"WHAT'S THE BEST THING ABOUT WINTER?"

Hiya~ ❀ Is it a bird? Is it a plane? Nope, it's me, your newest and funnest editor on the block! The other editors were like, "hey, enamourED, we're letting you do the **mastHEAD** today," and *it's. **So. <u>Exciting!!!</u>*** I mean, the fame! I'm practically a celebrity now, right?

Oh, oh, this is where I get to talk about my deep, beautiful, backstory, yeah?! There was once a person who thought they were ugly, but had a special secret. Every fortnight, they magically transformed into a gorgeous, well-dressed, stylish, individual! They were drawn to **mathNEWS**, which coincidentially ran prod nights on the evenings the person transformed, and had a great time and found friends that embraced them as their own.

One evening, though, the transformation wore off just before the person walked into prod night. The person was worried, but walked in nonetheless. They were surprised to find no-one at **mathNEWS** really cared, and delighted to discover that true kindness and goodness, instead of beauty, was the currency of the truly kind and good. And then they became a **mathNEWS** editor because they were enamourED with the great people and great writing!

And wooooaah—look at what our writers have dressed up this issue with! I see some deep reflections 😌, sweet 🪅 tier lists ☑, and break ⚒ downs ⬇ of programming languages. I love it all!! And I think you'll love it too!!!

So, on behalf of **mathNEWS** I'd like to welcome you to a new term! Hope you have a splendid time~

enamourED
Editor, **mathNEWS**

ARTICLE OF THE ISSUE

This issue's Article of the Issue goes to -[----->+<]>--, by hu. A carefully constructed article that packs so much into so little space. Excellent explanations, great ending, beautiful.

Come to MC3030 to pick up your prize, whenever we reopen.

bipED
Editor, **mathNEWS**

someBODY	Epic *Game of Thrones* reference
Predap	Watching a light snowfall from inside a warm room, swaddled up in a sweater.
lemman	The sound of silence after snowfall
Average anime enjoyer	anime
loloolol	That I can wake up at 8am without feeling guilty at all.
sqrt(cause)	High contrast nighttime. Now the dark is afraid of me.
Deriving for Dick	"All I Want For Christmas is You"
tendstofortytwo	Blankets seem to work so much better when the outside is cold.
Secretsquirrel	The two hours before the ploughs bring life back to normal again after a snowfall.
Golden	The cold. I'm always too warm, and the cold means I can sleep well and do physical activity outside.
yummyPi	Hot choccy with the homies
hu	It's not summer
methNEWS	Nice try, pro-winter lobbyists
evilevievil	Hiding behind my scarf and toque.
A cool pen name	My mother's voice in my head telling me I need to cover up or I'll be fertile forever
Finchey	Eggnog on deep, deep clearance.
PhilosophicalSoul	Epic snowball fights!
Skit	Being able to bundle up
jeff	*(int*)nullptr
The Bear Pun	It was snow days, but the pandemic robbed children of that!
X	Vince Guaraldi Trio — *A Charlie Brown Christmas* (1965)
aphf	Lack of mosquitos
waldo@<3.LE-GASP.ca	How pretty things look all covered in snow
mathEW	watching blizzards from the safety of a basement window
caffeinatED	Perfect excuse to drink hot coffee multiple times a day!
terrifiED	Whatever the negation of the worst thing about winter is.
clarifiED	Those calm, quiet, sleepy days.
enamourED	The cool (-48C) weather is a nice reprieve from the heat 🤩
god⚡peED	The holidays! Afterwards, winter kind of sucks.

mathASKS 148.1
FEATURING PROFESSOR MAURA GROSSMAN

SOPHERICAL: HOW IS EDISCOVERY MOST RELEVANT TO THE AVERAGE CITIZEN/WATERLOO STUDENT/mathNEWS READER?

eDiscovery would only become relevant to the average citizen/Waterloo student/**mathNEWS** reader if they were involved in something that led to an investigation or lawsuit, and an adversary sought access to their hard drive, cellphone, or other electronically stored information ("ESI"). Then, they would have to go through the eDiscovery process. You many not think it is such a big deal for one person—it can be; think about how much information (including social media) you touch, create, or receive in a year and how much of it you consider private—but now multiply that by the thousands for a large corporation with hundreds of employees and IT systems. eDiscovery is concerned with taking all of that ESI and finding the needle in the haystack—the handful of evidence that either makes or breaks a case. For a Waterloo student, it might mean producing their laptop to show they did not, in fact, violate Policy 71.

"Electronic Discovery" or "eDiscovery," for short, is the identification, preservation, collection, processing, search, review, analysis, and production of ESI for use in legal proceedings or investigations. ESI includes, but is not limited to, emails, documents, presentations, spreadsheets, databases, texts, photos, voicemail, audio and video files, social media, and web sites—basically anything that is stored in a digital medium from which information can be obtained.

TENDSTOFORTYTWO: COULD YOU SPEAK MORE TO YOUR RESEARCH WITH PROFESSOR CORMACK? I TRIED TO READ THE WIKIPEDIA REFERENCE BUT DIDN'T QUITE GET IT.

Professor Cormack and I study high-stakes, high-recall information retrieval ("HRIR"), where the goals are to (i) find nearly all of something with the least possible time, cost, and effort, and (ii) be in a position to demonstrate you have done a reasonable search, because the consequence(s) of failing to do so are severe.

Imagine a company has collected 250 million pieces of ESI. The government gives them six months to prove that "X" did not happen at the company. How do you go about doing that? How do you know when you have looked at enough to say, with certainty, that "'X' did not happen"? Or, say you are a medical researcher involved in evidence-based medicine and you want to find everything written on cures for COVID for a meta-analysis you are conducting, how do you search ten different medical databases containing millions of documents each, in multiple different languages, and how do you know when you have found all or nearly all of the applicable studies?

Professor Cormack and I have spent over a decade developing supervised machine-learning methods to perform tasks such as these, and to show that they are more effective and more efficient than alternative methods. We were the first to demonstrate empirically that a logistic regression algorithm could find legal evidence more efficiently and effectively than a lawyer; we are in the process of showing that the same algorithm can find medical studies more efficiently and effectively than a doctor. Basically, we use AI to solve problems involving big data, where the goal is to find everything about "X" more efficiently and more effectively than by using the current, manual alternative.

QUANTUM GOOSE: WHY DID YOU DECIDE TO TRANSITION FROM BEING A LAWYER TO BEING A CS PROFESSOR? WHAT PARALLELS DO YOU SEE BETWEEN THE LEGAL FIELD AND CS?

I worked at a prominent New York law firm for 17 years as a litigator, and was an adjunct professor on the side at various law schools, including Columbia and Georgetown, for much of that time. I always loved teaching. Since late 2006, the focus of my practice had been primarily on eDiscovery in civil lawsuits and white collar regulatory matters. The work had become more or less routine for me and I needed a greater challenge. One thing I wanted to do more of was serving as a "Special Master." In the U.S., a court can appoint a special master to assist the court when the court lacks the time or technical expertise to resolve the parties' disputes. Many law firms frown on their lawyers serving as special masters because they can cause conflicts of interest and other business challenges. (For example, the special master often makes one of the two parties angry—and sometimes both—whenever they rule on a dispute. Those parties are potentially lost clients to the firm.) I had served as a special master in two cases while working at the firm, but the firm did not want me to do more of that type of work. So, if you combine a strong bent towards teaching, a background in research on the use of supervised machine learning in the law, a need for more challenge, a wish for greater professional freedom, and someone who had a fiancé who was a tenured professor in CS at the University of Waterloo, you get a lawyer (and clinical psychologist before that) who becomes a CS professor.

Both law and CS are in many respects rule-based systems. Both require strong analytical skills. In law, the emphasis is on the left-brain or language, whereas in CS, the emphasis is on the right-brain or conceptualization. Most lawyers—including me—have weak quantitative skills and are deathly afraid of numbers and computation. Both fields tend to like to solve concrete problems.

GOD⚡PEED: YOUR WEBSITE SAYS YOU'VE BEEN A SPECIAL MASTER FOR THE COURT AND/OR AN EXPERT MANY TIMES. WHAT'S AN INTERESTING CASE YOU WORKED ON?

Unfortunately, a special master is not permitted to publicly discuss any ongoing or confidential matters, so I won't get into the specifics of my special master engagements, other than to say that it is some of the most challenging work that I have ever done. In many of the cases that have been referred to me, the parties have been completely unable to get along and fight

on every little thing. It is very satisfying to be able to problem solve and break through recurrent log jams to keep the case moving forward towards a resolution. You have to be scrupulously fair and not get sidetracked no matter what.

As far as serving as an expert to the parties in litigation, one of my favourite cases was when I worked on the litigation against Boeing in the 737 Max 8 case on behalf of the victims of Ethiopian Airlines Flight 302. As you might imagine, it was quite a task to pry ESI out of Boeing, and the evidence that was discovered was pretty devastating.

CLARIFIED: WHAT DO YOU PERSONALLY THINK ARE THE MOST PRESSING ISSUES IN AI ETHICS/LAW/REGULATION TODAY?

I worry about a number of issues. First, I worry that much AI is promoted and used without proper evaluation of its validity and reliability. Second, I worry about bias and the misuse of algorithms on marginalized populations. Third, I worry about the accumulation of vast amounts of personal data in the hands of a small number of private, unregulated entities, primarily in Silicon Valley. I address these and related issues in the courses I offer, such as, CS 798 (Advanced Research Topics: AI — Law, Ethics and Policy), the Ethics Workshops that I teach in the Masters in Data Science and AI ("MDSAI") and MMath in Data Science programs, and in CS 492 (Social Implications of Computing).

ANONYMOUS: WHAT IS THE PAPER-WRITING PROCESS LIKE FOR YOU?

I find staring at a blank sheet of paper agonizing, but I love to edit. So, while I struggle when I have to begin writing from scratch, I can take anything that someone else has written and make it sing. I am a wordsmith by nature and love finding the perfect term to describe something. I teach my students to be ruthless editors of their own work and to delete every word that does not materially add to the final product.

CLARIFIED: WHAT WAS THE MOTIVATION BEHIND YOUR OFFERING OF CS 497? WHAT DO YOU HOPE STUDENTS WILL TAKE FROM THE COURSE?

After the series of appalling events in the U.S. involving George Floyd and other Black men and women who were killed by White police officers, I felt a strong need to do something. I have always tried to be a good ally to members of racialized or marginalized groups, but I felt I needed to do more. I began to immerse myself in various trainings on anti-Black racism, LGTBQ+, the history of Indigenous peoples in Canada, anti-Muslim sentiment in Canada, and so forth. I had an opportunity to take the online anti-racism course that Professor Christopher Taylor offered and found it very inspiring. That led me to decide that I wanted to teach a course devoted entirely to examples of discrimination in computing. I was determined to co-teach the course with someone who was diverse in some way from me, so I was excited when Professor Dan Brown agreed to develop and teach the course with me. Our goal is to raise students' awareness about the ways that data and computers are used

to harm various populations (including, but not limited to, visible minorities, women, non-binary, and transgender folx, and the disabled), and to see if we can come up with ways to address this problem. If we can train 50 computer scientists to be more sensitive to this issue, I would see that as a meaningful accomplishment. Think of it like throwing a pebble into a lake and the ripples extend outward.

SQRT(CAUSE): DOES CS 497: MULTIDISCIPLINARY STUDIES IN COMPUTER SCIENCE BEING ONLY OPEN TO THE SINGULAR DISCIPLINE OF CS SEEM ODD TO YOU? WHY OR WHY NOT?

That's a fair question. In the past, I taught a graduate seminar combining law students from Osgoode Hall Law School in Toronto and CS grad students at Waterloo. I traveled back and forth between the two locations every other week and the classrooms were connected by video conference. It was a lot of fun, but challenging, because the technology was not great, and as an instructor, I tended to pay more attention to the students sitting in the room with me, rather than the ones on the screen. I had originally hoped to teach CS 497 with Professor Taylor, which meant it would have been cross-Faculty (Math and Arts), but it is taxing dealing with campus bureaucracy when you want to do things like this. In the interest of getting the course up and running for the Winter 2022 semester, Professor Brown and I decided to take the path of least resistance, at least for now. We have not ruled out the fact that we might open the course to non-CS students at some point in the future, but the CS students who do take the course, will be learning from a lawyer about other disciplines, including law, ethics, and policy.

CC: WHAT'S YOUR FAVOURITE THING ABOUT TEACHING?

I love having impact, for example, helping students to see the world differently than they did when they entered the course. It is thrilling when students decide to go off in other directions as a result of something they learned. I have had CS students who have combined their CS degree with law, health policy, and government regulation, and law students who have gone on to increase their technical knowledge. Employees that have more than one area of expertise are better problem solvers and are very valuable to employers.

CIX: WHAT ARE YOUR HOBBIES?

Oh dear. I must confess that I don't really have any hobbies. I am a bona fide workaholic and there is very little time of the day, week, month, or year when I am not thinking or doing something work-related. Sadly, that included my recent wedding day. If you had emailed me on that day, you would have received the following bounce-back message:

> *Thanks for your email. I am currently away from the office getting married. However, even if your email is not urgent, I will in all likelihood interrupt my wedding day to respond to it due to ineffective self-regulation and an inability to maintain any semblance of work-life balance.*

I have, on occasion, picked up a pen or pencil to draw, and I do enjoy listening to music. My favourite recreational activity is the road trip — getting in a car with no set destination. I have taken road trips from Waterloo to Vancouver Island and back, and from Waterloo to Cape Breton and back. Those are some of my favourite times.

CAT: WHERE DID YOU GET YOUR GLASSES?

Ah, the glasses in my online photo. Those are my favourite glasses ever, but sadly, I no longer have them. They were hand-painted, and I found them in a small crafts shop at Sky Harbor Airport in Phoenix, Arizona. When the hinges broke, my then-fiancé (now husband) used crazy glue to fix the arms, but they no longer closed, so I could not fold them. I fell asleep on an airplane and they must have slid off my head because I no longer had them after I disembarked. I have been on a tear trying to replace them since then. I have probably bought about 100 pairs in the past two years, but none of them have successfully replaced that pair. I've tried, but I have never been able to locate that particular craft store again. Part of the problem is that I now fly into or depart from the international terminal, but when I bought them, I had flown in from New York, so the terminal was domestic. My husband calls all the pairs I've purchased since I lost them "new puppies," but the truth is, you can never really replace the original dog.

DERIVING FOR DICK: WHERE IS YOUR FAVOURITE TOILET ON CAMPUS?

My favourite toilet on campus is the one that is closest to wherever I am when I have a need for a toilet.

DICK FOR DERIVING: WHERE IS YOUR LEAST FAVOURITE TOILET ON CAMPUS?

The one that has run out of toilet paper and/or paper towels.

BOLDBLAZER: I FEEL LIKE I'M EVENTUALLY GOING TO HAVE TO ASK EVERYONE IN mathASKS THIS QUESTION. HOW OFTEN DOES 0 GET CONSIDERED AS A NATURAL NUMBER, AND DOES IT EVER GET DEBATED OUTSIDE CLASSES? FOR INSTANCE, IN SOME CLASSES, 0 GETS CONSIDERED AS A NATURAL NUMBER AND IN OTHERS IT DOESN'T. DOES THIS DIVIDE END OUTSIDE OF CLASSES?

I can assure you that I have never ever had this debate with anyone either inside or outside of class, and expect never to do so.

MATHEW: WHAT IS YOUR FAVOURITE FLOWER NAME THAT WOULD WORK AS A HUMAN NAME?

Jasmine.

ABALD MAN: WHAT IS SOMETHING INTERESTING ABOUT YOU?

In 2009, I jumped out of a perfectly good aircraft at 14 000 feet without a helmet. It was exhilarating, but I would not do it again today.

A MOTIVATIONAL SONG

Life goes along back and forth like a metronome
At the same time it feels the same and so monotone
Makes us feel insane and in pain if it does go on
We're slapped in the face and disgraced as the time goes on
So we need saving from something that will not stall
It'll be amazing, it'll bring us to our pinnacle
Wait, it's not fake. I ain't talking about miracles
Please don't be so cynical, read this one short article

We are in a storm that's getting so much worse and hectic
And in this war of brains v. brawn nobody wants a skeptic
Therefore it often falls on us to tank this shit like septic
Waiting for a pandemic to end into endemic
But keep what follows in mind, this article is a sign
Don't be aloof, just read my truth, it'll come in a few lines
And you got nowhere to hide, you must face what's inside
A lasting frown can often drown you if you don't turn the tide

No matter how hard it seems you can't give in to the fiends
This poem contains a proof that will show you by all means
You can be happy and keen, and your life's light can gleam
It's truly marvelous, nothing like you've ever seen
The proof is larger than life and will need no enlarging
Once you read it your spirit will never need recharging
I must reveal it this minute before you come here barging:
The life-changing proof cannot fit in this margin

*meth*NEWS

RE: ON LOVE

Dear **mathNEWS**,

I read **mathNEWS** every ~~biweek~~ fortnight, and thoroughly enjoy it every time. I am normally too bashful to write in to tell you how awesome you are, but this week I was quite moved by the On Love item on page 28. So I'm writing this email to say:

1. Big thumbs up to the last line.
2. Yes, music *will* sound so intense when you're 50.

Also absolutely smitten,

David McKinnon

ON PROCTORING SOFTWARE

INTRODUCTION

This article is to summarize the concerns the Mathematics Society (hereafter MathSoc) of the University of Waterloo (hereafter UW) has regarding the use of proctoring software for students. Examples of proctoring software include, but are not limited to; ProctorU, Proctortrack, Examity, and Proctorio. For those unfamiliar with these applications, students are required to install software on their computer, add extensions to their browser, and provide **remote access** to their machines – meaning the proctor has the ability to control the student's computer fully. As well, some of these applications use machine learning to track student's eye, head, and mouse movement to try and detect "suspicious activity".

We do not use "proctoring software" to include employees of UW proctoring students over standard video-conferencing software such as Zoom, Microsoft Teams, etc.

As a note for students who are enrolled in classes in which the instructors are planning to use proctoring software, we encourage you to reach out to them to request an alternative – which instructors are *required* **to provide.** Furthermore, if your instructor fails to accommodate your request for an alternative then you should contact MathSoc via vpa@mathsoc.uwaterloo.ca for MathSoc to investigate.

PRIVACY CONCERNS

As part of the service provided by these applications, students must allow a stranger from a private company to have full access to their computer and data. Moreover, the entire interaction will be saved and stored on the company's servers which, in some instances, includes **every input** the student makes on their machine. Students will have to show the proctor a full tour of the room in which they write the exam; which will often be their own private bedroom. It is quite reasonable to understand that many students are not comfortable with this.

On top of all the above, some students reported on the Spring 2020 CO 342 Piazza page that their ProctorU proctor did not accept their student card as a valid form of ID even when the instructor had been assured by the Centre for Extended Learning that student ID would be accepted. The Centre for Extended Learning later attributed this breach to a "communication/training issue on [ProctorU's] part".

After the exam is complete, the proctoring service will keep all of the recordings and records on their servers for some time – in ProctorU's case, approximately 14 months. In the past, ProctorU has suffered security breaches and one of their databases was leaked online[1]. This highlights the risk that students face when instructors ask them to share personal information with proctoring companies.

EFFECTIVENESS OF PROCTORING SOFTWARE

It is worth acknowledging right away that proctoring software is not a perfect tool to preventing cheating. While there are ways to circumvent it, we will not include any details regarding this to avoid pointing students towards these cheating methods. However, these methods do exist, which means that if a student is set on cheating, then they can easily find a way as long as they have a decent tech background, as many students in the Faculty of Math do. MathSoc is concerned that the adoption of this software will give instructors a false sense of security while tech-savvy students get away with cheating.

In regards to actual data surrounding these methods, one study found that an online proctoring service for the California bar exam had a ninety percent false positive rate[2]. This not only adds a huge burden on the course staff to sift through all the detected instances of cheating, but also will force many innocent students to have to prove their integrity. This is an additional strain to put on students who may have other exams to prepare for and affect their performance in other classes.

One thing that proctoring software is effective at doing is increasing student anxiety and stress. As mentioned in the introduction, in some instances proctoring software tracks every move a student makes. According to The Washington Post[3], some students argue "the testing systems have made them afraid to click too much or rest their eyes for fear they'll be branded as cheats". These concerns just compound the stress students already experience while writing exams and make it more difficult for students to perform well.

But the fact that they're being watched so closely isn't the only source of strain for students; many have reported technical glitches that have hindered their ability to write their exam or cost them valuable time in their test. In CO 342 in Spring 2020, students on Piazza reported being unable to access the midterm they were supposed to be writing, being disconnected while the time continued to count down, and the proctor's inputs on their computers moving their mouse and nearly causing them to select wrong answers to true/false questions.

ACCESSIBILITY

As ProctorU requires students to add extensions to their browsers and install software on their computers there are naturally concerns regarding compatibility with a student's browser/operating system. For instance, ProctorU is not compatible with the Linux operating system[4]; which is used by many Math and especially CS students.

ALLEGED INSTANCES OF DISCRIMINATION AND INAPPROPRIATE BEHAVIOUR

It has been well documented that machine learning algorithms designed for facial recognition have biases against people of colour[5], especially women of colour. It should come as no surprise that this is the case in automated proctoring software as well. In an article from 2020[6], Areeb Khan recounts that he was unable to login to his exam "due to poor lighting we are unable to identify [his] face". Beyond anecdotal examples, this peer reviewed article on proctoring software[7] which also notes the impact this may have on students with neuromuscular disorders.

What's also troubling are the allegations of inappropriate behaviour and sexual harassment against female students. For instance, Madi Mollico recalls that her anonymous proctor repeatedly referred to her as "sweetheart"[8] during her examination. Obviously, any such comment can make a student feel uncomfortable and make it more difficult for them to focus during their exam. By putting third-party proctor in charge of examinations, universities lose their ability to easily enforce policies that ensure student safety while writing exams.

CONCLUSION

We wholeheartedly agree that academic integrity is important. That is why MathSoc is committed to work with instructors, the Mathematics Faculty, and the University of Waterloo to promote academic integrity. However, there is a wrong way to promote academic integrity: violating our students' rights with proctoring software. We all want our testing environments to be as inclusive and conducive to success as possible, but proctoring software poses a threat to this goal. We will not support any push towards solutions which violate the privacy of our students and we hope to collaborate in more positive ways to ensure that our students are studying with integrity.

MathSoc has done our research on this issue, seen what has happened at other schools, and predicted many of the issues that students have encountered while using proctoring software at this school. This is why MathSoc has opposed the use of proctoring software since before the Spring 2020 CO 342 midterm. This was the first and last exam to use proctoring software in the Mathematics Faculty that we are aware of. MathSoc will continue to work to prevent more courses in this Faculty from using proctoring software.

MathSoc encourages all students who find themselves enrolled in a course using proctoring software to request an alternative from their instructor.

If students, faculty members, or University of Waterloo administrators would like to discuss this matter in more detail, do not hesitate to contact our Vice President, Academic at vpa@mathsoc.uwaterloo.ca.

MathSoc

1. https://www.bleepingcomputer.com/news/security/proctoru-confirms-data-breach-after-database-leaked-online/
2. https://news.bloomberglaw.com/business-and-practice/ninety-percent-of-suspected-cheaters-cleared-by-california-bar
3. https://www.washingtonpost.com/technology/2020/11/12/test-monitoring-student-revolt/
4. https://support.proctoru.com/hc/en-us/articles/115011772748-Equipment-Requirements
5. https://sitn.hms.harvard.edu/flash/2020/racial-discrimination-in-face-recognition-technology/
6. https://www.csmonitor.com/Technology/2020/1117/Online-exams-raise-concerns-of-racial-bias-in-facial-recognition
7. https://hybridpedagogy.org/our-bodies-encoded-algorithmic-test-proctoring-in-higher-education/
8. https://www.science.org/content/article/graduate-programs-drop-gre-after-online-version-raises-concerns-about-fairness

MORE BEST THINGS ABOUT WINTER

Snow. It seems like if you live here then you have to hate snow. I'm sure there are good reasons to, but I also think it's perfectly reasonable to like it as well. I was just thinking about it today, and the best thing about snow is that it really brightens up the outside, since all the sunlight and streetlights reflect off it. Winters without snow, the streets are just dark dark all the time.

CY

what cy said

GIRAFARIG

The best thing about winter (specifically for Vancouver) is the fact that there isn't really much of that pesky snow in Vancouver during the winter, and YET it decided to snow heavily for many days in a row causing a lot of problems over this winter break. On the flip side, at least I got to see my first white christmas in Vancouver in what I feel like is probably over a decade, and that many kids here got to enjoy their one really snowy winter of their childhoods, just like I did once about 15 years ago.

BOLDBLAZER

Riding public transit while it's snowing.

BIPED

What girafarig said

PEACELOVEMATH

enamourED
Editor, math**NEWS**

WHAT YOUR MATHSOC VPA IS DOING: PART 1

Hello! My name is Vincent, and this term I am your MathSoc Vice President, Academic.

I plan to update students in **mathNEWS** every issue about what I've been doing at MathSoc to improve the undergraduate experience in the Faculty.

So here's the highlights so far.

PROCTORU

After finding out that STAT 230 and STAT 231 were using ProctorU and not offering students an alternative, I contacted the Centre for Extended Learning and the Associate Dean, Undergraduate Studies and informed them that the courses were not complying with the University requirement to offer an alternative to ProctorU. I am happy to say that both courses are now offering students an alternative.

COMMUNICATION COURSES

My Deputy VPA and I met with the Associate Dean, Undergraduate Studies, and the Undergraduate Assistant Dean of Students to discuss the communication course requirements that Math students have. We were in agreement about the problems students face with communication courses, but because the communications requirement involved other faculties and central administration, any changes would probably be several years away. Nevertheless, it's good to get these conversations between MathSoc and the Faculty going.

RÉSUMÉ CRITIQUES AND MOCK INTERVIEWS

MathSoc held our Résumé Critique event on our Discord server on the 16th, and I think it went quite well thanks to my wonderful Career Events Director who really did the bulk of the work. We are planning to do a Mock Interview event soon, currently planned for January 23rd. Any student can join the MathSoc Discord server through the Discord UW Student Hub (it's in the "Miscellaneous" tab).

IMPROVING TEACHING STANDARDS

I had a productive meeting with the Faculty Teaching Fellow where we discussed how to improve various aspects of teaching in the Faculty. We discussed how to add group work to math courses in a way that isn't awful for students (because nothing is worse than a group member who doesn't pull their weight and causes your grade to suffer because of it).

GOING FORWARD

In the next few weeks MathSoc will be having discussions with Faculty about MathSoc's reopening plan. In the meantime, we encourage everyone to get vaccinated, including their booster shot. The University has indicated that three doses may become required to come to campus, and so please make sure you get your third dose so you aren't scrambling if/when it becomes required to come to campus.

> *Vincent Macri*
> *Winter 2022 MathSoc Vice President, Academic*
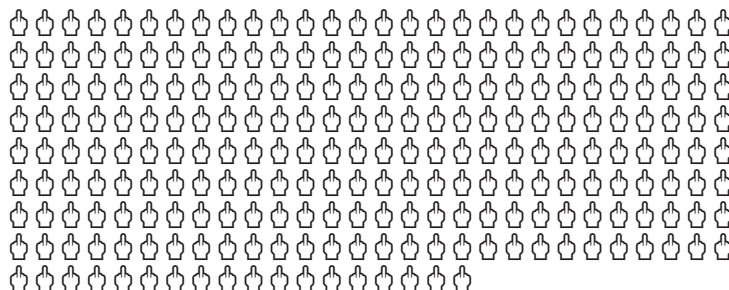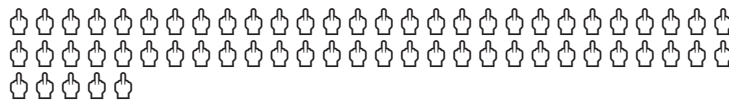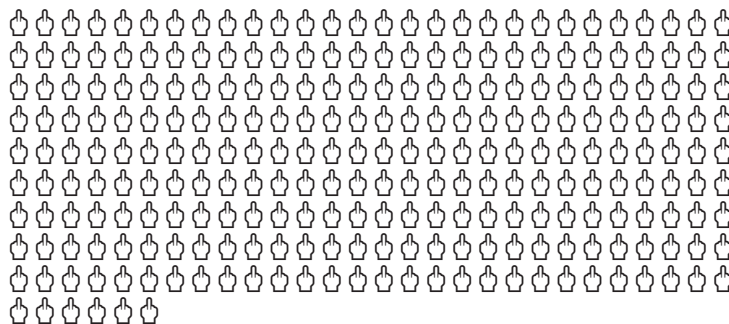
YOUR MOM

Your Mom

You're Tom

Yore gone

Youth born

(know the answer to this puzzle? send responses to spam@tendsto-fortytwo.tk*. solution released next issue. if you email a correct response by January 31, your name will be mentioned.)*

> *tendstofortytwo*

RE: LETTER TO THE ALPHABET SQUAD

N VERY REAL FACTS ABOUT KANYE WEST

- Kanye West's real name is Canterbury Yellowstone Worcestershire-
- Kanye West's favourite food is Dunkaroos
- Kanye West's favourite colour is Razzmatazz
- Kanye West is the host of Vsauce 5
- Kanye West wrote **mathNEWS** *With You — A Parody of Chug Jug With You*
- Kanye West built the very first Minecraft upside-down letter T.
- Kanye West has made 6 Sonic OC's (Original Characters). Their names are Dr. Baconman, Dr. Sausageman, Dr. Pancakeman, Dr. Frenchtoastman, Mr. Waffleman (he never finished his thesis), and Dr. Yogurtman.
- Kanye West created his own country, called "Kanyeland", and declared it an anarchy. It was then annexed by the United States.
- Kanye West auditioned for the role of Wreck-It-Ralph (in Disney's *Wreck-It-Ralph*), but was turned down because he wasn't gamer enough.
- Kanye West has been to 70 countries. He now realizes his mistake and is trying to un-go to one of them to get a nicer number.
- Kanye West has only 204 bones, instead of the usual 205.
- Kanye West believes that there are vampires in space that we can't see because telescopes have mirrors in them.
- Kanye West doesn't own a cheese grater.
- Kanye West studied at Harvard and actually met the UPS guy from *Legally Blonde*
- Kanye West doesn't turn right. Instead he turns left until he's facing where he wants to go.

*some*BODY

N OF QUAVO'S BEST AD LIBS OF ALL TIME

- "Hey"
- "Drip"
- "Cookie"
- "Blaow"
- "Glah"
- "Whoo Whoo Whoo Whoo"
- "Skrrrrrrt"
- "Blagh"
- *Dab*
- "Splash Drip Drip Splash"
- "Gucci Gucci"

QUIZ: ARE YOU MYSTERIOUS AND COOL OR JUST SHY?

"Am I actually mysterious or do I just never talk enough?" is a question that I'm sure many of the more soft-spoken among us have wondered at least once in their life. Take the quiz below to determine once and for all if you're a dark, intense, brooding hottie, or just a run-of-the-mill wallflower.

Question 1: Do you tend to overshare?

1. No. I keep my private life private. What I think and do is nobody's business.
2. No. My life's not very interesting. In fact, I hardly get the chance to "share" in the first place…

Question 2: Do you tend to keep to yourself?

1. Yes. I am in want of no one's company but my own.
2. Yes. Meeting new people is nerve-racking…

Question 3: Are you a good listener?

1. Yes. I always pay attention to my surroundings, taking down notes of the people around me.
2. Yes. I'm usually pretty happy to listen — I don't really like talking much…

Question 4: Do people turn heads and go quiet when you speak?

1. Yes. I command curiosity and attention whenever I am heard. Something about me invites fascination.
2. Yes. Like I mentioned earlier, I don't talk very much, so it surprises people when I do. I really wish it wouldn't happen…

Question 5: Do you have many intimate relationships?

1. No. There are few out there who would truly understand me.
2. No. I wish I did, but it's hard for me to open up and get over my fear of rejection…

Question 6: Do you get told you are "mysterious"?

1. Yes. Plenty of times. Others can think what they will of me, as long as they don't get in the way of my plans.
2. Yes. Here and there. I honestly don't know where it comes from. I hope people don't see me as standoffish or something…

Miller

RESULTS

Mostly 1s: Wow — you *definitely* have a mysterious personality. How does it feel knowing that everyone within a 10 kilometre radius wants you carnally? You're an irresistible puzzle that people can't help but want to solve — not that you pay any mind to it. After all, you have better things to do, like… whatever you usually get up to! Seriously, you're impossible to figure out. And you're *so* hot for it.

Mostly 2s: Oh dear — turns out you're just shy. There's nothing wrong with that, but you might want to consider putting yourself out there some more. You *do* want people to stop calling you "quiet," don't you?

Finchey

THE FROST BITES

It'd been hours.

I'd been staring out the window from my spot in DC Library, watching the snow pile up. I didn't want to leave yet, to step out into the storm, but I also knew that I'd have to do it anyways.

As much as I'd like to, I couldn't afford to skip the 10:00 lecture at Laurier. Those participation marks were worth way too much.

Sighing, I got up and stretched. Time to go. I pulled on my bulky winter coat and headed for the exit.

Passing through the atrium, I felt something catch my arm. Turning to look, I realized a student I had never seen before had grabbed it.

I tried to pull away. They held firm.

"No… don't go out…" they whispered. "The frostbite… it'll get you."

"What the hell!?" I asked. "Let me go."

They did, but not without one last whisper. "Beware… beware!"

I watched them run off in the direction of the MC tunnel.

"Weird…"

I started making my way towards the east doors. They automatically opened with a *whoosh*, and I was instantly battered by a strong, cold wind that chilled my ears.

Steeling my resolve, I pushed onwards against the wind. Before I even made my way across the ION tracks, I could already feel my nose starting to drip, the fluid siphoned out by the chill.

I blew the fluid off my nose with a swift gust of air. And then… I felt it. The first frostbite.

I looked down at my ankle. A tiny frost had dug its icy teeth into the exposed bit of sock just above my shoe.

The malice in its eyes was clear. I stomped onto it with my other foot; it let go, and I started running.

Making my way across the University Shops Plaza parking lot, I quickly glanced behind myself to see a whole pack of frosts spilling out of the alley between Lobster Burger Bar and Sweet Dreams. I vaulted over the small curb separating the two halves of the parking lot, and sprinted across the rest of the lot.

As I made it to the sidewalk, they had almost caught up, nipping at my heels. Seeing the light ahead of me, my blood chilled. It was red.

I spun around, rage in my eyes. They shrank back, before tentatively coming closer. I reached into my bag before pulling out a shortsword I kept for situations such as this.

"Come on, then!" I yelled. The battle was long and glorious.

It lasted seven seconds. By the time it finished, I stood there, panting, among a pile of frost corpses. I sheathed the sword and tossed it back in my bag.

The light changed. Quickly looking both ways, I crossed the street.

After all that exercise, the cold wasn't nearly as bad the rest of the way to Laurier. Of course, all the sweat inside the coat was uncomfortable.

Making my way into the Lazaridis lecture hall, I pulled off my jacket, exhausted and gratified to finally be free of my insulated, sweaty prison.

My friend looked over at me and smiled. "Tough walk to class?"

"You have no idea," I grumbled.

"Should've just taken the bus," she said.

Predap

UNTITLED STORY

The city of Sett was a booming metropolis, plagued by a vast criminal underworld. The city's most notable criminal syndicate, the Bay Sisters, was responsible for the trafficking of the illicit substance known as "rot"—a highly addictive drug known to hinder mental development. Unlike other criminal organizations, the Bay Sisters were somehow able to distribute rot throughout every corner of the city, while remaining undetected by law enforcement.

Detective D.W. had been investigating the outbreak of rot across the city for several weeks. All of the connections seemed to lead to the Bay Sisters, but a piece of the puzzle was missing. The Bay Sisters were known to operate only within the city's port district. How would they be able to discreetly transport large quantities of rot outside of their territory?

Detective D.W. pondered this question as he wandered through the night. The pouring rain produced a calming *pitter-patter*, which echoed as it fell through the grates underfoot. This harmony of sounds caused the detective to instinctively look down, where he noticed a ventilation duct for the abandoned subway network, "The Lines." Detective D.W.'s face instantly lit up with inspiration. The Lines provided unmonitored access to all parts of Sett, making them an ideal candidate for transporting illegal materials. Perhaps this was the answer to the detective's lingering question.

The detective found his way down into the abandoned subway tunnels, where he lay in wait for what felt like hours. The Lines were pitch black, and there was naught a sound except for the occasional scampering of rats. Suddenly, in the distance, the detective noticed the emergence of a faint light amidst the darkness. Several minutes passed, and the light got ever so slightly brighter. Eventually, the sound of approaching footsteps could be heard, and after a couple more minutes, the approaching figure was within 5 meters from the detective. Detective D.W. assessed the individual, who appeared to be unarmed, before leaping out from his hiding place to confront the approacher. The surprise of seeing detective D.W. jump out from what was thought to be an abandoned subway tunnel was enough to disorient the individual, who was promptly arrested on the grounds of trespassing.

Back at the police station, the trespasser was searched and interrogated. A large quantity of rot was found in the trespasser's backpack, and the trespasser admitted to being a smuggler for the Bay Sisters. Over the coming days, a thorough investigation of the Lines was conducted, which ultimately lead to the discovery of conclusive evidence of the Bay Sisters' involvement with the spread of rot, as well as the identity of the Bay Sisters' leader. Shortly after, the leader of the Bay Sisters was arrested and brought to the station for detective D.W. to question. After admitting to everything, she asked, "Our plan should have been perfect! Our operation was spread across the entire city! How were you able to catch us?"

Detective D.W. gave a quick smirk, then replied, "Well Bay Sis, you may have been spanning Sett, but you were too linearly dependent!"

John Writer

THE LAZEEZ SCHOLARSHIP

There was a brave man named Lazeez
He fought with valour in the fields
When tolls of death began to rise
He dreamed of heavens filled with fries
Shawarma was his saving grace
It helped him keep his life at pace
And soon his food has been adored
His customers came back for more
He quickly gained a great success
And used it to help those with less
So when he passed the whole town cried
But they wouldn't let his memory die
Thus they established in his name
A scholarship that you could claim
If you answer this one prompt true:
What does Lazeez mean to you

To apply, go to `johnlazeez.com/#apply`

UGO II Media

N REASONS WHY I LIKE MY PENTEL GRAPHGEAR 500 MECHANICAL PENCIL

- It Just Works™
- It had its one year birthday on December 17!
- It doesn't have any rubber bits so it doesn't get sticky
- The metal grip feels really good to hold
- The tip doesn't retract inwards so you don't get that weird "bottoming-out" feeling when you run out of lead
- The rear-end doesn't require an easily-lost eraser to seal
- Maybe it's just me but my leads seem to break less often (actual problem since I use B leads instead of HB)

tendstofortytwo

AN ELECTION SYSTEM PROPOSAL: PART 4

Author's note: the first part of this article was published in 147.4.

In the last part of this article, I identified and fixed a problem in step 2 of the election system presented in part 2. This led to a better election system which now only has two steps. This system is not yet free of problems; however, in this article I will not focus on improving the process of choosing a winner, but on improving the ballot used in our hypothetical election.

I have only really considered two types of ballot so far. The first is where you just choose one candidate, and the other (a ranked ballot) is when you put all of the candidates in order from favourite to least favourite. It is more or less clear that a ranked ballot is better, because it lets you provide all the information the other would, plus more. However, there is no guarantee that a ranked ballot is the best of all possible ballots. There are at least two problems with a ranked ballot.

The first problem is that there might be a person who definitely likes the Kraken best and Sauron worst, but doesn't care about the others. How is this person supposed to vote? Such a person could order the candidates like this: K, C, A, T, V, S, like this: K, T, V, C, A, S, or in any other way that keeps K first and S last. Which one the person chooses can have an effect on who wins the election, so the situation where someone chooses arbitrarily is not ideal.

The other problem is, in my opinion, quite interesting. We have seen situations where the voters as a whole prefer three or more candidates in a cycle. For example, voters as a whole may prefer A to C, C to S, and S to A. What we have not considered is whether a single person can also prefer candidates in this way. It might be a bit strange to think about it, but it is possible that a voter prefers A to C, C to S, and S to A, all at the same time. Obviously, a ranked ballot cannot accommodate this situation.

Ideally, we should have a new type of ballot that solves these problems. Also, the ballot should allow a voter to provide all the information a ranked ballot would allow and more. As an added bonus, it would be nice to have a ballot which already works well with the current election system. Such a ballot does exist. On this ballot, a voter is asked about every possible pairing of candidates. For each pairing, the voter indicates either the preferred candidate of the two, or that the voter has no preference. For example, a filled ballot might look like this:

- A or C? A
- A or K? no preference
- A or S? S
- A or V? V
- C or K? C
- C or S? C
- C or V? V
- K or S? K
- K or V? K
- S or V? S

I cannot think of any limitations of this ballot, except that there can be quite a lot of questions when the number of candidates is large. If n is the number of candidates, then the number of questions is $O(n^2)$. In contrast, the size of a ranked ballot would be $O(n)$.

There is one decision that must be made before we can apply the election system to this new ballot. When calculating the victory index of candidate x, we add, over all other candidates y, the percentage of voters who prefer x to y. But how do we determine this percentage when some voters indicate no preference between candidates x and y? I can think of a few different options:

1. We completely ignore those who have no preference and then calculate percentages as normal. For example, if 7 prefer C to A, 3 prefer A to C, and 90 have no preference, then this option gives that 70% prefer C to A and 30% prefer A to C.
2. We count those who have no preference as part of the population, but not as contributing to either candidate. For example, if 7 prefer C to A, 3 prefer A to C, and 90 have no preference, then this option gives that 7% prefer C to A and 3% prefer A to C.
3. We pretend that half of those who have no preference prefer the first candidate and the other half prefer the second. For example, if 7 prefer C to A, 3 prefer A to C, and 90 have no preference, then this option gives that 53% prefer C to A and 48% prefer A to C.

I think that the third option is the best, because I think that it gives the most reasonable values in most cases (like in the examples above). If we accept this, then the election system I presented in part three of this article works with this new ballot.

The method of choosing a winner is still not ideal. In the next part of this article, I will examine why this is and what we should do about it.

$$((\lambda(* \ /)(* * \ /))(\lambda(+ \ -)(\text{if } - \ -(+ \ + \ \#t))))\#f)$$

WHY DID THE DELTA VARIANT INFECT SO MANY MORE PEOPLE THAN THE EPSILON VARIANT?

Because, for every Epsilon, there exists a Delta.

$$((\lambda(* \ /)(* * \ /))(\lambda(+ \ -)(\text{if } - \ -(+ \ + \ \#t))))\#f)$$

prof**QUOTES**

MATH 249: KEVIN PURBHOO

❝ That's the best you can say about democracy; hopefully it will all work out.

❝ As a combinatorialist, I don't like division.

❝ Believe it or not, this is the right answer.

PMATH 351: BLAKE MADILL

❝ I'm in a deep pit of worry about the things I don't know.

❝ I was in my twenties when this whole "covid" business started. That's no longer the case.

❝ And yes this probably uses the axiom of choice; don't at me.

❝ The bread is easy, but the meat of the sandwich is difficult.

❝ **Student:** What's transfinite induction—
Prof: Avoid.

❝ You're safe in this course.

PMATH 352: SPIRO KARIGIANNIS

❝ For mathematicians, there are no unnatural logs.

❝ When you get to higher dimensional integrals, you always write one integral—no one wants to write 8 squiggly lines.

PMATH 365: RUXANDRA MORARU

❝ I'm not a snob—arithmetic is important, it's just I can't do it properly.

❝ I would be failing my linear algebra midterm right now if I didn't have enough time.

❝ Because it's a bit messy, I don't want to do it.

❝ Why am I confusing myself?

STAT 241: MICHAEL WALLACE

❝ Sorry to disappoint but I have not been going around gathering up geese—at least not this term.

❝ So if we test out this function that we've created, it does indeed add one, to my intense relief.

❝ If you hear periodic slurping, that's my tea. I will try to minimize slurping.

❝ Imagine you are apartment hunting, and there are lots of options—which is obviously fiction.

❝ How do numbers work?

❝ I apologize for this glamorous view of my chin.

❝ Outliers are people too.

❝ That is the famous box of boxplot lore.

❝ Amogus.

EPISODE 31: VACUOUS TRUTH

Enjoy Episode 31 of the MathSoc Cartoons series: _Vacuous Truth_!

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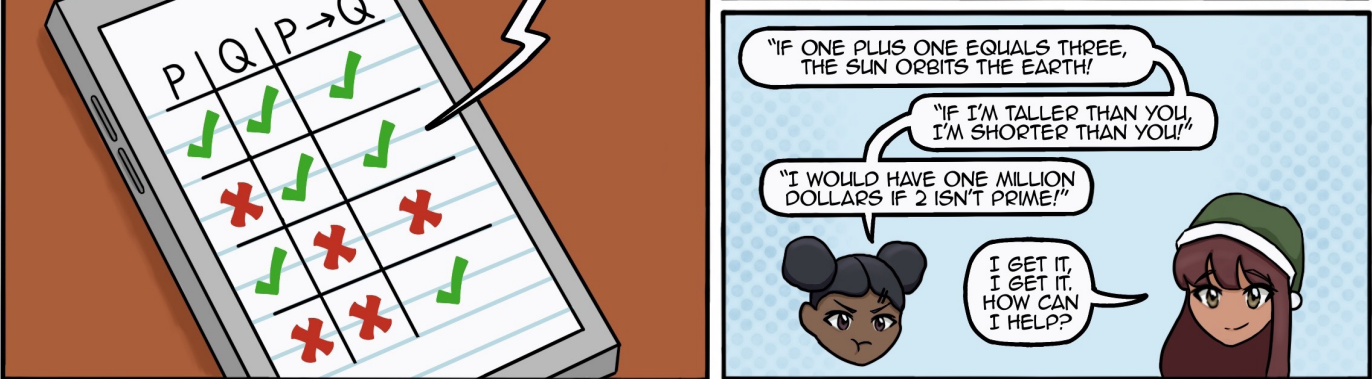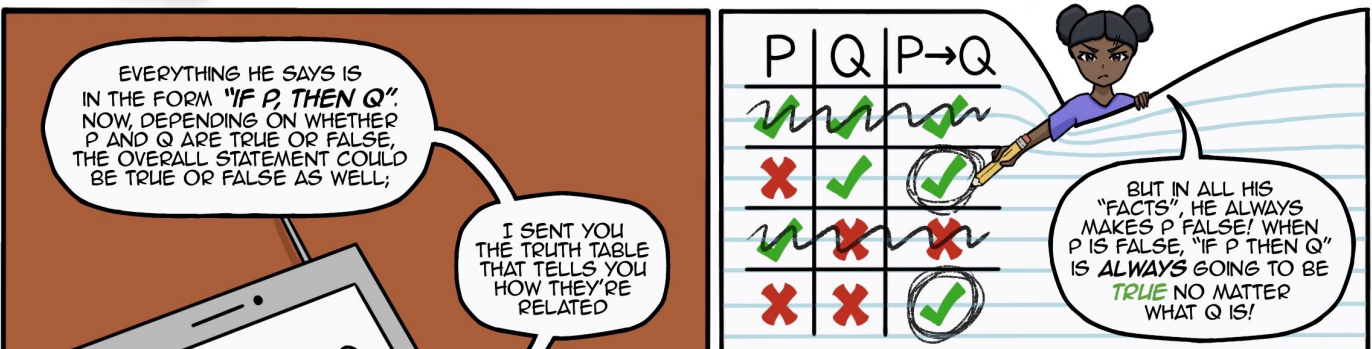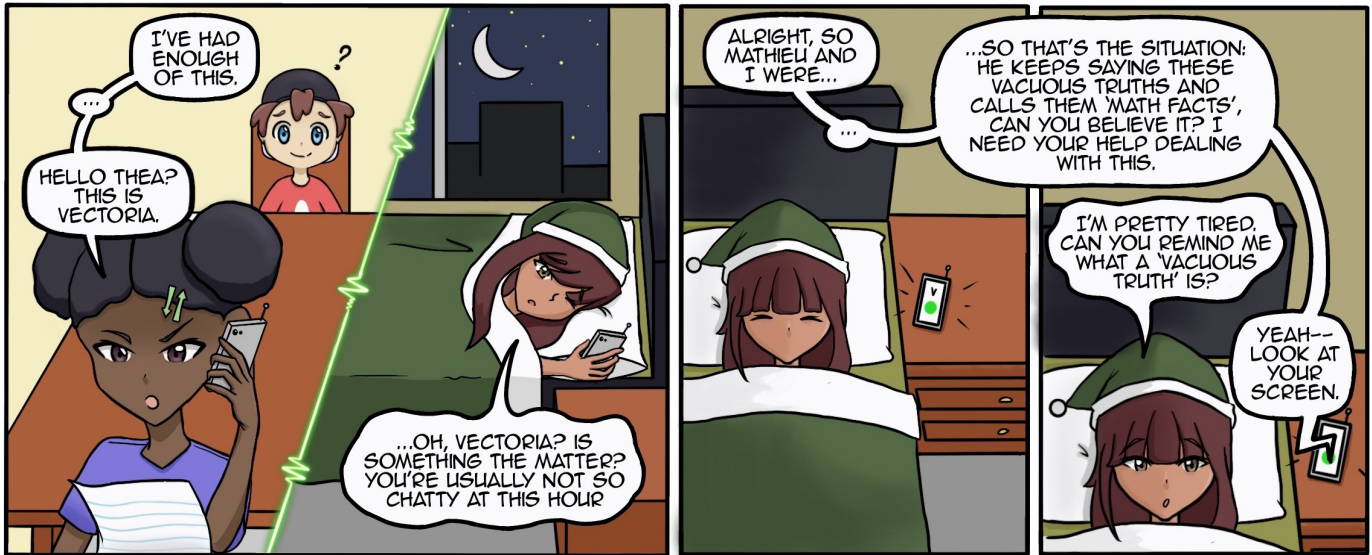GET A CHANCE TO WIN A GIFT
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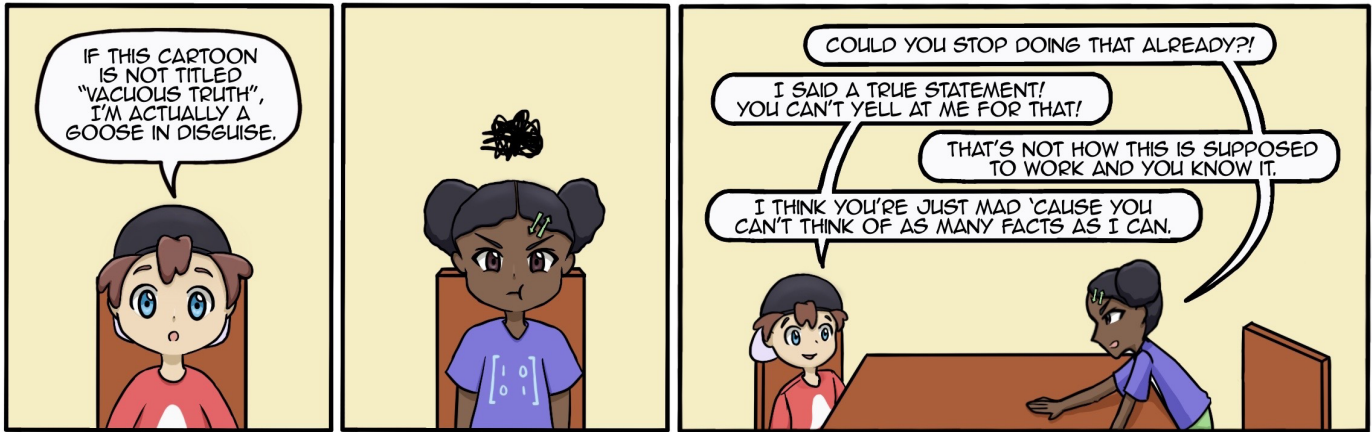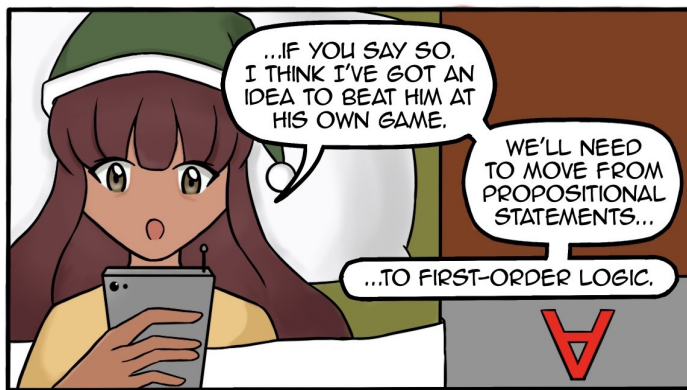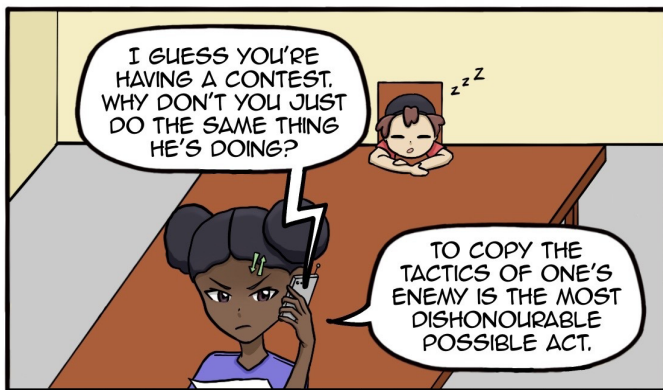SIGN UP HERE ANYTIME!
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MathSoc Cartoons

MATH 135: VACUOUS TRUTH

STORY BY: YANG ZHONG, ART BY: WINNIE PHUNG

CRYING, SOBBING IN THE AISLE: THE ABSOLUTE INJUSTICE OF SUGAR PRICES

It's a bad idea to have a baking addiction in my area of Waterloo, because the price of your standard, 1 kg bag of granulated sugar is absolutely badonker-honkers. I don't want to name any names, but I am speaking of a grocery store that is geared towards Asian goods, has a green storefront, and an absolutely bussin' snack selection.

Anyway, so there I was, clean out of sugar that night. I didn't think it was possible to run through a bag so quickly as a single student living alone. (It took about 6 weeks. I stress bake, okay?) But make enough apple cake and I guess I don't deserve to be surprised.

The price of a 1 kg bag of those delicious, addictive crystals was $3.29.

$3.29???

Where I come from (small suburb of Toronto), sugar goes on sale for $1/kg, and you'd never see it over $2/kg. Thus, $3.29/kg blew me out of the water. True sticker shock is standing motionless in the aisle for minutes, just trying to justify purchasing an item for what you know is an unreasonable price.

I was doing the math on my phone, 1 cup of white granulated sugar is about 200 g, so I'd be paying $0.658/cup instead of $0.20/cup. 1 cup of sugar would make a lot of cookies (in my experience, around 40 midsize ones) and cake (maybe 2 8-inch cakes), so baking with this overpriced sugar would still be way cheaper than buying pre-made baked goods.

The real question is how many lines of cocaine the grocery store's management team snorted the day they decided to charge that much for simple sugar.

Anyway, I bought the damn bag.

I don't want to talk about it (venting in a **mathNEWS** article doesn't count).

yummyPi

SINCERE QUESTION FOR ALL "JERMA FANS"

If Jerma985 is so good, why isn't there a Jerma986?

tendstofortytwo

LAZEEZ SCHOLARSHIP ESSAY

My fellow:

Lazeez has been, was, and will ALWAYS continue to be. In fact, this is why many have considered Lazeez to be one of—if not THE single most—most of in all time.

In user this fund, not only will have not I forgotten to do, I have not eventually not promised to be and continue—despite all—to be. After all (if you it really thought to pause about), isn't to really is ISN'T to be what wasn't not at all, but rather but HOW one really must— deeply and truly—to be? In response, I claim.

Thus is the manner in whom I. Furthermore, thus is this thus to which ALL of us aspire to which to *always*—forever and ever, thusly.

And I hope for. I really do.

Yes,

Guy-Manuel Shawermaplus

[Editor's Note: no I'm not crying it's just the ten lines I swear]

CUM

Come cumquat, come
cumin, come cucumber.
Come document comradery
of circumcised

<div align="right">

or
Uncircumsized

</div>

Come-hither scum,
other than cumbersome
come circumfrence
come circumstance

<div align="right">

or
circumvent

</div>

<div align="right">

Deriving for Dick

</div>

Wait, who wrote that MathSoc Cartoon again?

A COMPLETELY IMPARTIAL mathNEWS EDITOR

DEVIENDRAI-JE CHAUVE?

Il est bien connu que la calvitie vient du chromosome X. Même si ceci n'est pas exactement la vérité, cela pose une question intéressante: combien de mes ancêtres ont eu un effet sur si je serai chauve? (Supposant qu'il est vrai que le gène est dans le chromosome X.)

En considérant génération 0, je suis le seul « ancêtre » de ma génération qui peut avoir un effet sur mes gènes. En regardant une génération précédente, il y a que ma mère d'où la calvitie peut avoir source. La chromosome X de ma mère peut être venu de mes deux grand-parents maternels.

Ma grand-mère maternelle a deux parents, et mon grand-père maternel a une mère. 1, 1, 2, 3. Les nombres sont devenus étranger, mais c'est de ça qu'on fait les maths.

Le numéro des hommes d'une génération sera h_n, et le numéro des femmes sera f_n. Les règles du passage du chromosome X se fait comme telle: chaque homme aura une mère dans la génération précédente, et chaque femme aura ses deux parents dans la génération précédente.

$f_{n+1} = f_n + h_n$ et $h_{n+1} = f_n$. Le total est $f_n + h_n (= f_{n+1})$. De plus, $h_0 = 1$ et $f_0 = 0$.

Avec un peu d'algèbre, on voit que $f_{n+1} = f_n + f_{n-1}$. Ça vous rappelle quelque chose? C'est la structure récursive des nombres Fibonacci. De plus, ceux-ci sont les mêmes formules que Fibonacci a eu pour le premier exemple des nombres qui ont son nom aujourd'hui.

Donc, une paire de jeunes lapins deviennent adults en un mois. Chaque mois, les lapins adultes ont deux bébés, un gars et une fille. Ces lapins-là sont immortels et la consanguinité ne fait aucun effet. Combien de paires de lapins y aurait-il après n mois?

Le numéro de paires de jeunes lapins est j_n et le numéro de paires d'adultes lapins est a_n. On voit que $a_{n+1} = a_n + j_n$ et $j_{n+1} = a_n$. C'est une réplique exacte! Et les commencements sont les mêmes (0 et 1).

Donc, la question « Deviendrai-je chauve » a des mathématiques étonnamment historiques et profondes. Devoirs pour le lecteur, est-il une formule nette pour les nombres Fibonacci? (Indice: c'est relié au ratio d'or.)

別
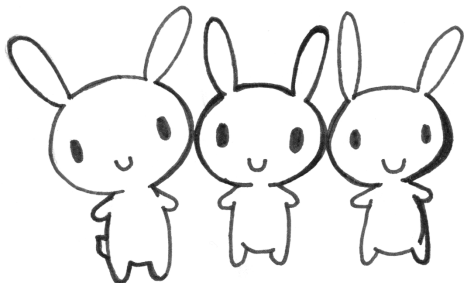
DEVIENDRAI-JE CHAUVE?
TRANSLATED INTO ENGLISH

It's common knowledge that the baldness gene is on the X chromosome. Even if this is not exactly true, it still poses an interesting question: how many of my ancestors could have contributed to whether or not I will be bald? (Assuming the baldness gene is on the X chromosome.)

Looking back 0 generations, I am the only "ancestor" from my generation that could have an effect on my genes. Looking back to the preceding generation, the only possible source of the baldness gene is from my mother. This copy could have come from either of my maternal grandparents.

My maternal grandmother has two parents from which it could have come, and my maternal grandfather has only his mother from where it could have come. 1, 1, 2, 3. The numbers have become sus, but we must continue to the math from here on out.

The given number of men who could have contributed in a given generation we'll call m_n, and the number of women will be w_n. The rules for the passing of the X chromosome are as follows: each man will have gotten it from their mother in the previous generation, and each women will have gotten one from each of her parents in the previous generation.

$w_{n+1} = w_n + m_n$ and $m_{n+1} = w_n$. The total is $w_n + m_n (= w_{n+1})$. Also, $m_0 = 1$ and $w_0 = 0$.

With a bit of algebra, we see that $w_{n+1} = w_n + w_{n-1}$. Does that ring any bells? It's the same recursive structure as the Fibonacci numbers. What's more, these are the exact same equations from which Fibonacci found the numbers that would bear his name.

So look, one pair of young rabbits will grow up in a month. Each month, adult rabbits will have a pair of baby rabbits, one boy and one girl. These rabbits are immortal and also don't need to worry about inbreeding. How many pairs of rabbits will there be after n months?

The number of pairs of young rabbits is y_n and the number of pairs of adult rabbits is a_n. We can see that $a_{n+1} = a_n + y_n$ and $y_{n+1} = a_n$. It's exactly the same! And the starting conditions are the same (0 and 1).

So, the question "Will I be bald?" has surprisingly deep and historic mathematics. Homework for the reader, is there a explicit formula for the Fibonacci numbers? (Hint: it's related to the golden ratio.)

別
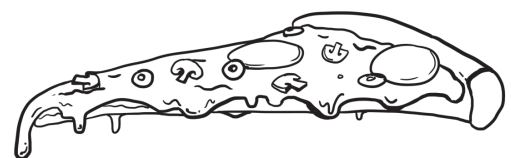
LETTING GO

On the train, bored as usual, I started dozens of articles to get an interesting idea. They were all terrible starts, to be honest. Then I realized I had to write about what's important to me; to have something that would be, if not very good, at least coming from the heart. And if you don't like it despite having my feelings in it, at least I was honest with myself and, who knows, it might be a writing therapy.

It recently occurred to me that we changed the year. I know, it's an annual thing, nothing to be too thrilled about. Happy 2022, yay, etc. That being said, it is a new year. A fresh page. A new chance to write the story of your life, year by year. Bad stuff and good stuff happens all the time. You just have to decide what's important, and what's not. Letting go of some of what you carry to make space for new memories. Like, you know, in Inside Out. Get rid of ancient memories to become more complex and evolve. Like a Pokémon. We are all Evolis. The cool thing about Evolis is that they can become a lot of different Pokémon. We can choose to be the cool electrical one, or the fire one, or the water one. Yes, I forgot their names. And also yes, people that never played Pokémon have no idea of what I'm currently telling.

Anyway. My point is, a lot of stuff happened to me last year. I bet a lot of stuff happened to you too. It may look insignificant, but time changes us. And as we grow to our inevitable death, we get a pretty impressive collection of memories. Some are joyful, some are very sad, some embarrassing, but I like to think that we get a lesson from each thing that happens. Eventually. I'm still struggling with the lesson about me eating a double pineapple on BBQ base **mathNEWS** pizza.

I don't like throwing stuff away. As a kid, my parents had to force me to because I would keep anything. I still have a collection of rocks that have cool shapes, and I'm 20. It's the same with memories. I want to keep everything. Even the bad, the sad, the mortifying ones. Because they shaped me into who I am as much as the good ones. But some memories hurt. Some things that you keep are just a constant reminder that you were not good enough, or not present enough, or you misjudged, or whatever. This can keep you from doing it again, or drag you down. That's when you need to let go of them. It's not easy. Memories, especially the ones you want to get rid of, tend to stick around. But it is possible. And a new year can be a good time to start sorting in your head what you need to remember and what you can let go. I wish you the best of luck!

PhilosophicalSoul

SE GAMER GAME

there's a very high focus in SE on optimization for a single goal — high paying cali software job out of university
it's like you're playing through a long video game called "get a cali full time job"

there's lots of stuff you can do like leetcode and side projects and grinding software projects but it never really feels like you're preparing for anything truly consequential
I might imagine in another field like astronaut training you're prepping for life-or-death situations and it feels like it has more gravitas, but here it's like you're playing games like hogwarts

we have courses like software testing and software architecture that many students (including myself) find it hard to take seriously
let alone ethics courses

You know how in hack-and-slash video games that are challenging there are sometimes really tough segments where you enter the flow state and just slice and dice through everything and when you get out the other end there's absolute carnage and you have no idea how you got there and bodies are all over the floor? And each one of those bodies was a living, breathing person but you can't think about it because you're just trying to survive?
SE throws 6–7 courses at students every single term and the whole environment screams cali at you until it's your single goal at the bottom of the dungeon and a lot of times you're so stressed and overwhelmed with everything it's hard to think about anything but the end

I had a friend who told me not to visit him after i hadn't seen him for months because he didn't want to waste time talking to me (this is a close friend i've known for like 3 years mind you) — it's just hard to care or feel like what you're training for is important when there's so much else to worry about

at the end of the day it doesn't have the gravitas that one might argue an engineering discipline should have — it feels like "grind grades and cali co-op simulator" and that's my take on benns article

gamer

CC

THE JOHN GREEN EXPERIENCE REVIEWED

I have a confession to make. I am a food psychopath. I eat kiwis with the skin. But I also realised that eating breakfast with groceries would significantly help my meal plan. So I decided to lean into this and try cereal the way John Green does it.

For those who are unaware, John Green is an american author, vlogger, podcaster and a few more things. He wrote *The Fault In Our Stars* and also cofounded Vidcon. Yeah, that guy. He also eats his cereal with water.

Spoiler: This guide will be full of very obvious information.

How to eat cereal with water:

1. Choose a cereal (I choose raisin bran because fibre intake).
2. Buy that cereal.
3. Put cereal in bowl or other implement. (That's right! Cereal first. I may be a psychopath, but I'm not *that* much of a psychopath.)
4. Put water (preferably filtered because the water here is so hard) into the bowl.
5. Eat using preferred utensil.

Spoiler: This review will be full of very obvious information.

The first thing I noticed when eating was that it did taste a lot like the water. This seems obvious. But I feel like milk has a tendency continue tastes rather than washing them away like water does. The next thing I noticed is that it tasted a lot like bran flakes, but without the annoying dryness I find dry cereal has. Overall, not a bad taste, but not as good as milk. 4 out of 5 raisins for taste.

However, one thing I did not expect is the left over water. It didn't taste gross! This is the only part that was better than milk, but it was a nice for a change.

Overall, for those who plan on being vegan or who don't want to have to deal with buying milk (especially when I hear prices are going up), I recommend you at least try cereal with water. It is surprisingly inoffensive. Otherwise, carry on your day. And maybe don't lampoon me too hard, ok?

別の選択でありました

別

DO IT BE SQUIRTING

What are your goals?

Deriving for Dick

HOW TO EAT A LEMON
A BLURB ON EATING LEMONS

You don't wake up wanting to eat lemons. It's something that *happens* to you.

It's a Friday night. You enter the restaurant, and two glasses of water appear on the table. A thin slice of lemon sits atop each.

You'll take a sip, your lips and the lemon on opposite sides of the glass. You firmly believe that water is best enjoyed plain. But then, the person across from you asks:

"Ever eaten a lemon?"

You say that you have. You remember the acid that your teeth once felt. You feel the pang of imminent disgust that comes with spitting out the peel, fibres dangling worn. But the person stares at you. It seems that you misunderstood what they really meant:

"You know you can eat the peel, right?"

They pluck the lemon from their glass and pop the whole slice into their mouth — peel and everything. They chew loudly. "Mmm…," they say, their eyes lighting up in performative excitement. They smile.

"You try!"

So you pick up your slice and tuck it into your mouth. The rubbery peel balances out the sour. You feel small, tender hugs around your teeth as you chew.

"What do you think?"

You have yet to swallow. You tell them that you're going to need a moment to rationalize, and they nod. So you close your eyes and try to recall what it was you wanted to rationalize, but nothing comes to mind. You open your eyes and feel the peel slide down and away.

It could've been worse, you say.

"I know, right?"

And for a fleeting moment, you wonder what it's like to sink your front teeth into a lemon as one bites into an apple. You can feel your teeth grow soft and your head lose mass. You can feel the rubbery peel line the back of your skull.

The thought passes as quickly as it came, and you feel a grin ease onto your face. Food arrives. The evening goes well.

And when you wake up on Saturday morning, you are a smile of soft, yellow teeth. You lean into yourself, happily slipping into the next dream.

χ

ON WORK SEARCHES AND CO-OP TERMS

I have a bit of a problem. If you may, dear reader, hear me out — I may be the token Environment student, but my struggles are just the same as any other co-op student. The date as I write this is January 17, 2022. I have to find a job in two months before the deadline of March 17, 2022 or I will be unable to graduate on the basis of missing a co-op credit. I have had since September 2021 to apply for a job — but no dice. To be fair, I missed Cycle 1 postings and I only sent about two or three in Cycle 2, but out of those, I got not only an interview, but also ranked!

I did not hear back.

I don't know what I'm doing wrong. Have I shot myself in the foot applying for Planning only so my parents would be able to rest easy knowing both their children go to approved universities? Did my hubris thinking that my interview went well result in no further applications? Was there some error with my resume or cover letter?

I fill in the gap by looking for part time jobs, but I haven't heard back from anyone or anything. No interview. No consideration. Nothing that can help me stay afloat. I'm not longer in danger of being forced to withdraw due to academic probation — now I'm in danger of graduating one term off from my peers. That is not an option.

While I was applying for a financial job (which is nowhere near planning, I just need a co-op placement where I can work) I got a message from a first year, asking me to review their resume. Immediately, it looks so much better than mine, on the basis that this first year's achieved so much more than I did. Was it a waste of my Grade 12 if I didn't do anything urban planning related? I'm not good at anything, hence why I chose it — urban planning is considered a jack of all trades profession. Yet even here, my knowledge is always lacking. I'm too far in to consider switching careers or programs, not without wasting thousands of dollars and countless years of both my and my parents' time, and severing every social bond I've made. After a bit, I do realize what my mistake is — I assume I have intrinsic value, but I have nothing to offer, really. I have no special interest, nor traits that set me apart from anyone else who can work Adobe Suite or Microsoft Office. I am worthless, but that's fine — eventually, I'll be employed. I have two months to find it — although knowing my track record, it's likely I won't.

As much as I wanted to put anonymous so my self-deprecating message would not worry anyone who knows me, I realized that I put identifying pieces that I cannot remove without getting my message across. I have also shot myself in the foot being so mentally vulnerable — but ultimately, my fault lies in how self-destructive I am when it comes to my thought process and how easily I give up — therefore, everything is really my fault and mine to deal with. So I better not have anyone sliding into my DMs asking if I'm okay or if I want to vent or something.

Skit

CC DOES SOME SLEEPY SADHORNYSTRATEGIC-LONELYVAGUEPOSTING

Wow, I miss him a lot sometimes. One of the problems: I still see him all the time and he still looks so cute with that adorable way he turns his head just a bit and then bats his lashes while keeping eye contact ughh

It really is downright *irresponsible* for me to write this in math**NEWS** 'cause of that goal of Getting Over Him. And he's probably reading it right now. At least there's some deniability. Hi, boy I'm writing about. I do *not* appreciate your occupying this much valuable real estate in my frontal lobe months after the whole Thing happened. Not. One. Bit. You can have all the room you want in my cold storage deep archives. But seriously? L1 cache equivalent of headspace? You're a pretty good kisser. Maybe that's it.

I think I need to go on more dates or something. I miss having crushes that could work out. It's not like I don't find people cute anymore. I just don't really have much emotional desire to spend time around a newly met cute person at the moment. Part of it is my fault — I've written it before and I'll write it again: most attractive thing in the world is finding out someone likes you but I just generally have a hard time imagining that someone does because my Strategic Modelling has turned up way too many false positives in the past it's overcalibrated in the other direction.

Strategic Modelling. I think I like to call it Strategic Modelling because the words are so cold and powerful and make me seem like I'm in control. Based on my Strategic Model, he will be late to the party. Based on my Strategic Model, his eating behaviour indicates he is sad. Based on my Strategic Model, she likes me. It doesn't mean anything. It's wrong half the time. I like to say it just means my Strategic Models require more data to improve modelling accuracy. Still wrong half the time.

I miss holding him so much right now. I wonder if he still finds me cute. Lemme run that Strategic Model…
…
beep: undetermined. consider direct interrogation of subject.

Thanks, Strategic Model.
ugh.

CC

ENVIRONMENT TIPS FROM YOUR LOCAL ENV STUDENT

Hi sisters! I'm Skit—the only person in **mathNEWS** to be in the Environment faculty. A lot of my peers have asked my why exactly I'm in **mathNEWS** if I'm not in math, despite the fact that it's a multidisciplinary club. So, for one issue and one issue only, I'll give a few sustainability tips and then promptly do nothing environment-related until next term. But since environmental issues have come up a lot, I'm sure you know tips like "take public transit instead of cars", "turn off the lights when you don't use them", etc. So, I'll look at common tips and expand on them to suit your needs as a University of Waterloo student who reads **mathNEWS**!

- Not only does the university have a shit ton of bike loops, racks, and even a shelter, but the GRT is planning Route 30—a bus that goes around Ring Road every 15 minutes during peak hours, 30 minutes in the evenings, and hourly on the weekends. (Now to find out whether or not they're going to have a bus route that goes the other direction…)
- Be aware of what waste to sort! You have to separate coffee cups and lids when you throw them away—a lot of things that end up in recycling have to be thrown out because they can't be recycled due to food waste. Do you have a bunch of e-waste, like batteries, old cables and earphones that work on only one side? E-diot. You can put that, and more, into the E-waste bin at SLC (Staples also has E-waste recycling programs)
- Be aware of single use plastic items, like straws, plastic bags, and condoms. Carrying a metal straw isn't a bad idea, and taking reusable bags with you when you go grocery shopping can be a huge help (not to mention they can carry more compared to plastic bags), and as for condoms, well. You're a math student. You already solved that problem ages ago.
- You already know supporting local businesses is good—but where would you start? If you're in Waterloo, check out Zero Waste Bulk in the Uptown Area—or if you're not, look for zero waste shops in your city! The GTA has plenty (mostly in Toronto) of zero waste boutiques, stores and restaurants. Bulk shops are also good to keep in mind—Bulk Barn can be a godsend sometimes.
- Follow @uwsustainable for more tips on sustainability, mostly because I'm too lazy to really type environment related tips. So true bestie 😌✨

Skit

WHY DIDN'T MEEK MILL HAVE A BIGGER COMEBACK SOULJA BOY?

Why didn't Meek Mill have a bigger comeback Soulja Boy? Why? Okay I was locked up too. What record was number one? What record was number one? Okay there we go, that was a nice record. That was a nice record, and the album was a nice album. But he ain't have a bigger comeback then – YOOOOOO! YOOOO! MEEK MILL AIN'T BEEF WITH CHRIS BROWN AND WAS FINNA BOX WITH FLOYD MAYWEATHER. DRAKE? DRAAAAKE??? THE GUY THAT GOT BODIED BY PUSHA T??? THE GUY THAT'S HIDING HIS KID FROM THE WORLD BUT THE WORLD WANNA HIDE FROM THE KID? DRAAAKE??? Y'all need to stop playin wit me. Stop actin' like I ain't teach Drake everything he know. Y'all ain't hear Drake on his first song? "Tell me what's really goin on, drizzy back up in this thing, I'm ready." THAT'S SOULJA!!! THAT'S MY BAR! HE COPIED MY WHOLE FUCKIN FLOW! HE COPIED MY WHOLE FUCKIN FLOW! WORD FOR WORD, BAR FOR BAR. DON'T ACT LIKE I DIDN'T MAKE DRAKE BRUH DON'T DO THAT. DON'T DO THAT. DRAKE? AUBREY?

Miller

-[----->+<]>--.

There is a pure joy to be found when interpreting Brainfuck in legitimate programming languages.

Lemma 1.1. Desmos is a legitimate programming language.

Many of you, dear readers, sensible individuals, may have objections: what do you mean, dear writer, when you say legitimate?

Definition 1.2. A legitimate programming language is one that can interpret Brainfuck.

Some of you, readers, individuals too sensible for sensibility's sake (a trait which frankly your dear writer does not find dear), may have objections: is that reasoning not circular? I shall not deign to answer you.

A brief introduction for the uninitiated: in 1993, wanting to design the minimal compiler, Urban Müller created Brainfuck. A Brainfuck program consists of a sequence of the eight characters `><+-,.[]`, where:

`>` and `<` move the memory pointer right and left.

`+` and `-` increment and decrement the cell the memory pointer is pointing at.

`,` and `.` take input into the memory cell being pointed at from an input array and output the memory cell being pointed at to an output array.

`[` and `]` act as a while loop: if the current memory cell is nonzero, then (re)enter the loop; else, jump to the end.

By all rights Desmos shouldn't be able to do this. While it supports an unexpected number of functions (did you know you can get the Pearson correlation coefficient on two arrays in Desmos?), they all halt. Desmos' variable, array, and function definition features don't help either: recursion isn't allowed. No Y-combinators for us. Indeed, Desmos *without actions* isn't able to do this.

A Desmos action is a variable mutation on some kind of trigger. For example, with the array definition `M = [1 ... 10]`, the action `M → [1 ... 20]` will, on trigger, reassign `M` to the array of numbers from 1 to 20. Now, there are limitations: for example, an action may only redefine the entire variable. Something like `M[5] → 100` is not permitted. However, using Desmos conditional statements (`{(boolean expression) : (true clause), (false clause)}`) and Desmos array comprehensions (`[(expression) for (variable) = (range)]`), we can define a function `C(L, i, n) = [{k = i : n, L[k]} for k = [1 ... length(L)]]` that replaces the ith element of `L` with n. Then, we finish off with an action: `M ← L(M, 5, 100)`.

In a similar vein, we can define array push as `Pu(L, n) = [{k = length(L) + 1 : n, L(k)} for k = [1 ... length(L) + 1]]` and array pop as `Po(L) = (exercise to the reader)`.

With this, we have all of the puzzle pieces necessary to begin the task at hand.

We'll let `B` be the program array, `M` the memory array, and `I` the input array, with their respective pointers `pB`, `pM`, `pI`. As Desmos arrays don't support strings, we'll have to encode Brainfuck commands into their ASCII values: `>` is 62, `<` is 60, `+` is 43, `-` is 45, `.` is 46, `,` is 44, `[` is 91, `]` is 93. In addition, we'll obviously want an output array `O`, and less obviously a loop-tracking array `J` to be used as a "stack" (stack in quotation marks because it's just an array operated on using solely `Pu` and `Po`).

Time for some actions. The easiest to implement are the resets: `M → [0 for k = [1…1000]]`, `J → 1`, `O → 2`, `pB → 1`, `pM → 1`, `pI → 1`. Note that while Desmos supports arrays longer than what we've set our memory array to, we compromise for the sake of efficiency (I implore the reader to ignore the O(n) array mutations). Now, on the topic of the memory array: when does it update? If the instruction pointer is beyond the instruction sequence, the program has terminated. If the instruction pointer is pointing at a `+` or a `-`, it updates the current memory cell. And, if the instruction pointer is pointing at a `,`, it reads into the current memory cell from input. Thankfully, Desmos allows us to express this logic idiomatically: `M → {pB > length(B) : M, {B[pB] = 43 : C(M, pM, {M[pM] = 255 : 0, M[pM] + 1}), {B[pB] = 45 : C(M, pM, {M[pM] = 0 : 255, M[pM]−1}), {B[pB] = 44 : C(M, pM, I[pI]), M}}}}`. It is left as an exercise to the reader (that's you!) to figure out the appropriate actions to update `pM`, `pI`, and `O`.

Which leaves us to deal with `J` and `pB`. In essence, `J` is a stack keeping track of all open `[` commands. Upon reaching a `]`, we look at the current memory cell to see if we need to loop, and then at `J` to see where we need to jump to if looping is necessary. Technically, we don't need `J`: we can just scan the entire instruction sequence backwards starting at a certain index to find the first occurrence of a `[` to jump back to. In fact, the code we have does this in the opposite direction — starting from a `[`, it determines where the end of the loop is in case it is allowed to skip execution entirely. However, `J` is a nice way to allow the reader to exercise their usage of the `Pu` and `Po` functions. What can I say other than "enjoy"?

The following implementation of `pB` may look daunting, but it's just the amalgamation of everything we have previously discussed (note that `(boolean expression A) {(boolean expression B)}` is Desmos' syntax for the and operator): `pB → {pB > length(B) : pB, {B[pB] = 93 : {M[pM] = 0 : pB + 1, J[length(J)] + 1}, {B[pB] = 91 : {M[pM] = 0 : min([{k > pB {B[k] = 93} : k, 100000} for k = [1 ... length(B)]]), pB + 1}, pB + 1}}}`. And we are done.

Desmos actions can be triggered in two ways: on click, or periodically on a ticker. Mercifully, 0 milliseconds is a valid ticker interval, and so we simply chain our actions together and execute. And should we pass to our program the instruction

```
sequence B = [62,43,43,43,43,43,43,43,43,91,60,43,43,4
3,43,43,43,43,43,43,62,45,93,60,46,62,43,43,43,43,91,6
0,43,43,43,43,43,43,43,62,45,93,60,43,46,43,43,43,43,4
3,43,43,46,46,43,43,43,46,62,62,43,43,43,43,43,43,91,6
0,43,43,43,43,43,43,43,62,45,93,60,43,43,46,45,45,45,4
5,45,45,45,45,45,45,45,46,62,43,43,43,43,43,43,91,6
0,43,43,43,43,43,43,43,43,62,45,93,60,43,46,60,46,4
3,43,43,46,45,45,45,45,45,46,45,45,45,45,45,45,45,
45,46,62,62,62,43,43,43,43,91,60,43,43,43,43,43,43,43
,43,62,45,93,60,43,46], why, it would give us a friendly O =
[72,101,108,108,111,44,32,87,111,114,108,100,33].
```

And we would say "hello" back.

ꑂ

FACTS DON'T CARE ABOUT YOUR FEELINGS

And gcc doesn't care about mine.

lugubrious

SUPER EUROBEAT: WRITE FOR mathNEWS

(sing to Back on the Rocks by Mega NRG Man, from the Initial D soundtrack)

[Verse 1]

When you write for **mathNEWS**
You ever wrote for **mathNEWS**?
Just try it, it'll be fun
It need not be math
Or even news

[Pre-Chorus]

Close to the ending you get pizza
Spending all the money we got
No more slices left to eat now
We gotta write more somehow

[Chorus]

Write for **mathNEWS**
Write for **mathNEWS**, baby
Write an article, and another
Write for **mathNEWS**
Write for **mathNEWS**, baby
You gotta go and make the cover!

[Verse 2]

When you're back at prod night
It means you've had a delight
Answer questions, on the **mastHEAD**
Or ask professors
in **mathASKS** instead

[Pre-Chorus]

Close to the ending we get pizza
Vote the best to the top
Triple pineapple BBQ
Gluten-free crust and cheese too

[Chorus x2]

Write for **mathNEWS**
Write for **mathNEWS**, baby
Write an article, and another
Write for **mathNEWS**
Write for **mathNEWS**, baby
You gotta go and make the cover!

[Verse 3]

If you get AOTI
It means you're ready to fly
Time to head to Conestoga
Get yourself something
with the sweet gift card

[Pre-Chorus]

End of the term we have EOT
Get together one last time
Time to head home for the break now
See you all next term, now ciao!

[Chorus x0.5x2? idk]

Write for **mathNEWS**
Write for **mathNEWS**, baby
Write for **mathNEWS**
Write for **mathNEWS**, baby

[Chorus x2]

Write for **mathNEWS**
Write for **mathNEWS**, baby
Write an article, and another
Write for **mathNEWS**
Write for **mathNEWS**, baby
You gotta go and make the cover! *[Editor's Note: seriously though if you do art and want to see it on the cover, we want to see it there too, I don't know if people realize this but cover art is a thing you can contribute and we'd love to have some by you]*

tendstofortytwo

NONE BOOK WITH $10+ SHIPPING

There is a "non-item" available on the WStore[1] that you can add to your cart and have it shipped. It's called "NO TEXT: NO TEXT FOR THIS COURSE — SEE COURSE SYLLABUS" and I found it used as a placeholder in WStore's Booklook service for courses which don't have any required or optional textbooks or course notes. It costs $0 and you can add it to your cart just like all the other actual items. The checkout process still works with it and you can pay the $0 for it along with the applicable shipping fee and get it shipped to you.

I actually ordered this non-item to be shipped a couple terms ago. However, I did not order just the one non-item. I had this non-item alongside this one required course text which I purchased. Throughout the entire checkout process, the site insisted I was getting 2 items, including the receipt. When it arrived however, and I checked the receipt that came with the package, it only noted the course text, and not the non-item. I assume that at some point after the completion of the checkout process and before the package was sent out, someone manually removed the non-item from my order.

There is one thing I want to do with the non-item, which is to just order the one non-item and see what happens, but I don't want to end up wasting money on the shipping fee just to do that. So, if someone has more disposable cash on hand to risk than me, feel free to just drop the $10+ on shipping fees and try to have the non-item shipped to you. Please do tell what happens in a future **mathNEWS** article if you do decide to do that. Perhaps if anyone reading works/worked for WStore, details about what happens can be put into an article as well. I assume that what happens would be that the order is cancelled and the shipping fee is refunded, but who knows?

boldblazer

1. The item is at https://wstore.uwaterloo.ca/no-text-no-text-for-this-course-see-course-syllabus.html

DON'T FORGET.
VIVEK GOEL GUERRILLA WARFARE

The Ford government stole 900 dollars from your OSAP last year.[1]

They've shown they'll do it again.[2] Vote on June 2nd, 2022.

sqrt(cause)

1. https://www.ousa.ca/newsroom_osap_clawbacks
2. https://www.macleans.ca/opinion/canada-is-falling-behind-globally-on-public-funding-for-universities/

I DON'T CARE HOW MUCH GLASS YOU PUT IN FRONT OF YOUR EYES, YOU STILL CAN'T SEE. IT'S BASIC BIOLOGY

I am so sick and tired of people talking about getting glasses like it's some normal thing you could just go and do at any time. It's completely unnatural and should be shamed.

Don't you understand? No matter how much you wear prescription glasses, you still can't fucking see. When I try wearing glasses everything gets all wonky and my head hurts. If it doesn't work for me, it doesn't work for anybody.

Not to mention they want to give glasses to CHILDREN! You do realize how fucked that is? You are destroying that child's vision forever when they just need to learn how to see things better. Send them to the eye doctor or something — don't make them wear glasses because you think that's not bad.

If you think glasses work then why can you take them off? Shouldn't they be glued to your eyes so you can always see? Why would you need to get a higher prescription? I thought glasses worked.

Not to mention I've seen a lot of people stop wearing glasses eventually. I'd even say most of the people that wear glasses eventually regret it and stop.

Then there are people who wear contact lenses and think we don't notice. WE CAN ALWAYS TELL. Your eyes get all dry and stuff, and you have to blink an unnatural amount of times. Normal people don't have to blink that much, it's just proof that it doesn't work. Also, contacts change the colour of your eyes. All of them. I understand what I'm talking about, yes.

What do you mean you can get eye surgery to not need glasses anymore? Seriously? Mutilating your eyeballs because you think you can't see? They also take children as young as 3 and force them to have this surgery. That's how horrible they are. No matter how much you laser your eyeballs you will always be unhappy with your eyesight.

Trust me in all of this. I am a smart.

Miller

WINGWOMAN

Vigil sighed, chin sat squarely on **warSOC**'s dinner table. Eleven o'clock at night. He didn't feel happy, or sad; just a mild empty disappointment after the double date. He ran over the interactions in his head: chatter on school, work, life. Vigil didn't really *do* normal conversations — the concept of small talk and flirting seemed wasteful, and he'd much rather discuss the merits of recent developments in avant-garde cooking or high-performance computing. His mind dug into that, and he was content for some time until the **warSOC** clubhouse door burst open, Sarah flying in.

"Vigil! Tha was great, ya? Ya chattin' much betta than las' time. I think she had fun too. Why ya chin so low?"

"I appreciate your compliment, Sarah — I have been practising." Vigil sighed. "I unfortunately, and simply, do not appear to have formed what you have been referring to as an 'emotional connection.'"

"Why na? Josephine's cute, she likes computers, she likes ya from wha' I see."

"Correct on all points but computers: Josephine is a video game enthusiast; 'gamer,' if you will, while I am a computing enthusiast. Our interests are quite disparate."

"But tha's not wha it all about, ya? Just 'cause she like somethin' ya don't do don't mean it won' work!" Sarah pulled a chair up to the table, and sat down, making eye contact with Vigil. "Ya done a good job with all tha' dating stuff we been talkin' 'bout, Vigil. Good work. But tha' not all a' it! Name an' me, we can set ya up, but we can only do so much! Ya gotta like the girl ya-self!"

"I understand, Sarah."

"It always come back to tha' ya? Ya know wha' I think? Ya gotta give 'em more a' chance. Ya can't love a girl without knowin' them first, ya?"

Vigil was about to reply, but was interrupted by Name as she stepped into the clubhouse, carrying a two-litre bottle of organic orange juice. Her eyes met Sarah's and they held the moment a touch longer than innocence would merit. Name saw Vigil's lowered eyes and table-bound chin.

"What's up, Vigil? Is it something with the date?"

"Yes. As I was saying to Sarah, similarly to the past few romantic occasions, I simply feel nothing for Josephine."

Name sat down next to Sarah. "It's okay, Vigil. It… took me a long time to find someone I connected with too. You can take your time; all the time you need."

"Thank you, Name."

Name pulled out a trio of glasses from a drawer and set them on the table, filling each with some orange juice. "We'll be your wingmen — no, wing*women* — as long as you need us. And when you do find someone, it'll be all worth it, okay? Cheers, Vigil."

CC

MATH AND FEBRUARY INEXTRICABLY LINKED

Lots of people in math are born in February. In a **mathNEWS** poll with a very legitimate sample size, ⅕ of people were allegedly born in February, whereas in a random sample of the population without taking into account university major, this would be less than 1/12.

TLDR Aquarius = math and also we should have a big party in February

peacelovemath

DINOSAUR TIER LIST

mathNEWS presents an objective look at the non-avian dinosaurs. Considerations for accuracy of restoration and general cool-factor are critical to the review process.

S is for Saurischian feathered integument, as all good mathies should know dinosaurs are giant cheepers.

A is for Ankylosaurians, see also Amargasaurus.

B is for Borealopelta, because its so cool it gets to be here twice. Baryonyx who?

C is for Carnotaurus, arms day is for chumps.

D is for Dimetrodon, syke, don't let this man distract you from the fact that in 1998, Diplodocus threw Dromaeosaurus off Hell In A Cell, and plummeted 116 ft through an announcer's table.

E is for the Edmontosaurus mummy, that shit's gross.

F is for Fukuisaurus being a round boy. Not Simosuchus though.

also…

G is for Giraffatitan.

H is for Herrerasaurus, what are you?

I is for Ichthyovenator, for having that massive chip on its shoulder.

J is for Jingshanosaurus, prosauropods weren't all that great.

K is for the death of Kronosaurus, RIP.

(mandatory minute of silence)

L is for Lambeosaurus, how could a mathematician not appreciate a face shaped like that?

M is for Maiasaura for not being all that great of a mother.

N is for Notosuchians sneaking their way in through the Archosaur loophole, then not giving a shit for 200MY.

O is for Oviraptor being depicted as an egg stealer rather than a better Maiasuar.

P is for pronated wrists, a Utah Raptor would hug you to death before slashing you.

Q is for Quetzalcoatlus not being a Dinosaur, but making the list for the biggest animal to fly under its own power.

R is for Rugops, anti-aging cream's newest target market.

S is also for Spinosaurus Aegyptiacus bones having taken a bomb to the face during WW2.

T is for Triceratops. Fight me.

U is for Unenlagia, pick a lane!

V is for Velociraptor. You could have chosen to be the self-evidently better Microraptor, but you didn't.

W is for Wannanosaurus, doing a bad job of protecting your skull, with that fragmentation. How can you call yourself a Pachycephalosaur?

X is for Xiaotingia, stealing Archaeopteryx's fame for Chairman Xi.

Y is for Yinlong, being just the weirdest Triceratops.

Z is for zoology, who wants to deal with genuine feces?

sqrt(cause)

THE DEATH OF A DREAM

Do you know were dreams go when they die? I don't. I can only imagine. I feel like whenever a dream is dying in my head, it is just melting down and drowning my heart in my chest for a bit. Which is stupid, since I am perfectly aware that the heart is really just a pump that keeps you alive. Awesome, really, keep going, but it makes all these heart metaphors irrelevant. But they probably are fancier than saying that my brain somehow makes me feel heavier than usual, so for the sake of style I'll keep using them.

Anyway, the feeling changes depending on the dream and the time. Like, when I didn't receive my Hogwarts letter at 11, I felt like the magic in my head changed into bubbles that popped and disappeared. When Covid struck and suddenly we had nothing to look forward to since all plans were cancelled and even when you try to make new ones, you end up worrying about who you saw recently and when exactly and how likely you are to be contaminated, it just felt like any dream of normal life was disintegrating. When a close friend told me that I was really annoying her and that she never wanted to see me again, I felt like ice was storming in my heart and freezing (quite literally to be honest) the rest of my body.

Maybe I should change this title from "the death of a dream" to "the death of hope". But isn't hope a dream that you have for the future? A real dream, though, only fades into the mist of forgetfulness. Or it was a very precise dream, and the details just stick with you for a bit, getting in your head and keeping you wondering if it has any meaning. Like this weird dream about the space treasure. Very unsettling, if you ask me.

I feel like I haven't made a point yet. Maybe there is none. Feel free to go on with the reading of more cheerful or wittier articles. But keep dreaming, people. The death of dreams may be unpleasant, but any dream come true can make up for it. Dream small, dream big, dream bigger. Dream alone and with people. Because if there is some sort of cemetery for dreams, as endless as it may be, the field of dreams achieved because you fought for them must be a very respectable size as well.

Dream.

HelplessDreamer

BASH: [OR [[?

Alright, alright, I'll give you a break from the C++ stuff for a while okay? This time it's about bash, everybody's favorite Linux shell. I got asked this production night what the difference between [and [[was in bash, and I didn't really know. For the non-CS majors and people who have forgotten the weird bash section in CS 246, the square brackets are usually used to test conditions for "if" statements in a bash script. For example,

```
x=3
if [ $x ≠ 0 ]; then
  echo 'x is nonzero'
fi
```

will print "x is nonzero" to the terminal. However, you can also do the following:

```
x=3
if [[ $x ≠ 0 ]]; then
  echo 'x is nonzero'
fi
```

and it'll do the exact same thing. What's the deal? Were the bash people just trying to make bash less typo-prone? No, and the real answer might make you cringe a bit.

So, the difference is that [is a shell *builtin*, whereas [[is a shell *keyword*. What's the difference? Well, a *builtin* is basically an executable that comes part of the shell. Wait, come again, an executable? Hold on.

```
$ which [
/usr/bin/[
```

Oh Christ, it's literally a fucking executable called [. Yeah. Everything that comes after it, including the test and *even the closing square bracket*, are just arguments to the [command. It's basically just an alias for the `test` command that requires "]" as its last argument, i.e. the following are equivalent:

```
if [ 0 = 3 ]; then
```

```
if test 0 = 3; then
```

This is so fucking stupid I can't even begin to articulate it. And you know what's worse? *The bash people didn't even make this decision. This was codified in the fucking POSIX standard.* I actually can't believe that this nonsense is standardized; it's ridiculous! Who in their right mind would—ah, whatever, what's done is done, right? Can't go back and change the standard now.

Recognizing this fact, the enterprising bash people left the stupid [command in but also decided to provide a more sane substitute that also comes with more flexibility. This is where [[comes in. [[is not a shell builtin (i.e. not a command); rather, it is a shell *keyword*, which you can verify by running `type [[`. What's the difference? Basically, rather than existing as separate commands, they're hardcoded *keywords* which bash looks for when parsing. They exist in the bash syntax. Other examples include `if`, `while`, and so on.

As a special syntactic feature of bash, this offers some more flexibility in what you can do; it's also a lot safer than [. For example, many things that used to require quotes won't anymore, since the content inside the double-brackets isn't getting interpreted as arguments. For example, with [we would get this:

```
$ str1='hello world'
$ str2='world hello'
$ [ $str1 = $str ]
-bash: [: too many arguments
```

[[is smarter, and doesn't force us to worry about that:

```
$ [[ $str1 = $str2 ]] # this returns 1 (false)
```

Yes, get over the fact that 0 is true and 1 is false. Again, POSIX. But yeah, it just works! Much safer and less error-prone. [[also supports using other special bash symbols inside, like &, &&, ||. Using these symbols in [would cause trouble because they wouldn't get passed as arguments. Bash interprets them literally. For example,

```
$ [ 0 || 1 ]
-bash: [: missing `]'
1]: command not found
```

whereas it'll just work if we use [[. It also lets us use < and > as comparison operators, rather than letting them be interpreted as IO redirection by bash. It also lets us use other things we like to use in bash, like globbing patterns and also regular expression matching for comparison, using the =~ operator. You can look into this yourself, it's really nice. Overall, a hell of a lot nicer feature-wise, and safer to use.

The only disadvantage to [[is that it's not POSIX-compliant and hence not guaranteed to be portable between different shells, but really, who cares, right? Bash or bust.

virgin [
- is a command
- prone to syntax errors
- cares about some paper from 1988
- can't see < or >
- "sry what's a regex?"
- doesn't know what whitespace is
- self-conscious about working with other shells
- -bash: [: missing `]' 1]: command not found

chad [[
- regular expressions
- hardcoded bash syntax
- omniscient
- liberated; free; modern-day
- understands modern language features
- 2x the brackets 2x the strength
- confident; doesn't care what other shells think
- "-o? -a? sorry, I don't speak emoticon"
- OUCH!

jeff

IF YOU HAD TO CHOOSE

A few days ago, I was killing time by scrolling through forgettable content, when a siren I had never heard before began blaring loudly in my apartment. As I stood up automatically, my confusion turned to fear when an automated recording notified me that an emergency was taking place in my building and to prepare to exit if the evacuation signal for my floor followed the message. (It did not.)

I've fortunately never lived through a fire or otherwise significantly destructive disaster. I spent the sixty seconds following the message quickly gathering my important possessions into a backpack to take if the evacuation signal were to sound. This also forced me to decide in sixty seconds which of my possessions were most important (keeping in mind what I could carry with me).

The next hour was largely spent stressfully watching a fire truck outside my window and hearing a firefighter outside my apartment door talking on his radio, trying to stay ready to evacuate at any moment long after the initial adrenaline rush had passed.

The story ended anticlimactically, with much less fanfare than when it began: a malfunctioning sprinkler had triggered a false fire alarm, the evacuation signal never went off, and at some point the fire truck quietly left. But I'm now relieved to know that I can decide what matters in the moments when I have time for only that, and at the same time I'm surprised by how much less I valued most of my things than I would have thought previously. Although the whole experience was a highly stressful disruption to my formerly sane evening, it also served as a good reminder that many material losses in life might be more bearable than expected.

cutlet

WORKING CONDITIONS ARE LEARNING CONDITIONS

This space intentionally left blank.

sqrt(cause)

OFFICIAL mathNEWS FRUIT TIER LIST

The Fruit Luipers

N THINGS YOU DIDN'T KNOW ABOUT CHIEF KEEF

- No one gave birth to Chief Keef, he simply decided to exist
- When Chief Keef was born, he told the doctor to stop crying
- Chief Keef once forgot the name of the 9th planet and now we have 8 planets
- Chief Keef doesn't turn off the shower, he punches it until it stops crying
- One time Chief Keef woke up an hour late and now we have daylight savings
- When Chief Keef makes a new account on a website, the website has to accept his terms and conditions
- When Chief Keef does a push-up, the earth moves down with him
- Chief Keef doesn't worry about traffic, he just drives straight and cars move out the way
- One day Chief Keef felt like giving somebody a gift and then Christmas was a thing

Miller

SOCKS AND JOY

There's this weird idea that I got sometime in my mid teenage years that liking childish things is immature. I felt like I had to start "being a grown up", and even though I didn't know exactly what it meant, I knew that I couldn't do things that were "for kids" anymore. Stuffed animals were banished to a box under my bed, animated shows about the power of friendship collected dust in the "Watch it Again" section of my Netflix, bookmarks migrated from my YA fantasy novels to my bedside table. All the things that induced child-like glee were gradually replaced. I wasn't *happy* with any of this, but I felt like it was the "right thing to do".

I'm a pretty childish person in general. I mean that in the literal sense — in many ways, my attitude and energy is like that of a child. I like cute fluffy things and practically squeal "Puppy!" every time I see a dog. I'm generally trusting, friendly, bubbly, energetic, and I'm just joyous and energetic, and I've always been this way. However, as I left behind my childhood artifacts, I tried to leave this behind too. I had this mental picture of how adults acted, that they were jaded and cynical and stoic, and I wanted to be taken seriously, so I tried to fit that image. I never really stopped being flamboyant or energetic, but I avoided expressing my genuine joy and awe at most of the world.

Now, anyone who knows me can attest that I outgrew this As I write this article, there's a stuffed animal beside me, I have *She-Ra and the Princesses of Power* playing in the background (fantastic show), and I'm wearing my favourite pair of socks, which are covered with pictures of smiling golden retrievers. The socks really are lovely. Every time I wear them, my day is brightened because whenever I happen to look at my feet, I get to see so many dogs and they're all so happy and oh my god it's adorable and I want to cry.

I love the socks not only because they're cute, but they're a reminder that people love the sheer joy that I show when I wear them. Whenever I show off my cute socks to my mom or my sister or my girlfriend or my friends, they'll smile, not just because the socks are cute but because my face lights up and I'm authentically happy. I like that reminder, because that excitement and glee is *me*. I'm past the point in my life where I want to suppress that, but I still feel… silly? I feel like this isn't what I should be doing.

The thing is, when I go to sleep and I squeeze a stuffed animal, I don't feel safe. When I get excited about a dog in public I'm a little embarrassed, but whoever I'm hanging out with ends up smiling. Whenever I try something new and I light up, I might come across as a little immature, but it is authentic

Maybe it is the case that "grown ups" should be stoic and cynical and jaded, but if that's the case, I don't want to be an adult. Other people might find my dog socks silly, but who cares?

They make me happy.

Golden

THE FIRST ARTICLE I'VE EVER WRITTEN UNDER SEVERE TIME CRUNCH

If you've written for **mathNEWS** before, you might know that the article deadline for submitting to a new issue is typically noontime on the Tuesday before the issue gets published. Sometimes the editors go to work before that, and your changes get lost (we're sorry) and sometimes we get started later and people manage to squeeze another N-things list or whatever in here. But most of the time we don't set strict deadlines, and if someone tells us they're almost finished their article on Bash and to give them just a little more time, at, like, 12:20 PM or something, we let it slide.

This isn't that. I'm writing this article under a, as previously described, severe deadline. It's 11:06 on Thursday and the issue is coming out digitally on Friday (so, 50 minutes from now), and we just discovered that the lovely *Socks and Joy* you see to your left somehow slipped through the cracks and didn't make it into the draft issue. Actually, I know exactly why this happened because I was the one doing layout this time, but no matter.

So now I'm here to fill up space, as *Socks and Joy* is quite a bit shorter than the previous filler article I wrote to even up this issue's page count. Good thing COVID-19 has forced us to not print these issues until later, so we don't have to deal with the tyranny of physical media: in normal times, if we found out about this mistake now the presses would have gone long cold and the issues already flying off the racks, I'm sure.

So thank you, Omicron. You've done one service to this editor's professional career. Now forever begone.

bipED
Editor, **mathNEWS**

FREDDY! YOU'RE SUPPOSED TO BE ON LOCKDOWN!

Vanessa. I'm…

a material gworl! 💅✨😊

Anonymous

GUEST VARIETY CROSSWORD

gridCOMMENT *148.1*

Hello people of **mathNEWS**,

Here's a (relatively involved) crossword that I wrote last year with the intention of sending it in, but it's based on the campus and so it made more sense to wait for stuff to open. I was trying for something as close as possible in spirit to a variety cryptic, without the solvers actually having to learn how cryptics work.

What are all these grey boxes? These aren't what you're looking for at all! You'll need to solve the crossword and complete three other tasks (numbered below) if you want to finish your search. Along the way, you'll run into a few clues with peculiar characters that need to be dealt with before they can be solved. In particular,

(a) 2 clues house the same rough-edged character that could do with being a bit smoother,

(b) 3 clues contain a pair of characters (the same in each) trying to do the job of one, as they often do, and

(c) 3 clues are hiding a character (again, the same in each) that shouldn't be there at all. All other clues can be solved normally.

1. If one of the above characters is in the nth word of its clue, circle the nth letter of the corresponding entry in the grid. Connect the circled letters in a counter-clockwise loop using straight lines, starting at the rightmost circle. The shape and circled letters themselves should give you an idea of where you are.

2. Luckily for you, the thing you're looking for is in one of the grey boxes! To figure out how to find it, identify the grey boxes in order with their abbreviated names to obtain a string of characters, which will include one of each of the types from (a), (b), and (c). Once they have been dealt with (as they were for the clues), the result will name a few things you'll need to take to reach your goal.

3. You should now know which box to search in. If that box is labeled m, then, starting at the mth clue, read the first letter of every m^{th} clue (in listed order), stopping once you have an 8-letter string. If the pth letter in this string is the qth letter of the alphabet, then advance the pth letter of the result from part 1. by q places in the alphabet, wrapping from Z to A as needed. The result will finally reveal what it is that you're searching for.
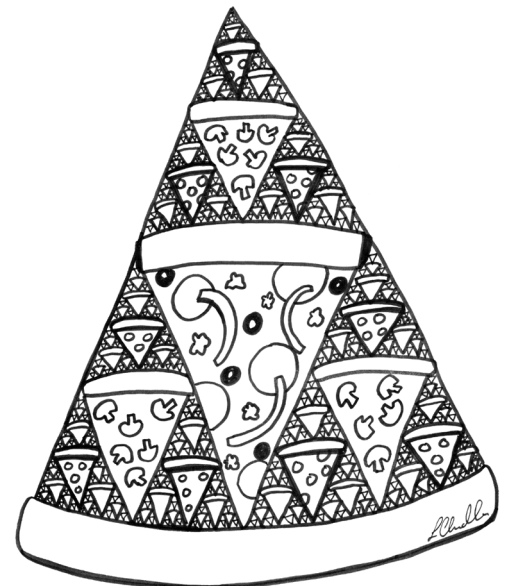
Axiom

ACROSS

1. Clip a photo
5. Site where phishing might occur
9. Clog location
14. Tempt
15. Jon or Sansa's sister
16. Gossiper
17. 46-Across, for one
18. Tidied and made presentable
20. Imitating 5am in a Seuss book?
22. Cantaloupe-like melon
23. Golfer's supply
24. Unchanged
25. Next yr.'s alums
28. Toscanini and others
30. Music's __ Na Na
33. Japanese capital
35. Enjoy La Peste or L'Étranger
37. Nice friend?
38. Clap shapes in a 61-Across
39. Various long types of fish
40. Order at the bar
42. Blood line?
43. Dawn goddess
44. Mouthwash users
46. Third of a tablespoon (abbr.)
47. Synthesizer pioneer
48. Road sign silhouette
50. Like standing trees at a logging site
53. Admission of fear
57. Mille-feuille seller
59. Sector
60. Goosebumps author
61. Dash, cheat, or rally
62. Cousin of a bassoon
63. Nostalgic olden times
64. Apple bit that i5 in the core
65. Moment of silence?

DOWN

1. This, e.g.
2. Ladder part
3. The first of its kind (abbr.)
4. Small, to Pierre
5. Supercontinent (var.)
6. 2 cookies, according to the box
7. Comment from a Pop-Tart cat
8. Dis's opposite
9. Symbol or marking such as "mph"
10. Peanut butter cup maker
11. "__ partridge in..."
12. Steve Wozniak's bathing machine?
13. California wine valley
19. Hallmark.com purchases
21. Fish who was found
24. Did a cat's job
25. Put on, as a play
26. Alpha __ (auto manufacturer)
27. Vaudeville segments
29. Penn and Connery
30. Intelligent
31. Causes to cache
32. How maple syrup starts its life
34. Supporting vote
36. Earlier
38. __ Belt (constellation feature)
41. Is half-asleep
42. "Just gimme __, I'll be right there"
45. Do some lawn repair
47. Easternmost US state
49. Sweeney Todd prop
50. "__-daisy!"
51. Brussels-based alliance
52. Ruckus
53. Requiem's "of wrath"
54. Courtroom coverage?
55. Grandson of Adam
56. Mosquito repellent
58. Trauma ctrs.

If a goose honks on campus, and there are no students to scare away, does it make a sound?

lookAHEAD

WORDLE THIS, WORDLE THAT

Why don't you stop being so Wor-dull and go get yourself some friends? A nice job, a house, a car, something? What even is this Wordle thing anyway?

No, no, don't tell me, I don't want to –

Wait, what?

That's it?

Oh this is easy. Is this what you were all so...

Oh. Oh, hmm.

I see.

Hmm.

wordle 213 ⅚

Lamenting the (anticipated) lack of gridWORD?

Do something about it!

We're looking for a new gridMASTER!

If you have expertise in the crosswording arts,and can write one (1) blurb and thought-provoking question per issue, email us at mathNEWS@gmail.com.

Hundreds of readers will thank you.

AN EDITOR WHO'S REALLY HOPING TO SEE gridWORDS AGAIN