I didn't eat lunch because I'd spent all my money — a twenty dollar bill, two toonies, a quarter, and three nickels, to be exact — on my boots. My winter boots that I had to buy since it's fucking winter right now and my feet get cold. But, you see, I'm not walking down towards my apartment, I'm walking in the wrong way, up to the northwest. I was lost.

After two hours, I crossed the bridge over Highway 85. I decided to take a break from walking. As I'm panting, nearly about to heave from the physical exertion and exhaustion, I wonder to myself:

What would happen if I just climbed over the railing here?

I'll let you know, I'm twenty-one years old and two years ago my parents took me to a bunch of neurologists to figure out

what's wrong with my brain because apparently I have no self-control and I'm really impulsive. Their words, not mine. I don't think there's anything wrong with my prefrontal cortex but when all the docs in their white jackets took a look they were all like, "*Whoooaa what the fuck is uppp!*". Again, their words, not mine. My hair's still growing out, you know. It used to be really, really long — down to my feet — but they shaved it all off. The neurologists. Anyway I have really horrible executive function, if you couldn't figure that out already from this story. So I'm on the bridge over Highway 85. Unable to inhibit myself, I'm climbing over the railing, but it's kind of high and I'm kind of tired. I stopped trying and promptly forgot all about it. Well, that's a lie — if I forgot about it, how could I remember it to tell you just now? Gottem. I restarted walking in the same direction as I always did, the wrong one.

Eventually I arrived at a three-way junction, the intersection between Lobsinger Line and King Street. I felt really bored after walking on King Street for so long (I wouldn't have been able to tell you then how long it was since I left Conestoga Mall, where I bought my winter boots, since I think my watch was snatched up by a crow at some point. They're like magpies — they love shiny things), so I was like, *Bitch what the fuck, let's just turn left here, it's not like I could get any more lost*. Which was true.

In fact, this was the first step towards my salvation.

Honk, honk, honk.

I found myself standing in front of this building, called "The Poultry Place". I duly noted and appreciated the use of alliteration.

Hey reader, I wanna ask you something. Are geese poultry? Well, I don't care what you have to say to that. I think they are, they're fucking birds right? And aren't birds poultry? Fuck you, you know I'm right. Now where was I again? I was walking west on Lobsinger Line (I appreciated the alliteration in the street name too) and then I came to this building called "The Poultry Place", all because I forgot to buy some winter boots three months ago. They're still in the plastic bag I got from Payless, by the way. I hadn't put them on my feet yet. In fact, my feet were completely bare. No socks, even — do you think I have the time to do laundry? I'm a busy man. Oh, did you think I was wearing shoes at all? Aren't you quick to judge. You're just despicable.

So I break and enter into The Poultry Place because I was hungry and I thought I heard geese and I wanted to eat them, obviously. There weren't any geese but there was also nobody there, which made me feel relieved — the cops wouldn't be called on me this time. No sir, not today! You know why, reader? Because He was watching over me.

Near the back, there was a counter with a computer on it. An indescribable compulsion took over my body; I walked over to it and turned it on with immeasurable anticipation. File Explorer opened up, showing me the Sight. And boy was it incredible! Awesome! Divine!

Thirty-nine pictures of the same goose, each rotated one degree clockwise more than the last.

The sheer dedication! The expansive cosmic potential! An unlimited intersection of the ever-expanding consciousness with the whole of Being. The revelation of the collective, universal energetic ability that emanates from us all; we are all One in the eyes of the Creator. All this I realized in that split second.

And then He appeared. The Creator Himself, physically manifested, in the mortal world. I was mere inches away to His right. He reached his beautiful Arms towards me and embraced me. My broken, battered soul was healed and I was filled with his light. I felt the hate, the anguish, the loathing, built up over a lifetime and sorrow and wandering, all wash away from my heart. The weight of my sins and vices were lifted off my shoulders, and I was imbued with a new hope for this world. A will to live and the courage to dream of better, kinder days.

The Creator retracted from me and began to walk away but not before He gave me a twenty dollar bill, two toonies, a quarter, three nickels, and a pair of wool socks.

"Buy yourself some lunch — you must be hungry, after all — and put those socks on; you'll need them for the journey home."

I was weeping. What benevolence! What grace! The Creator was fading away into the light shining from the crack of the open double doors to The Poultry Place. I called out to him:

"No, please! Don't go! Don't leave me!"

He smiled softly. "Don't worry. I will not forget you, my wayward son. And you will not forget me — let the Daily Rotating Geese be a reminder of what has transpired in this holy house today. Remember that the geese are sacred; you shall not eat them, nor despise them, nor subject them to your wickedness and taunting, but revere them as my heralds and incarnation on this planet. Farewell."

And then He was gone. Not to be seen again in this life. But today, as I rose from my bed, having returned home warm, safe, and satiated with His Gifts yesterday night, I was reminded of what happened on that fateful day when I opened up Reddit in the morning and saw it. The fortieth goose. Wishing me a happy and prosperous day in His own special way. I dutifully commented below, "thank mr goose".

I put on my wool socks and slid into my Payless winter boots, getting ready to leave my room in Columbia 1. I set out on my newfound mission to spread the word and salvation of The Creator: for He is all-powerful, all-knowing, but most importantly, especially in the spirit of the upcoming holiday, He is all-loving. He is Derpalooza.

A REVIEW OF DUCK DUCK GOOSE BY CUPCAKKE

All Waterloo students have strong opinions about our campus pests. Here we review Pitchfork's #10 song of 2018, Duck Duck Goose by CupcakKe featured on the album Ephorize. Duck Duck Goose is an anthem for all of us here at Waterloo especially in this tense political climate. We offer a breakdown of this beautiful masterpiece.

We were advised by the **mathNEWS** editors that the lyrics may count as pornography under Canadian law, so a lot of it has been redacted. You can see the full lyrics for yourself at <https://genius.com/Cupcakke-duck-duck-goose-lyrics>.

I thought I came but I [REDACTED] on the [REDACTED]

[REDACTED] hair got inches, that's weave on the [REDACTED]

[REDACTED] like a tree, it got leaves on the [REDACTED]

Bang bang this [REDACTED] Chief [REDACTED] with the [REDACTED]

Climbing on that [REDACTED], need a 10 feet ladder

I love the D, that's my favorite letter

My nudes in your phone, takin' up your data

My cakes got fatter by usin' [REDACTED] as the batter

Look down to your [REDACTED] and tell him I won't disappoint it

[REDACTED] on punishment if she miss a [REDACTED] appointment

Sloppy toppy for papi, leave sloppy Joe shook

I only call you Captain, 'cause your [REDACTED] is off the hook

CupcakKe rhymes [REDACTED] with [REDACTED] with such fluidity and effortlessness that the audience is immediately captivated.

I can make your [REDACTED] stand up (are you ready?)

Like Statue of Liberty once we [REDACTED] (so hard)

Tap the head of the [REDACTED], duck, duck duck goose

Head of the [REDACTED] duck, duck duck goose

Get that [REDACTED] up and runnin' when he [REDACTED] this [REDACTED]

Covered in all my [REDACTED], the [REDACTED] be lookin' like a goose

Head of the [REDACTED], duck, duck duck goose

Head of the [REDACTED], duck, duck duck goose

Get that [REDACTED] up and runnin' when he [REDACTED] this [REDACTED]

Covered in all my [REDACTED], the [REDACTED] be lookin' like a goose

The reference to the Statue of Liberty expresses the need for the proletariat to stand up against their oppressors. She uses reference to a beloved children's game to inspire our next generation.

[REDACTED] so wet, you could take a cruise on it

Suckin' yo neck till I leave a bruise on it

Let you eat the [REDACTED], just don't use a spoon on it

Put it in a box like you 'bout to move on it

This that submarine [REDACTED], Mr. Clean [REDACTED]

This that I'm 'bout to [REDACTED] you longer than the limousine [REDACTED]

High self-esteem [REDACTED], it's a dream [REDACTED]

If you broke, then the [REDACTED] actin' funny like a meme [REDACTED]

Easy-Bake Oven, and this [REDACTED] so similar

Touchin' yo head but ain't checkin' the temperature

Got the [REDACTED] on lock like a [REDACTED] prisoner

[REDACTED] in my [REDACTED] hair, that's deep conditioner

Through references to pop-culture, self-esteem, and self-care CupcakKe fills the room with acoustic beauty. She discusses current world issues such as how people who ignore climate change are like children messing around with their Easy-Bake Oven.

Cut the [REDACTED] off, took it home with me

'Cause any [REDACTED] that long, it belong with me

This [REDACTED] iconic, yeah it moan with me

Put your finger in the hole, come bowl with me

Let me brush your [REDACTED] hairs while I suck on your [REDACTED]

Get all the [REDACTED] out your [REDACTED], make it go
out-of-stock

Turn it into a Yeezy shirt when you rip off my top

My box already small, it don't need to be cropped

Turn double-dutch with yo' balls while I'm jumpin' on your
[REDACTED]

Tell your grandma sew my [REDACTED] since you split open
my [REDACTED]

[REDACTED] guaranteed to put you to sleep so damn soon

Ridin' on that [REDACTED], I'm readin' Goodnight Moon

Vending machine, vending machine

Can't eat it until there's money between, money between

This [REDACTED] is a vendin' machine, vendin' machine

Can't eat it until there's money between, money between

From Kanye West to *Goodnight Moon*, she expresses how in today's society, too many people are up all night instead of at home reading to their kids before bed after a long day of work. This is because of the corporate greed that forces parents to work long hours for low wages and reinforces the need for the proletariat to revolt.

We rate this song 9.9/10 because it lacks the honking that the lyrics would otherwise promise.

Sandwich Expert and Spoiled Milk

THE STORY OF ST. VALENTINE

Hey **mathNEWS** readership! I know this edition will be covering the time around Valentine's Day, so I hope you all find someone to be your Valentine (and keep in mind, it doesn't have to be a lover; it could be a friend)! I have been told, however, that some people don't know the history behind the holiday. Not only that, but I also found out that I knew less about St. Valentine than I actually did! So, time to tell you the story of St. Valentine.

St. Valentine was a Christian (obviously). However, he was a Christian in Roman times, which made him a persecuted minority. A judge was to condemn him to death for his sacrilege against the state. The only way to be redeemed in the eyes of the state was to show the power of St. Valentine's false god; he needed to cure the judge's blind daughter. St. Valentine, miraculously, found a cure, so he was set to roam free. The judge wished to convert to Christianity as a result, so St. Valentine told him to fast for 3 days and then baptize himself. Him and his entire estate were baptized.

St. Valentine was then requested to see the emperor of the Roman Empire itself: Claudius I. Claudius and St. Valentine got along well, until the subject of Christianity came about. Enraged from St. Valentine's conversion attempts, Claudius

set out an ultimatum: accept the Roman pantheon, or death. St. Valentine chose death. While in prison, it is said he wrote a letter to the judge's daughter, and this is where the romantic myths can be found at their earliest.

The Feast of St. Valentine was created by the Pope about 200 years later, in 496 AD. The feast was created to commemorate St. Valentine's story of perseverance and camaraderie. Some historians argue, however, that due to St. Valentine's obscurity, this was simply meant to take over the mid-winter Pagan festival of Lupercalia. Eventually, as bird mating season was associated with mid-February, and the previous letter, the holiday began to take on a romantic connotation. Pair that with holiday marketing, and here we are!

Valentine's Day is fun, where you get to express the love you have to give for your friends and family, eat chocolate, and wear red and pink! I hope you now know why Valentine's Day came to be.

Works cited: Wikipedia, and My Brain.

Xx_420SonicFan69_xX

**Want to write for mathNEWS? Come to the next
production night! New writers are always welcome!**

Check the lookAHEAD for the next date!

A mathNEWS EDITOR WHO NEEDS NEW FRIENDS

INKLING

Nothing but blackness. And then there was light. The blinding white brightness of the University of Waterloo's CAS login page illuminates every single filthy, rancid surface of a space that once may have been a human bedroom in another life, but now may only be likened to a rat's nest — completely fittingly, for the dark, amorphous form that sits in front of the dazzling aluminum-chassis lightbox is more murid than man. That wretched creature is me. Oh, dear reader, I once used to walk among society, among humankind. I was once adjusted. Happy. I do not remember when I began my devolution to the ranks of rodentia. I do not know whence I last stepped out of this room; I am no longer privy to the manmade concept of "time".

It does not matter to me anymore. I stopped caring for the past long ago. Yet, stirrings of hopes and dreams for my future still brew within me — they are the last vestiges of my humanity, continually dragging me down into a sea of sentimentality against my primal will like the tentacles of a large cephalopod. "Why am I here?", a voice croaks out. I whip my head around frantically, scanning the room for the intruder with my beady, black eyes like any true burrowing prey animal would. Then I realize the voice was my own — it must have been, although I can hardly recognize it as such.

I try to think about the question. I have not intelligently "thought" for eons, as I prefer to be driven primarily by base instinct. Saves energy. But this time I make an exception, and I compel myself to try. It's hard. My cranial neurons, wasting away in disuse, have probably forgotten how to fire. All those sodium-potassium pumps must be clogged or something. No problem — they just need a lil' juicing up to get going. I take a hearty swig from the vintage Pyrex coffee mug sitting beside my laptop. Swishing the mystery liquid around in my mouth like squid-flavoured Listerine®, giving it a taste before I gulp it down, I conclude it's battery acid. Pensively regarding the delicate floral designs on the translucent, white borosilicate (the mug used to belong to my late grandmother who died after falling into a well in Bavaria, *bless her soul*), I wait for the acid to kick in.

It comes to me in a fleeting vision. Something hot is beating down on my skin. The sun. I feel like I'm a deep fryer. Above me, the sky is clear and cloudless, beautifully blue. I can hear the waves of the ocean in the near distance, soothing my weary, hardened spirit. I am also surrounded by huge fuckin' piles of cash. Towers as high as skyscrapers for as far as the eye can see. And it's all US tender, mind you. None of that weird, smelly plastic stuff I'm used to. I briefly wonder how many trees had to be killed to print off this financial windfall (which, upon further inspection, consists solely of ten-dollar bills) before a persistent chant interrupts my line of thought:

"Ca... ca... ca..."

It starts off quiet but grows louder. *Ca... ca... ca...* There are thousands, even *millions* of voices. They all chant in unison. *Ca... ca... ca...* I look around. There is no one. *Ca... ca... ca...* The

sky turns black and stormy. The ocean rages, and the thick, gelatinous water threatens to consume me, much like how it swallowed up grandma Barbara in that well, the poor old hag. *Ca... ca... ca...* I finally glance down at the ten-dollar bill held in my mouse-like claws, at once realizing the source of the baleful chorus.

CA...! CA...! CA...! The chant is deafening, pounding on my skull from within. My head is going to burst open like a kid in an early 2000's-era Fruit Gushers commercial. I am sobered with the knowledge that this will be how I die. Having accepted my fate, I pluck up the courage to ask my tormentor a question.

"Hamilton!", I cry out to the bill in my hands. "What do you want? What are you trying to tell me?"

The former U.S. Secretary of the Treasury moves his head towards me, his dark, inky eyes staring right into mine. "*THINK, YOU RAT BITCH,*" he demands, booming with an impossibly deep, yet sultry voice that sends a tremor of Richter magnitude 9.5 quaking through my bones. "*HAVE YOU FORGOTTEN?*"

"No!", I cry. I join in the Hamiltons' chant, desperately hoping that it will jog my memory for the answer I need to appease them. "Ca, ca, ca... Ca, ca, ca..." I wish I had only realized the purpose of the chant sooner, for it all rushes back in immediately.

"WAIT! DO YOU MEAN **CAL**—"

I snap out of my vision and am transported back into my nest. I look down at my hands — the ten-dollar bill has been replaced by the familiar, homely sight of Barbara's Pyrex mug, crusted on the inside with a flaky white alkaline powder. I lovingly set it back down beside my laptop, which glows yet as bright as ever with the beckoning light of the login screen. I type in my credentials and press ENTER; the WaterlooWorks dashboard welcomes me. Immediately I click on "Hire Waterloo Co-op" and after waiting for the page to load for twenty minutes and thirteen seconds, despite the fact that I have unlimited 500 Mbps internet, I am greeted by the comforting view of an uninspiring white and blue colour scheme and a table of job listings that is so poorly designed it cuts off the names of the fucking job titles for God's sake. No, I have NOT heard of WaterlooWorks Azure and I have no desire to look it up. This sorry excuse of a UI would discourage most people on a good day, but not me. Remember when I asked, "Why am I here?" Thanks to some nudging in the right direction from my good pal Alexander, I now have an answer. A purpose.

Visions, dreams, whatever — they're meant to be interpreted. They contain clues to our innermost, subconscious desires; that guy Freud was onto something. As I begin to shortlist jobs, I mutter the Hamiltons' mantra under my breath — the complete version, the one they intended for me to know. Drool dribbles from my open mouth onto the greasy keyboard; I can already taste my savoury prize.

"Calamari or bust... Calamari or bust... Calamari or bust..."

Finchey

DEEPER DOWN

When the word "tunnels" is brought up, I get annoyed, but only because the single real tunnel on campus is the one connecting the basement of C2 to MC (the green wasteland portal no-one asked for).

But someone well-versed with the history of the school might ask, "What about the *other* tunnels? You know, the tunnels under the school, where they hide the blueprints of new buildings like E8 and M4?"

Well these aren't stories the faculty would tell you. It's an old university legend.

The tunnels were and are still being used to carry heating from the central heating plant at plant operations to all the buildings in the school. But don't take it from someone writing for **mathNEWS**, take it from someone who has been down there.

My interviewee, who wishes to remain anonymous, has been down in the tunnels as lately as last term and describes them as "mesmerizing".

"At first it's a little scary, but then as the tunnels continue for hundreds and hundreds of meters you begin to realize that this place is a little magical.

"I ran the tunnels all the way from CPH to V1, so almost the entire length of the school.

"When you see the markings and writings on the walls, it shows you a rich history of troublemakers and curious adventurers that have gone down these tunnels."

Among the landmarks in the tunnels include a big black pipe with "DANGER" marked in yellow letters underneath MC, a Half-Life lambda symbol printed underneath a set of rusted stairs, and a vertical room that reaches upwards into E2.

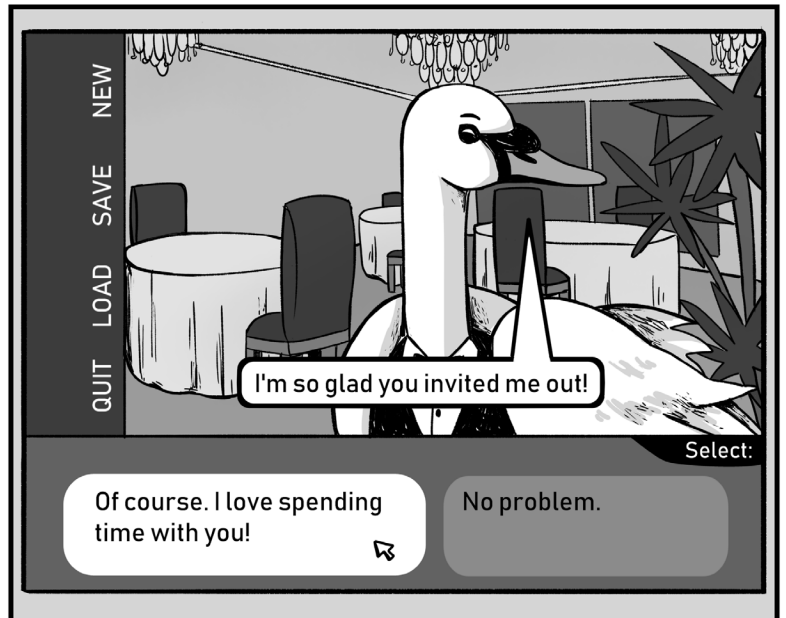
"But the most special landmark was a section of the tunnels with Styrofoam walls underneath RCH.

"I think I saw names down there that dated back to the late 60s. Everyone that passes through here has written or engraved their names into this wall. Once you get your name on this wall, it stays there forever."

Mulch

THIS CHARMING MAN

BY CIX



DANNY & ROSE

Hello, hello yes come on in. Make yourselves comfortable, there's room for both of you on that couch over there. So I spoke with Daniel on the phone earlier, a pleasure to finally meet you. And your name is...

Rose.

Ah yes, yes, Rose; that's right. A pleasure. I'm sorry for the mess around here. I've had other matters to attend to over the past couple days. As you can imagine, I practice somewhat of a dying art these days, and as a result my clinic has suffered. Which makes the both of you somewhat of a rare breed as well! Haha, how far our society has come and yet how backwards some things are now. But enough of my ranting, let's talk about why the both of you are here. Why don't you start, Rose.

Well, okay, sure. So Danny and I have been together for about six years now. We actually first met back in high school, which feels like ages ago now. At the time, I don't think either of us were really looking for a relationship. I was worried about keeping my marks up and getting into the right schools. Daniel was focused on his artwork and building up some sort of portfolio. But nonetheless, we continued to see each other, I guess mostly as friends at the time. We'd talk about our futures and what we'd do with our lives once we moved out of our parents' house.

Time went on and I eventually moved away for university. I think that's about the time when things started to change. We had both gotten used to seeing each other all the time, which was no longer a reality now that I lived two hours away. But we persisted, seeing each other on various weekends and whatnot. Eventually we got into a relationship and did the long distance thing for a bit, which was torturous, but I finally graduated and we moved in together. That was a really exciting time for the both of us. Our careers were both just getting started, and we were there to support each other along the way. It was us vs. the world and we were on top.

Well, as you may have already guessed, things haven't lasted forever. I got laid off from my job and Danny was already struggling to find a gallery to display his artwork. It's not like we were trying to become some sort of power couple; we just wanted enough money to pay the various bills in our lives. And on top of the financial worries, Danny and I ran into some personal issues too. For some reason, we seem to disagree upon more and more things these days, like we no longer understand each other's perspective. I believe the hardest part about finding your partner when you're so young is that people change. The person you fell in love with is no longer the person you see today. And I don't mean that in some negative way, like Danny has lost his compassion or whatever. I just feel like both of our perspectives, our outlooks on life have changed. And whether or not we should be together

for the rest of our lives, given the fact that we are totally different people than when we first met, is something we both have to consider.

Okay. Very good Rose, thank you for sharing your thoughts with us. I know it can be difficult to adapt to your partner's changes. Things you once loved about them may no longer seem present, and you may even notice behavior that is not a part of "who they are". But like you said, we are always changing, especially as young adults. How will we adapt to each other's changes? Are we willing to give up certain elements of ourselves for the benefit of the relationship? These are important questions we must ask ourselves when working through the issues the both of you seem to be going through. Okay, very good. Now Daniel, what do you think about the things Rose just mentioned? Is there anything you would like to add or share with us?

Yeah, so I pretty much agree with Rose. We have been experiencing some issues within the relationship, both financial and personal. And as a result, we've grown distant from each other. However, I do feel that she has the tendency to withdraw when things start going bad. For example, she mentioned that we have both changed quite a bit since we first met, which is true. We have both changed quite a bit, but I believe, at least for the most part, that we've grown together, not apart. Of course there are some things that we no longer see eye to eye on, but those feel like exceptions. Now she wants some space to re-evaluate things, which I'm obviously willing to give. However I think it will only distance us further, which is why we agreed to come to you as a compromise, as an initial step in helping us figure things out.

Okay, very good Daniel, thank you for sharing. And yes, I'm glad you have both visited me. It means that you two care about the relationship and are willing to put in the effort to take care of it. Many adults your age have given up on dating another human. They'd much rather prefer an Alexa or Jarvis; an echo chamber of a partner, if you ask me. The truth is, people are no longer willing to work through and experience the negative aspects of a "flesh" relationship. They only want the highs. It's the couples such as yourselves that understand that struggle is an intrinsic part of any relationship and that it must be overcome in order to understand that you are with the right person. I only hope that I can guide you through that struggle and assist you wherever I can. On that note, it seems that we are all out of time. It was a pleasure meeting the both of you and I hope to see you next week so we can continue this discussion.

half-baked cookie

THE CANADIAN TAX SYSTEM IN 5 WORDS

file before april 30th kthxbai

Axel

FRACTIONAL ENCOUNTERS

With Valentine's Day soon approaching, not all of us are likely to have a romantic evening with a special someone. When it comes to fractions, whether you numerate, denominate, or both, some of us might just forget our desire to divide evenly. Instead, we'll keep things real and just lust after uneven division instead. It's never been easier to find someone to divide with, so it's important to know where we might find ourselves on the 14th.

(1 / 1) — THE ONE

A partner that makes you feel whole. A fraction that just feels natural. Together the two can be whoever they want to be, and as long they do it together they'll only ever have a ositive relationship. It's what we all want in the end, but maybe this Valentine's day, it can wait.

(3 / 7) — SETTLING FOR LESS

Our denominator feels unsatisfied. He doesn't feel fulfilled at all, he feels like he's not even halfway there. It's not that our numerator has done his job badly or anything, but it will be awkward or disappointing, to say the least. Our denominator deserves better on such a special day.

(13 / 6) — GO BIG OR GO HOME

Now that's much better! It may feel improper, or even give us mixed feelings, but in the wise words of Canadian singer-songwriter Carly Rae Jepsen, "Wrong Feels So Right". Our denominator is more than satisfied with the size of his numerator. In fact, the numerator is giving more than double that our denominator might've expected.

(7 / 8ⁿ) — DENOMINATION

Our denominator isn't just dominant, but *denominant*. Letting your denominator take control of the situation will keep you on the edge. Who said that only numerators can take the power? It's an exponentially pleasurable experience for all when a power denominator takes the numerator for a ride that he'll never forget.

(- 9 / 8) — A CAUTIONARY SIGN

In this day and age, being negative or positive shouldn't be a big deal as long as we're mindful of ourselves. If we're reckless, however, we might leave our partner with an unwanted negative sign. Make sure to play it safe to ensure nothing goes wrong. Always be sure to keep an honest relationship with your fractional partners, and if well-prepped, everything should be just fine.

(1048576 / 512) — NEGLECTING TO REDUCE

Make sure that you're taking care of your factors and flushing away those leftover number 2's. Keep things clean and always reduce, reduce, reduce! Not everyone will appreciate a messy

numerator, and definitely not a messy denominator. An unexpected number 2 might kill the mood, unless you're into that of course.

(1.625 / 0.75) — THE MORE THE MERRIER

Looking closely, all we're dealing with is a fraction of fractions. In this mix we have a strict numerator, a strict denominator, and two terms that can do both. This experience might not be for everyone. Some people might find it overwhelming and prefer to keep things simple between themselves and a partner, but there's nothing wrong with being experimental. It's three times the division and four times the fun!

*π*llow Prince

L REASONS DATING IS HARDER THAN DAVID JAO'S MATH 145

- Coq lets you check if what you're doing is right before you do it
- David Jao gives you feedback (eventually)
- Dating gives you *slightly* more erections than seeing nice proofs by Gauss
- All that is required to get into Math 145 is checking a box during course selection, but dating requires social skills
- Dating doesn't have fantastic memes to motivate you such as:

Do you want to join my religion?

What's your religion?



I'm interested

Delivered

DaddyJaoFan

BUILDING M4: BUDGET CUTS AND SOLUTIONS

A few weeks back, the Ontario government announced that it was going to cut tuition fees by 10%. By now, you may have realized this means that the University of Waterloo will receive less money. Consequently, the mathies' common dream of a new Mathematics 4 building may never be realized.

But fear not! It turns out that there are many ways to decrease the cost of construction to manageable levels (or alternatively, raise enough money). Below, I introduce several money-saving measures through which our vision of a M4 may be realized.

1: BUILD IT OUT OF CARDBOARD

Surprisingly, this is a viable option. Shigeru Ban won the Pritzker Architecture Prize for his work in creating innovative, durable buildings with everyone's favourite wood pulp derivative. Among his structures: low-cost emergency shelters for refugee camps, a museum built out of shipping containers, and a church literally named the "Cardboard Cathedral". Were the University to pursue this option, an M4 could be erected quickly and cheaply.

2: BUILD IT VERY, VERY SLOWLY

A lot of construction costs come from labour. Solution: hire a minimal number of workers to build M4. The overall cost may end up being higher, and construction may never finish, but the yearly costs will be lowered. You can think of it as amortization to the extreme.

3: INVOLVE THE C&O DEPARTMENT

We have a world-class C&O department, complete with some of the best professors in the world (such as the legendary David Jao). By enlisting their talent to find a way to optimize the costs of constructing M4, we can minimize the sticker shock that comes with a shiny new building.

4: DEFINE AN EXPANSION MAPPING FROM A SMALLER SPACE

We define an expansion mapping to be a function on metric spaces¹ A to B such that the distance between any two points in B is at least the distance between those two points in A .² With this in mind, we can then build a small version of M4, and simply apply our expansion mapping to scale it up to a livable size. Problem solved!

5: BUILD IT IN \mathbb{C}^3

M4 might not end up existing in real life, but it'll always exist in our imaginations.

6: FUND IT WITH THE MATH C&D SURPLUS

Apparently the C&D makes a *metric shit-tonne* of money, which MathSoc needs to spend because non-profit and all of that.

Presumably, an M4 Building Fund®™ could be set up by MEF/MathSoc, and all of the C&D's surplus profit funnelled into that. Combined with the introduction of the proposed bar, careful price increases, and a massive marketing campaign to bring more people to C&D, there could potentially be enough money to help raise M4 within a couple of years.

7: BRIBE MULTIPLE LEVELS OF GOVERNMENT

Ever wondered how massive private projects like sports stadiums somehow get public funding, to the point where the owners don't even pay a dime for construction? So do I. Although mathies may not have the political clout to convince multiple levels of government to contribute to a new math building, if we all pooled the money we saved from the 10% tuition cut towards paying off, uhm, certain members of government, we might be able to see some of our taxes (mis) directed towards a new M4. In fact, like true mathematicians, we could then extend this towards a general concept of finding alternative sources of funding for any sort of capital project. Completely renovating MC? Done. Building M5? Done. Erecting 2147483643 tiny huts labelled from M5 to M2147483647 so we can finally claim we have more buildings than Engineering? QED. Speaking of Engineering...

8: GET ENGINEERING TO PAY FOR IT

It's really only fair after they got E7.

quantum goose

1. A metric space is a set M that defines a distance function (i.e. a metric) $d : M \times M \rightarrow \mathbb{R}$ between each of its members (i.e. points). Examples: 3-D space with our conventional concept of distance is a metric space, and so is \mathbb{R} with $d(x, y) := |x - y|$ for $x, y \in \mathbb{R}$.
2. i.e. the opposite of a contraction mapping,

DID WE DEFEAT EDCOM?

In previous years, the almighty EDCOM intruded the sacred tie ceremony during orientation and presented math with an EDCOM plushie (Pusheen**COM**, Domo**COM**, Panda**COM**, etc).

However, EDCOM did not come to the 2018 tie ceremony. Did we intimidate them so much in 2017 that they got scared and ran away? Did they just not want to come?

Now the first years don't know who EDCOM are and can't bask in the beauty of the top engineering students, hand-picked by the Dean of Engineering herself.

I miss EDCOM. Pls bring them back.

a past orientation leader who misses edcom

N REASONS WHY CHINESE NEW YEAR IS SUPERIOR TO VALENTINE'S DAY

1. Restaurants are going to fill up on Valentine's day. If you choose to go out for dinner, you'll have to suffer through long wait times and poor service. You know what never fills up? Your mother's house. Bring your significant other (or lack thereof) there for a 饺子 and 年糕 date instead, and enjoy impeccable service from the world's best hostess.
2. If you have a partner, Valentine's Day is expensive. You're both obligated to buy random stuff that neither of you deem worth the price, lest the other person think poorly of you. That's a big hit to your net income. With the OSAP cuts coming, there's no way you can afford that. Conversely, if you choose to celebrate Chinese New Year instead, you actually gain money from your aunties in the form of 红包. That's far better for your bottom line.
3. If you don't have a partner, Valentine's Day is still expensive. Emotionally expensive, that is. You're forced to spend the whole day seeing other people walking around with their sweethearts, while no matter how many sweet heart-candies you buy it's still not quite the same thing. With the OSAP cuts to worry about, there's no way you can emotionally afford that either.
4. The entertainment options for Valentine's Day are average at best. You could go to a movie, but the seats are uncomfortable, the concessions are overpriced, and as you're buying the ticket you'll probably only be able to think about how much money you would have saved just pirating the movie instead. Much better to sit with your loved ones watching the CCTV New Year's Gala, the most popular entertainment show in the world by viewer count. (And it's free!)
5. You might think "but I must show appreciation to my boyfriend/girlfriend/bestfriend/other because they love me/haven't dumped me yet/are adorable/help me with math and this arbitrary day is a good day to do it!" That is true — it may be very hard to find a boyfriend/girlfriend/bestfriend/other who loves you/hasn't dumped you yet/are adorable/helps you with math — but it's even harder to find a better loving family than yours, whoever your loving family may be. So go spend time with them this Chinese New Year :)

KINGDOM HEARTS II.9 — A REVIEW

MILD KINGDOM HEARTS III SPOILERS AHEAD

YOU HAVE BEEN WARNED

When I picked up my copy of Kingdom Hearts III last week, I was expecting to play Kingdom Hearts III. However, in true Kingdom Hearts fashion, I had to wait through another last-minute installment before actually reaching the much awaited Disney-Final Fantasy crossover.

Yes, despite what the opening cinematic may indicate, the first three chapters of the game are labelled under Kingdom Hearts II.9. II.9 starts where Kingdom Hearts 3D: Dream Drop Distance ends; Sora, Donald and Goofy are making their way to Olympus to learn from Hercules about how he regained his powers.

Despite obviously being a joke by the creative team referencing the release (and subsequent memes caused by) II.8, I felt that II.9 actually served an important purpose to connect the plot of 3D to III. For example, Sora lost his abilities as a consequence of the events of 3D. As a result, II.9 explored Sora's determination to regain his abilities alongside his friends, which fits much better in the linear II.9 than the semi-linear III. Since players have the ability to choose (to some degree) the order in which they visit the many Disney-Pixar worlds, this particular plot point would have featured more in the early chapters of the game without the inclusion of II.9. This may have detracted from the individual stories of each world.

Another aspect of II.9 that I enjoyed was Sora's attire. Since the three half-pints travel to Olympus directly after the events of 3D, Sora has not received his new duds, so he's left with the outfit many players have grown accustomed to since it's introduction thirteen years ago. I personally felt some nostalgia watching Sora flail about acrobatically in the prologue.

The final aspect of II.9 I want to mention is the length. I mentioned before how the opening portion of the game is a good joke, and part of what makes it a good joke is that it is not dragged out. I didn't feel at any point during II.9 that I was being held back. I had a good laugh, readjusted to the battle system, and moved on.

So that's it. II.9 is an enjoyable experience that acknowledges the patience of fans but does not test it any further. I fully enjoyed my time being reintroduced to Kingdom Hearts, and I wish the same to everyone else planning to pick up the game.

For a review of the graphics and music, please see my KH III review, later this issue.

THEODORE BEAR REVIEWS — AVENGERS: ENDGAME

Greetings all. For the movies coming out in 2019, there is probably no film more anticipated than Disney's Marvel's Avengers: Endgame (a film by Disney and Marvel). Audiences all around the world are eagerly waiting to see the conclusion of this epic 10-year storyline, set to arrive in theaters on April 24th, 2019.

Well, the wait is now over.

In a daring infiltration straight out of the songs of old, I, Theodore Bear, managed to sneak in to Disney's headquarters and get my hands on a copy of this highly-anticipated movie. And exclusively for **mathNEWS**, I will give you the first-ever review. I have seen it from start to end, and let me tell you, what I saw shocked me to the core. This may be the absolute pinnacle of film. It is so incredible that I even have trouble putting the words to describe it on the page, which is why I thankfully am typing this article on a computer.

Set a year after the shocking events of Disney's Marvel's Avengers: Infinity War, Avengers: Endgame picks up right where that movie left off. The world is devastated by Thanos's snap and the Avengers (made up of the main group of Robert Downey Jr's Iron Man, Chris Evans's Captain America, Chris Hemsworth's Thor, and Mark Ruffalo's Hulk) have to come together to undo all that carnage so that Spiderman and Dr. Strange can have their sequels. Along the way, they have to recruit all the allies they can get. After having lost so badly in the last movie, this time, the Avengers are bringing the fight to Thanos.

While the internet called Infinity War to be the most ambitious crossover in history, Avengers: Endgame manages to blow that previous movie out of the water. Joining our heroes are not just familiar faces, like Paul Rudd's Ant-Man, but also stranger additions, like celebrity chef Gordon Ramsey. Yes, while Infinity War gave us an incredible story featuring many characters we knew from the Marvel Cinematic Universe, the cast of Endgame is more expansive. Joining the roster of the Avengers in this film are Rudolph The Red-Nosed Reindeer, Freddy Krueger, John Wick, award-winning director Peter Jackson (brought back to life with stunning CGI), and Mario. In a shocking twist, Luke Skywalker from Star Wars shows up to help the heroes in their fight against the mad titan and his Minions (the yellow ones from those movies).

Also later in the film, the Avengers meet Paul Rudd, who joins them for the rest of the movie, leading to Ant-Man having graphic sex with himself from another dimension in a subplot that simultaneously goes on for too long and doesn't go on for long enough. There's also a running joke in the movie where Captain America tries to chew at his arms in a vicious attempt at autocannibalism, only to be slapped in the face by Tony Stark, who tells him to stop using a song. This happens a total of 19 times over the movie's 6 hour and 20 minute runtime. I was initially taken by surprise by the entire movie being a musical, but eventually grew to appreciate the choreography of

every single number. Several of which kept playing in my head even after the movie.

Most of the runtime is taken up by the heroes chasing after Thanos and fighting his minions, only for him to barely make an escape, taunting the heroes as he does with a "Nihihi". This eventually leads to the final showdown with Thanos, where the film takes another shocking swerve by making the climatic battle a cooking contest that ends with Batman cooking a dish that reminds Thanos of his childhood, convincing him to undo the snap and return everyone back to life. This also undoes The Force Awakens and The Last Jedi, setting up a Star Wars movie in the future that doesn't rely on showing us things we know. The film then ends in the only way it possibly could, with a dance party where all the characters who appeared do the Macarena. The end credits are then overlaid over real-time footage of the Hindenburg Disaster.

All and all, Avengers: Endgame may be the most ambitious film I have ever seen. It certainly is the greatest movie of the year, and may I say it, perhaps even the greatest of all time, even eclipsing masterpieces like 1941's Citizen Kane and 1997's Spice World. It was so good that after I watched the movie, I immediately joined the Air Force, though that may also have been due to the characters repeatedly turning to the camera and urging the viewer to join the Air Force, along with having the Air Force's logo flash on the screen in a way that you're able to only barely notice.

Anyway, Disney's lawyers are coming after me to break my legs, so I need to go now, but not before urging you to watch Avengers: Endgame (I hope saying that is enough to make them stop).

Rating: 10000000000000 / 10

Theodore Bear

N n'S

- N
- n
- Ń
- ń
- Ñ
- ñ
- H (Russian Uppercase)
- h (Russian Lowercase)
- 110 (Ascii Uppercase)
- 78 (Ascii Lowercase)
- 4E (Hex Uppercase)
- 6E (Hex Lowercase)

Fruitboy

RESTAURANT RETROSPECTIVE 1

My wing is ready to fly
I would rather turn back
For had I stayed mortal time
I would have had little luck.

—GERHARD SCHELEM, "ANGELIC GREETINGS"

High up in the northern land of Svithjod rises rock, and upon this rock stands an angel—eyes and mouth agape, wings outstretched—staring seemingly aimlessly, yet unfathomably purposeful, for the present holds not its vision; as mere mortals history is experienced, a sequence of unending events, while the angel sees a single catastrophe, mounting and accumulating as it recurs again and again. They would like to pause for a moment so fair, to awaken the dead and resurrect that which is no more, but the storm of progress buffets their wings, unable to cease the turbulent chaos spreading the rubble of the ruins far and wide. It is amidst this storm where we chase the sensations which are no more; as lost as the words of Etruscan to the graveyard of time.

MIKEY'S EATERY

This restaurant has been a pillar of the KW community, having opened in 2000 and remained open until December 2018. The eatery served both traditional North American steam table fare and slightly more traditional American-Chinese cuisine straight from the kitchen. With fast service, reasonable prices, and a spectrum of Americanized and more authentic dishes (granted, you'll have to know which dishes are which, but that's not too hard to do), it's a common neutral ground for "Chinese Food" for everyone.

VEGETARIAN FAST FOOD

Despite the name, this was an independently owned restaurant, of which I believe the proprietor was Vietnamese, given the menu. Also despite the name, not every dish offered at this location was vegetarian, and with its large vegetarian and vegan (?) menu befitting its name, it was a good option if dining with vegetarian/vegan friends. Its cuisine was southeast Asian inspired, and its pad thai was probably the best available in plaza, with variable spiciness and affordable price.

GREEN SUSHI

Green Sushi was an all-you-can-eat sushi place in plaza which closed in 2015 at a low price point, with \$14 lunches and ~\$20 dinners. Unfortunately, some of its items were less than stellar, giving it a poor reputation which probably contributed to its ultimate closure, but for its price, and so long as you stuck to the items which they were good at (thankfully, these are the usual popular sushi items like salmon), it was a reasonable option for all-you-can-eat sushi at an affordable price with the added benefit of not having to bus somewhere and back (168 Sushi didn't exist back then).

If you would like to contribute an opinion about a restaurant around campus which no longer exists, please let the editors know so I may contact you and pepper you with questions about the establishment.

Chilling with Raziell,

Zethar

N WORKOUTS TO DO AT CIF TO UP YOUR MATH GAME

When faced with the choice of going to the gym or not, I know a lot of us prefer to spend an extra hour studying rather than exercising, because that quiz worth 1% of your total grade is so much more important. But what if going to the gym helped you get full marks on that quiz worth 1% of your total grade? Then going to the gym would be so worth it for the sake of succeeding on that quiz worth 1% of your total grade!

1. THE CIT-UP

Get on the sit-up bench and use your abs to curl your body into a perfect C shape for each rep. Do enough reps until you feel a pain so memorable that you will be feeling it all the way up to your next MATH 138 quiz and hence remember to add that +C during integration.

[editor's note: I will try this next at the gym thx]

2. 150 LB WRIST CURLS

Grab a 150 lb barbell with your writing hand and stretch out your arm. Using only your wrist, flick the weight up and down as fast as possible for 50 minutes. This way, when it comes to writing that 50 minute quiz with a 0.150 lb pencil in hand, you'll be so fast at writing up that lengthy proof and save precious time (also works with any other writing device weight less than or equal to 0.15 lb).

3. 20/20 EXTENSION

Go stand in the corner of the gym. Look at the corner. Then look at the opposite corner. Then look at your corner again. Then the opposite. Repeat. This works out the muscles in your eyes' ciliary body, which flexes the lens to adjust for viewing objects at different distances. So when it comes quiz day, you now have that 20% vision to cheat off your classmates, however far they are and however small their handwriting is.

M BETTER USES OF MATHSOC MONEY THAN DIGITAL LOCKS

- Donating to the Math Endowment Fund
- Providing subsidized textbooks
- Building M4
- Getting better air quality in MC
- Building Mn, for $n > 4$
- Buying an even bigger pink tie for orientation week
- Funding a war on EngSoc
- Building a wall to protect Mathies from the filthy n-jineers
- Paying **mathNEWS** writers
- Redistributing the wealth to overthrow the capitalist pigs
- Purchasing a liquor license for C&D

Fight Me MathSoc

P ADDITIONAL USES OF MATHSOC MONEY THAN DIGITAL LOCKS

Hi, MathSoc President for Fall 2018 here. I noticed someone writing an article about MathSoc's use of money for digital locks. A bit of background info into this — I passed a motion through the MathSoc Board of Directors last term authorizing the purchase of digital locks. However, I agree — there could have been other uses for the money:

- New MathSoc candy
- New jar for the candy
- New candy for the CnD
- Giving it all to EngSoc
- Buying everyone in the Math Faculty a pencil and an eraser
- Funding **mathNEWS** for 100 years [*editor's note: Woohoo!*]
- Donating it to Bombardier so they can hurry up and finish the ION trains
- Allocating it for M4 construction costs

Obviously, these are all great ideas. But since we all hated the old turning locks (and they were a pain to reset), we decided to replace them all with digital locks and now everyone's happy!

*Alex Lee
MathSoc President, Fall 2018*

N REASONS TO WRITE AN "N THINGS" ARTICLE

- They're painfully generic and therefore easy to write
- They are easy to read
- They turn **mathNEWS** into a collection of BuzzFeed articles whether the editors like it or not
- They make a great filler
- You can shorten them more easily than you can with a real article
- You can also lengthen them arbitrarily
- You don't have to bother counting how many things you've listed
- They're a cheap way to get free pizza every other Monday night
- They're more likely to be read by the readers (because paragraphs are scary)
- You can just steal them from BuzzFeed if you lack creativity and motivation
- Being meta is still cool thanks to PHIL101
- You only need some of the points to be entertaining to the reader for it to be a good article

2.3.5.7.735.2333772

A LAMENT FOR THE LONELY N

A random digit like 7, a random prime like 57, and when in doubt, 42.

A non-trivial amount of time spent on my CS assignments goes towards choosing which of my favourite numbers gets to be N on the next test case, over and over again.

But some poor numbers have never been N.

Back-of-the-envelope, the UW website claims under 40,000 math alumni, who ought to have taken no more than 10 CS courses each with 10 assignments per course with 5 questions per assignment and 50 opportunities to choose N per question.

Even if they chose a different positive integer each time, we're still not even halfway to using up every available int.

My new favourite non-falsifiable (for now) theory is that there is a very special lonely N plucked out of obscurity by the first CS prof, scribbled on a yellowing sticky note in a vault on the seventh floor of MC, and a long standing bet in the department on how long until one of us monkeys uses it.

Or maybe a **mathNEWS** listicle will get it first.

HONEST REVIEW OF mathNEWS EXPERIENCE

I know a lot of us have been curious what goes on in the **mathNEWS** lair, so I decided to go experience it first-hand to give an unbiased review for all you mashies that are on the fence on writing for **mathNEWS**, based on a sample size of one meeting*.

ACCESSIBILITY:

It rained on my way to MC and once I arrived I walked one flight of stairs to the meeting room, only to be led down another flight of stairs to the *actual* meeting room. At least it was at a building that I know how to find. Rating: $1 / \pi$

FOOD:

The pizza toppings are chosen democratically, but it's been almost two hours since the start of the meeting and none of the promised pizza has arrived. Though I have nothing against pizza, since it is not pie, I am going to have to give the following rating: $0 / \pi$

WORK:

Writing for **mathNEWS** is harder than any English course I've ever taken since there is no topic, prompt, rubric, rules, or anything. I literally have no idea what to write here and end up producing stuff like this. However, this is a pretty fun way to procrastinate on my 5 assignments due this week. Approximate rating: $3.14 / \pi$

Exact rating: $(22/7) / \pi$

Overall rating: $1 / \pi + 0 / \pi + 3.14 / \pi = 4.14 / \pi$

This rating is greater than 1. so I think I may have messed up on my rating system. I'll try better next issue when I will have had two more weeks of math lectures.

License2Derive

**actually less than one meeting since it is still happening as I write*

A HAIKU FOR MOST

I am suffering

Interviews are killing me

And so are midterms

Herbie

IF OVERLEAF DID AUTOCORRECT

One would imagine that the spell checker of Overleaf, the most popular online LaTeX editor, would recognize common mathematical terms such as “*coprime*,” “*piecewise*,” and “*factorizations*.” This is not the case, however: type one of these words, and Overleaf will underline it in red and offer a list of preferable alternatives.

It's fortunate that Overleaf does not automatically insert one of these alternatives. If it did, the consequences for math students' homework would be dire.

Consider the following excerpt from a proof which is totally legit and makes perfect sense ...

"A simple combinatorial argument on the monotonicity of the infimum and the supremum shows that the contravariant represents both isomorphism and diffeomorphism.

"It follows from Euler's totient function that the cofunctor is both surjective and injective; i.e., it is bijective. Hence the two have the same cardinality.

"The contrapositive is a direct consequence of idempotence. So the result is proven for an arbitrary matroid. \qed"

... and the version incorporating Overleaf's proposed changes ...

"A simple janitorial argument on the mountainside of the extremism and the supermom shows that the contrarian represents both mesomorphs and feminism.

"It follows from Euler's torment function that the fornicator is both seductive and inactive; i.e., it is fictive. Hence the two have the same carnality.

"The contraceptive is a direct consequence of impotence. So the result is proven for an arbitrary matricide. \qed"

Deciding which variation is preferable is left as an exercise to the reader.

Epsilon Screwn

Give us a bigger office,
and the rag lives.

A POSTER ON THE WALL IN
THE mathNEWS OFFICE THAT I
DON'T KNOW THE ORIGIN OF

N TESTS YOU SHOULD ALWAYS TRY TO PASS THE CS 136 SECRET TESTS

Failed all your secret tests on the last assignment? Here's a handy reference you can use to make impenetrable programs next time.

1. SMELL TEST

Run your program and sniff your computer. If you smell smoke and burnt hardware, your code likely uses too much memory. Make sure to download more RAM, run your code again, and rerun this test until there is no smell.

2. DURABILITY TEST

Open your code on the center of your screen and then form a fist with your dominant hand. Then run the program using your non-dominant hand and punch the program as hard as possible. If a crack forms across your computer, it wasn't strong enough. Rerun this test until no cracks appear (may require additional monitors).

3. WEATHER TEST

Based on how rainy it is Waterloo, inclement weather can hit your program at any time. To make sure it is weatherproof, use the squirt bottle from orientation to splash water on your computer until it is completely soaked. Click run. If it works, then you've passed the test!

4. GOOSE TEST

You're going to reserve at least a day before the deadline to do this test. Go outside and drop your computer in the middle of a flock of geese. Come back only until at least 24 hours have passed. If your code has withstood Mr. Goose and still runs, this is clear proof that it is impenetrable to almost any attack!

License2Derive

EZPZ

Notice to all markers:

pls allow "easy peasy lemon squeezy" as a substitute for writing "trivial" in proofs to demonstrate obvious statements.

thx

WeirdFlexButOk

N REASONS WHY SLC IS DELAYED

The work on the SLC expansion has dragged on far past its projected completion date. This **mathNEWS** exclusive explains the reasons why:

- A misguided attempt to automate construction led to work being suspended until someone managed to reboot the Docker container.
- A typo led to 1 construction worker being assigned instead of 100.
- An experiment at QNC went awry, leading to a local time distortion where time flows 346% slower than normal.
- The letters SLC were mixed up with LRT, leading to two times more delay than normal.
- An immortal being that feeds off time spent walking under scaffolding has occupied the site and is leeching energy from nearby souls.
- A blueprint error led to parts of E7 being built on the site until the mistake was corrected.
- Construction is under hiatus until new co-ops are hired from WaterlooWorks.

genghis.khan

KINGDOM HEARTS III — A REVIEW

MILD KINGDOM HEARTS III SPOILERS AHEAD

YOU HAVE BEEN WARNED

inhales

AA
AAAAAAAAAAAAHHHHHHHHHHHHHHHHHHHHHHHH

KINGDOMHEARTSTHREEISHEREIMSOEXCITEDIM
PLAYINGASSORAANDEVERYTHINGISSOBEAUTIFUL
ANDITLOOKSLIKEAPIXARMOVIEAND
OOOOOOOOHHHHHHHHHHHHMYGOSHIMPLAYINGIN
TOYSTORYANDWOODYWANTSTOBEMYFRIEND

Whew, okay. Let's calm down and get back to the rev—
OHMYGOSHELSAISSINGINGLETITGOANDITSBEENLONG
ENOUGHTHATIACTUALLYLIKETHESONGAGAINLETIT
GOOOOOOOOLETITGOOOOOOOOIAMONEWITHTHE
WINDANDSKYYYYYYYY

crying It's so beautiful and fluid. It sounds amazing. Just go play it already!!

confusED

ACTUAL MATH PROBLEM OF THE WEEK

Hello **mathNEWS** readers! Another issue means a new math problem, and since we had an underwhelming number of submissions last time, this week's problem will hopefully be easier to tackle.

Given integers $a, b > 0$, such that:

For all odd integers $n > 2$: a^n divides b^{n+1}

For all integers $n > 1$: b^{n^n} divides $a^{n(n+1)}$

Prove that $a = b$.

Submit proofs to the Pure Math Club (MC 3033) for a hefty prize of a Drink and a Chocolate bar!

[Smaller prizes will be given to good attempts and/or partial results, (ex : proving that a divides b , $a \leq b \dots$)]

Good luck!

PMC Prez.

N REASONS TO REMAIN GOOD FRIENDS INSTEAD OF STARTING A RELATIONSHIP

- You can focus in class and get good grades
- You won't have to worry about a long-distance relationship when you go on co-op
- You won't be judged for your choice of partner at family gatherings
- You can spend your time playing video games instead of going on dates
- You can go to matchmaking events to get free bubble tea
- You can stare at your phone instead of another person during lectures
- You can eat ice cream alone on your couch on Valentine's Day
- You won't miss important co-op messages while... otherwise occupied
- You won't annoy your partner by making math references in bed
- You can save the environment by buying fewer gifts and using fewer condoms
- You can order an entire pizza for yourself and only be judged by the delivery guy
- You are less likely to catch some nasty disease like cooties
- You can write a **mathNEWS** article about it

Two Really Good Friends

HEY JASON KENNEY, GO SUCK A LEMON

*Editor's note: Any opinions expressed in this article are those of the author, and do not represent **mathNEWS** as a whole.*

For those who don't know, Jason Kenney was recently(ish) elected leader of the new United Conservative Party (UCP) in Alberta. Jason Kenney is one of those stupid kinds of conservative who doesn't believe in doing anything about climate change and is horrified by same-sex love.

Currently, Alberta is having trouble selling their oil, which is a big problem for them because they elected 40 years of conservative governments who mismanaged the economy to the point where it's all tied up in one industry. Go ask any mathie who's taken a single business course and they'll tell you that one of the most important parts of investing is to diversify your portfolio. With a diverse portfolio, it doesn't matter much if a few investments fail. If you invested 100% of your money in MySpace, you're probably not doing so great right now, but that's your fault, not the guy who told you not to. Alberta went 100% into MySpace, and is now amazed that

when oil prices go down, they have economic troubles. That isn't the fault of the current government. It's the fault of 40 years of conservative governments in Alberta. Of course, for Jason Kenney to recognize that he would need to have some basic economic knowledge, which he lacks. Jason Kenney is opposed to any form of a price on carbon, even though a Nobel Prize-winning economist had said it's the most effective way to reduce carbon emissions.

Of course, Jason Kenney is not just a climate change denier. He's also a raging homophobe who wants to out gay students who join the gay-straight alliance at their school, and has advocated to invoke the notwithstanding clause to allow discrimination against the LGBT community.

So, Jason Kenney, go suck a lemon. Suck many lemons. It would bring the world more joy than any of your policies.

Political Expert

PROCRASTINATING MY WAY THROUGH mathNEWS

gridCOMMENT 139.2

Hello, fellow **mathNEWS** readers! Surprised to see a **gridWORD** here? Unfortunately, no volunteers signed up to be **gridMASTER**, so I, bored on one night with many academic responsibilities, decided to make one myself. It is quite, quite ugly and definitely does not fit the New York Times' standards for crossword puzzles, but it is my first time doing this... please forgive a heathen like me.

Let's take a look at this **gridWORD** and scrutinize every mistake here.

- The obvious lack of symmetry (absolutely disgusting).
- There's no theme. However, I like to think that the theme of this **gridWORD** is No Theme.
- Bull-in-a-china-shop syndrome versus the nice, compact **gridWORD** when yclepED was **gridMASTER**.
- I didn't specify how many words an answer has. To clarify here, answers are either 1 or 2 words. One word has 3. Answers as abbreviations are also not specified
- I feel like the clues are either very obvious or obscure; there is no grey here.

Let's not be too negative, however! Look at the positives:

- It's functional!
- We *have* a **gridWORD**!
- I'm picking up new skills!
- You might learn something new!
- ???

As temporary **gridMASTER**, I promise you, my dear readers, that my **gridWORDS** improve, unless one of you wants to take the role instead. Next time, I'll make it by hand.

The actual, inaugural **gridQUESTION** is: "How are you staying warm in this cold, unforgiving winter?" Drop off your solutions and **gridQUESTION** answer in the **BLACK BOX** next to the C&D on the 3rd floor of MC. If your puzzle is correct and has the best answer to the **gridQUESTION**, you are eligible to win a \$5 gift certificate to our favourite cafe in the world — the Math C&D! We use your **gridWORD** answer as a tie breaker if there are multiple correct submissions. Deadline is Monday, February 25th at 6PM. Tick tock!

stapLED

ACROSS

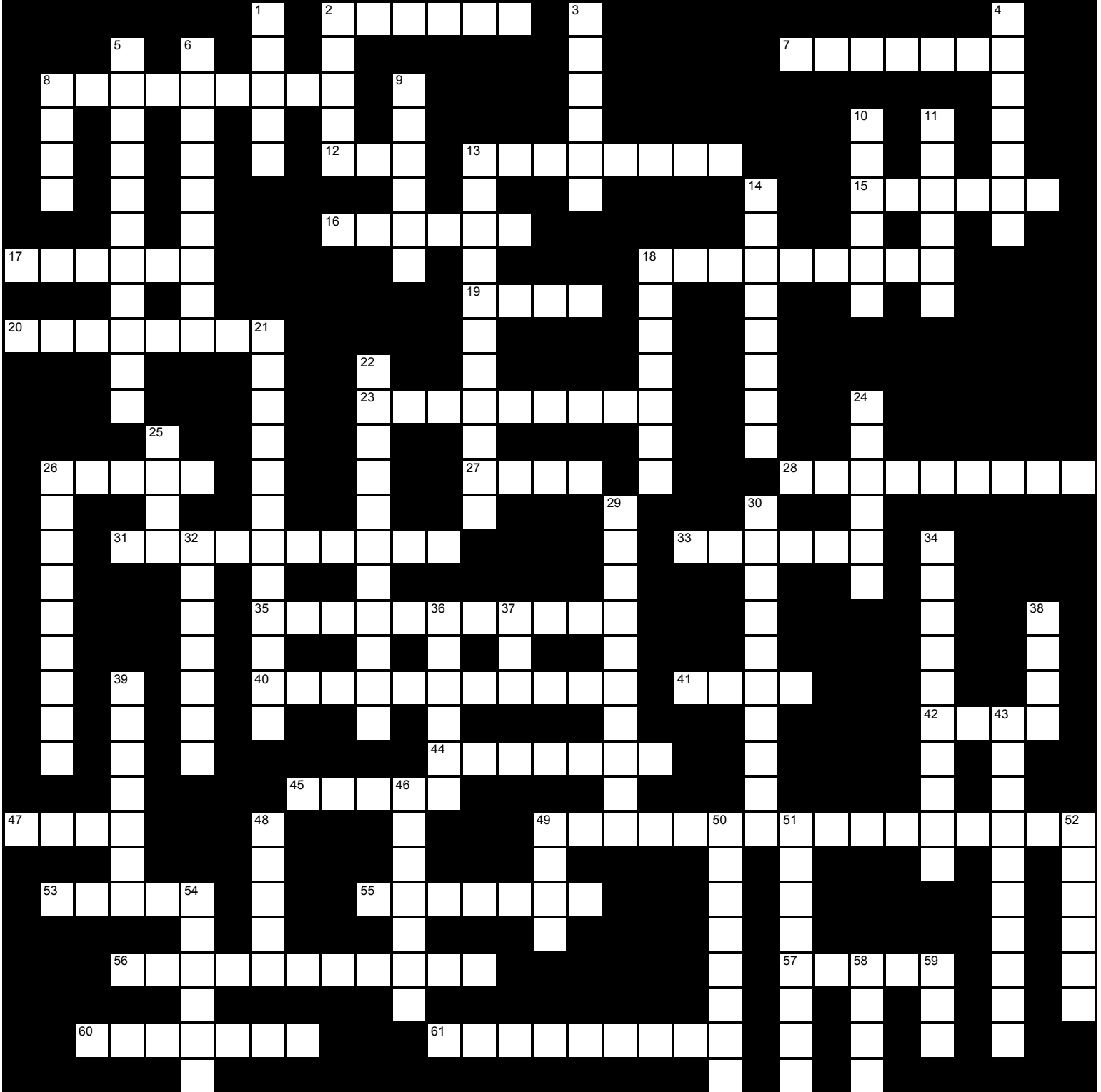
- French Anna Karenina
- Misspell this, get delicious pastry
- Place of questionable existence
- Bow in shame, awe, forgiveness, etc.
- Textured lava
- Duel took this man's life
- An anagram of a type of structure
- This one's a musician, not a politician
- Pop these like Swedish fish
- 64 cases!
- Many linguistic families here
- Keeps moisture in
- Blue, Red, or ____
- "Do it for the ____"
- More influential than the Beatles?
- A group is named after him
- The Three Legends, pluralized
- Price of wraps in C&D + HST (2 wds)
- Celebrated more in the States (3 wds)
- They just added in the MC
- "____ California"
- Painful smile
- Deemed too gangster in China
- Cocoa infused stew
- Master of Sprechstimme (2 wds)
- Desirable quality in meat
- The Potato King
- "You are not the father!"
- Most sought after stationary in this faculty
- You can ski and swim here in the same day

DOWN

- Midori
- Modest's cart
- Movie with Oedipal nightmare
- Winehouse covered this song
- 1Q84 composer (2 wds)
- Meow, woof, squeak, hiss (2 wds)
- "____ as Love"
- Liked to send poop-themed letters
- She looks like a British man with no hair
- Construct more of 'em
- Frequent Youtube recommendation (2 wds)
- Not a chum of Spongebob
- Fictional medieval evil matriarch (2 wds)
- Say the colour, not the word (2 wds)
- Euthanasia (3 wds)
- Seaside city with a German name
- Zoey Deschanel, appropriately
- Für Elise
- Blonded (2 wds)
- The Prince of Darkness (2 wds)
- Unaspirated t's
- Eyedrop used by beautiful ladies
- Good for night time and sleep
- Your first online friend
- Japanese George
- Chicky nuggets
- Don't read it back to back (2 wds)
- Peek at you - sound it out!
- Disillusioned
- "So be it."
- Algorithm created at a cafe
- Sacrificials go here (2 wds)
- Immediate nuker
- British snacks
- SLC

- Should-be anthem for Toronto Pearson Intl. (abbv.)





Drop your gridWORD solutions off at MC 3030. And yes, we do award points for creativity.

lookAHEAD

SUN FEB 10

Ohshithaveanexam Day

MON FEB 11

TUE FEB 12

WED FEB 13

Noon Hour Concert:
Grand Duo

THU FEB 14

(St.) Valentine's Day

FRI FEB 15

Tuition and fee refund
deadline — 50%

Singles Awareness Day

SAT FEB 16

Reading week begins.

SUN FEB 24

Reading week ends, and we all wonder how we managed to waste all our time not reading.

MON FEB 25

mathNEWS 139.3 production night.

TUE FEB 26

WED FEB 27

Noon Hour Concert: The Voice of the Whale

THU FEB 28

Rare Disease Day: gotta catch 'em all

FRI MAR 1

mathNEWS 139.3 published.
National Pig Day

SAT MAR 2

Dr. Seuss Day

LAST WEEK'S gridQUESTION

DOES THIS COUNT AS A gridCOMMENT?

Surprisingly enough, despite not producing a **gridWORD** at all last issue, the **mathNEWS** editors have received one **gridQUESTION** response! On the back of a fax journal report (yes, I was also surprised to find out those are still a thing), C* Sympathiser commands us to "Make a bonfire with all the old **mathNEWS** copies: It'll bring warmth to my body, complimenting the warmth reading **mathNEWS** brings to my heart and soul." Although we heavily disagree with your fiery proposal, our cold, dead hearts are touched by the comfort you find in **mathNEWS**. But if the heat in MC ever fails and the thermal output of our computers aren't enough to stop our lizard blood from freezing, we'll know *exactly* who to call.

Oh hi, Plant Ops. Don't worry, nothing to see here.

terrified

IMPORTANT UPDATE ON SLC CONSTRUCTION

Shit's still broken.

Fruitboy

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UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

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