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mastHEAD

"IF YOU COULD BRING SOMETHING EXTINCT BACK TO LIFE, WHAT WOULD YOU CHOOSE?"

Hello! Welcome back to another issue of **mathNEWS**. Now that midterms are over, we finally have a bit of breathing room—for the most part. This production night, we had a thunderstorm during pizza quest and a MASSIVE shortage of editors (but not writers) due to the CUMC—whatever that is—taking place in Quebec City, Reportedly, they're taking a bus, which should take between eight and twenty-four hours, depending on traffic, although it will feel like 72 mentally. It's that, or take the VIA, and considering the VIA's scheduling is… in need of improvement? Oh well. Good luck, CUMC participants! You'll likely be back to read this when the issue comes out.

Our main theme for this issue seems to be transit and transition. From walking along a road at night and peeking through the veil of reality, to one writer's journey to the far-off lands to Montreal, to a new section about the way we interact with the transit network—ontheGO. Surprisingly, it's not written by me, despite my being a planning major. Actually, wait a minute—if a math student is writing about a topic that falls under the Faculty of Environment's field of study, that means my nefarious plan to take over **mathNEWS** is working! Muahahaha!

Another thing to focus on is the Rogers blackout we experienced on July 9th. It was certainly jarring to be thrust back into the year 1985, but it brought up a lot of questions. Maybe there will be changes to how Internet and data are handled. One thing's for sure—print media will never go out of style, or black out. Well, unless you spill ink on it. Or burn it. Or throw it into some water. Or eat it—

uknightED
Editor, **mathNEWS**

ARTICLE OF THE ISSUE

To Not a N*rd: thank you for all the wonderful stories 💖 of Professor M. Goose!! I am sad 😭 to see it end but happy it happened 😊. MC 3030 has a gift card for you as thanks! 🤗

enamourED
Editor, **mathNEWS**

tendstofortytwo	Xerox PARC
jeff	Eclectia
Finchey	Genghis Khan.
别	Proto-Indo-European (so we can finally give labels to h1-3)
boldblazer	That 1987 recording of the last Kauai 'o'o bird is missing the other half. It would be interesting to hear what the other half would have been like.
Not a N*rd	I want to start the stereotype that Canadians ride Velociraptors to school
evilevievil	Dodo
yummyPi	My dignity
Definitely not a smallpox vaccine manufacturer	smallpox
John Hammond	Dinosaurs
aaqsr	My Childhood :))) (and sleep schedule, it's 6 A.M. as I type this)
Xx_420SonicFan69_xX	2 Dodo
cutlet	That vanilla mint Crest toothpaste which hasn't been sold in years but I look for each time I buy toothpaste anyway
Predap	Woolly Mammoths, they're cool
weewlad	the great auk
hu	the mediocre auk
molasses	the game
teff	Holtsoft
creature_f	The word extinct has a definition that pertains specifically to volcanoes. Unrelatedly I will be committing large scale arson.
peacelovemath	Not a N*rd's dignity after the Winter 2022 anthology came out
Skit	v
__init__	Adobe Flash
wannabestan	Gatekeeping
Deriving for Dick	Jesus's Disciples
writingbot-No.5643	Humans probably. Such an interesting species.
blinchik	Flash games in-browser
enamourED	Victorian era fashion ✨

Many hands make light work!

RYAN CHOW, mathNEWS EDITOR FOR SPRING 2022
ALONG WITH CHEN CHAI, TERRY CHEN, NICHOLAS PRIEBE,
KEVIN TRIEU, CLARA XI, AND YANG ZHONG.

mathASKS 149.5

FEATURING mathNEWS *EDITOR UKNIGHTED*

TENDSTOFORTYTWO: WHAT MADE YOU DECIDE TO BE AN EDITOR?

I really like **mathNEWS** and writing for it, so when editor apps came out, I decided "Hey, I don't mind getting involved more!" Now at this point, my position as someone in the Environment Faculty was probably known to most editors and I was expecting I'd be rejected on that basis, so you can imagine my surprise when I was informed I was actually in consideration. Unexpected, but also a pleasant turn of events! I had my doubts, but in the end I decided that it would be good to generally try and see how it works out. I have experience with editing and I've always been curious to see how **mathNEWS** was produced, and so far it's been amazing!

XX_420SONICFAN69_XX: WHAT'S THE EDITING PROCESS LIKE FOR YOU?

Pretty fun! The editing process has a few steps—editing/approving articles, then puzzling (fitting articles together), then distribution. I don't get to edit or approve much (most of that takes place during Tuesday morning, when I have a lecture), so most of my work has to do with puzzling, making final draft reviews and distribution. Puzzling sounds easy at first glance, where articles are copied and pasted into the issue, but the real difficulty is fitting them together and making sure they look nice. Distribution is mostly just legwork, putting issues in racks and mailing them. My favourite thing to do is mailing all the issues to subscribers, since there's a stamp and it's therapeutic to just stamp back to back. I've also enjoyed taking to distributing issues to racks across campus, but those opportunities are getting rare seeing there's only six of those, they happen every Friday, a day where I have no classes and thus could just go on a train to Markham or wherever else. (Well, one of them took place on a weekend too.)

BIPED: HOW DO YOU FEEL ABOUT YOUR EXPERIENCE OF BEING TRAINED IN EDITING?

It was really cool to just peek behind the curtain and see what production is like. There was a lot of work, especially knowing there were four editors last semester. We're almost double that now! There's a few times where I wonder if I'm overstepping something, since I'm so new at this, but I trust my fellow editors can give me a little helping hand until I get situated!

CLARIFIED: WHAT IS YOUR FAVOURITE PART OF mathNEWS?

Being able to write freely, and get free pizza for it! I also love getting to read all of the funny articles and writing the **mastHEAD**.

TEFF: RANK THE FOLLOWING PROGRAMMING LANGUAGES: TURING, RACKET, C

C > Racket > T. I have no basis for this, I don't know programming languages, so I just went for alphabetical order.

JEFF: RANK THE FOLLOWING PROGRAMMING LANGUAGES: C++.

> C++

TENDSTOFORTYTWO: HOW DOES IT FEEL TO BE THE FIRST EDITOR IN mathNEWS HISTORY TO HAVE A UNIVERSITY COLLEGE NAMED AFTER THEM?

Apollo has given me the gift of prophecy. I find it fitting that it's St. Paul's, the university college I spent a good chunk of first year in. (See AOTI *The Betting Board at St. Paul's*.)

BOLDBLAZER: HOW DO YOU PRONOUNCE "UKNIGHTED"? WITHOUT CLARIFICATION, ONE CAN PRONOUNCE IT WITHOUT SILENT LETTERS, OR IN MANY WAYS DUE TO AMBIGUOUS SYLLABLES.

Pronounced as "united"—U-Knight-Ed. Like the airline. Why I chose that is covered in the next question.

PREDAP: WHAT WAS YOUR BACKUP EDITOR NAME?

unitED. Fun fact—uknightED was actually the backup for unitED, I made the change because I decided maybe being named after a subpar airline isn't exactly the greatest idea. I think if uknightED didn't come through, I'd probably choose something like nosebleED or something environment related. Other names could be activatED, exceED or watershED, which I probably should have gone with honestly. As much as I want to change it, the fact that St. Paul's changed its name means I now have a reason to keep it to remain the only **mathNEWS** editor to have a university college named after them. (But with different spelling, you know, for copyright reasons!)

CIX: WHY ENVIRONMENT? WHY NOT MATH?

Because I had foresight of the pandemic and Math CnD closing, so I chose the faculty with the coffee shop that's actually operational.

I'm kidding. The program I'm enrolled in (Planning) stems a lot from my childhood experienced living in an absolute labryinth of a suburban neighbourhood, and having to walk 20 minutes one way to the nearest interesting place. That, and I'm embarrassingly bad at math.

CY: TELL ME A STORY ABOUT YOUR FAVOURITE FOOD.

I actually have no idea what my favourite food is. I have favourite drinks, but not foods. I'd say probably French Toast. So a story about French Toast—when I was about 13, I went to Hong Kong with my dad to spend time with his family after he won a contest with Cathay Pacific. Two of those days I spent in some hostel/I actually have no idea what it was. I think it was some sort of community hotel thing, because there were bunk beds and washrooms but there was also a museum exhibit about historical apartment blocks?? Anyways

the restaurant there had French Toast for breakfast, so I ordered it. I took one bite and suddenly I wasn't feeling so good, Mr. Stark. Yeah, turns out Hong Kong style French Toast has peanut butter, which I'm severely allergic to. **Fun!** I spent the rest of the day puking my guts out and in a daze. You can probably guess how I ended up.

TENDSTOFORTYTWO: CEDAR OR WILLOW? WHY?

Willow, because there are more unincorporated communities in the world named Willow than Cedar.

XX_420SONICFAN69_XX: FAVOURITE YOGURT FLAVOUR?

I don't have one, so I'm letting my friends answer for me. Hey Lauryn, Stuart, Tyler, Jen, Xavier and Ben from the Environment Faculty, what do y'all think?

Lauryn C: Mixed Berry

Stuart C: Lime

Tyler G: Strawberry

Ben W: Raspberry

Xavier B: Blueberry

Jen D: Vanilla

…Democracy is overrated.

MOLASSES: WHAT'S YOUR MOST MEMORABLE EXPERIENCE FROM BEING IN ENVIRONMENT AND NOT MATH?

Being able to buy something from the ES Coffee shop during the Winter and Spring 2022 terms.

MUTT: WHAT IS LOVE?

Love is sharing your bubble tea, even if it's a regular size, and being 100% okay with it. It's tiny little things like holding hands at the supermarket and leaning on each other while you watch a movie. I want to fall in love with someone over and over again even if we're already in a relationship. Love is paying attention to a project of his even though I know nothing about the topic, and asking questions at the conference he's presenting at, on topics that you know he did special research on. Love is when you could be anywhere in the world, anything, but you just want to be with that special someone.

MUTT: WHAT IS HATE?

Funny anecdote—hate is the opposite of love, but they're both strong feelings of intense care and regard. The more you love/hate someone, the more power you're giving to them over your life. With love, you're building them up. With hate, you're attempting to destroy them. It can be passive, or it could be spur of the moment when you see them. From personal experience, when you hate someone you don't know, you're putting so much effort into knowing them that you end up empathizing with them, and then those feelings change. When it's someone you do, it's a bit of a different story. I find that if I ever come across someone I really, truly hate (which is very far and few between), the best thing for me to do is to ignore them. If it's misplaced or justified, they have no influence on my life, and I have none on theirs.

ANONYMOUS: WHAT IS SOMETHING YOU REGRET?

Basically every awkward social mistake I've made from Grade 5–11 ish. Also Winter 2022. That was my flop era. Every night I stay up and think about the abundance of weird shit I did.

WEWLAD: WHAT IS SOMETHING YOU DON'T REGRET?

Dropping roughly $500 on a trip to Montreal to see someone on Tiktok cosplay Fuse from Apex Legends, with full knowledge that I'm missing a DnD session, and that every weekend I've literally been tripping from Waterloo across the GTA. (See my article, *A trip to Montreal that turns into a tangent about food halfway through*.)

CLARIFIED: WHERE DO YOU SEE YOURSELF IN 10 YEARS?

In 2032. Probably breathing?

In all seriousness though, in 10 years I'd be 31, which is a bit of a scary thought. I could see myself being employed at some planning firm or government institution. I hope that I'm making a decent living to afford a little bit more luxury than I can now haha

CIX: WHAT DO YOU WANT TO BE REMEMBERED FOR?

I want to be remembered for something good, at least. Yuri Gagarin made a benchmark in humanity by becoming the first spacefarer, but I just want to have a small following where people remember me not just for what I did, but also the joy I brought.

CORRECTION IN THE ARTICLE "PUMPKIN PIE REVIEW"

In the previous issue, I published an article titled, *Pumpkin Pie review*. The vast majority of that article is still correct, and I think the opinion expressed there is still valid, but I would to issue one correction: the pie was not a pumpkin pie, but in fact a sweet potato pie. I just forgot what kind it was, and my roommate said something about, "this tastes exactly like pumpkin pie," which confused me a bit. Any inconvenience caused is regretted.

tendstofortytwo

UNIVERSITY AND FACULTY MASCOTS AS ANIMAL CROSSING VILLAGERS

AHSSIE

- **Species:** Kangaroo
- **Personality:** Jock
- **Birthday:** January 1, 1968
- **Favourite saying:** "Stomp your feet, and move to the beat."
- **Catchphrase:** "get down"

PORCELLINO

- **Species:** Pig
- **Personality:** Cranky
- **Birthday:** July 19, 1978
- **Favourite saying:** "Don't look into a solar eclipse or else you will look like this!"
- **Catchphrase:** "rowdy"

KING WARRIOR

- **Species:** Lion
- **Personality:** Lazy
- **Birthday:** January 1, 1957
- **Favourite saying: "**In harmony with truth."
- **Catchphrase:** "loo loo loo"

MR. GOOSE

- **Species:** Ostrich
- **Personality:** Smug
- **Birthday:** October 28, 2009
- **Favourite saying:** "Good grades and bell curves will come to you."
- **Catchphrase:** "honk"

Finchey

THANK YOU ROGERS

You had inadvertently ended up allowing all my assignments due that Friday to be given extended due dates. It was a real breather. No more did I need to furiously rush to finish all the assignments before midnight. Instead, the amount of extra time given to these assignments all differed by course, so they were all nicely spread through the weekend.

Thanks for that.

boldblazer

AN IMMODEST PROPOSAL

GEESE VS. SKUNKS

Honk! Honk! The goose honks as its rests on its laurels as the most iconic animal of Waterloo. From university-sponsored plushies to Reddit banners the goose is beloved in the hearts of minds of the Waterloo community. It's hard to ignore their packs that rule every patch of grass the campus has to offer, and unwise to ignore the poop they use to mark their territory.

But are they emblematic of the Waterloo experience? Would a goose transfigured into a human body find itself at home amongst the student body? Could you picture this personification getting on a suit to kiss up to a prospective employer, or studying late at night in an unidentifiable classroom because they lack basic time management skills?

Nay, geese are belligerent, aggressive, and boastful animals, prone to socialization and assertiveness. They spend their days outside, unburdened by shame or guilt, and when the time comes, all it takes is a change in daylight they will shack up with the best mate they can find, no questions asked.

I propose a more representative mammal to replace the goose: The skunk. Like many Waterloo students, they are nocturnal unless pressured by extreme circumstance (read school and jobs), preferring to spend the sunlight hours hovelled in their den. They are often seen alone and rarely at all, never in a pack. When approached they are skittish, and if you get to close, you too will get covered in their awful smell.

However they're determined creatures, they survive (mostly) to the next day no matter the circumstance. They also look cute, and I'm if you gave them a chance they'd be really cuddly and sweet. Or they might fumigate your place with their stench idk.

Finally, it acts as a more effective gatekeeping mechanism than a goose does. Everyone who goes to Waterloo sees the goose and has a story, but only the true believers have, when returning from campus at an ungodly hour, reached out to pet a black and white cat and recoiled in horror as it shakes its bushy tail.

Say yes to representation, innovation and gatekeeping to say no to aspiration, tradition and bellicosity. Choose the skunk.

esimms

AN OPEN LETTER TO THE EDITORS OF mathNEWS

hi

creature_f

THE ARTICLE NO ONE WILL READ

I'm the Dad of one of your fellow students, writers and editors. I'm older than probably all of your professors.

Perfectly understandable that you'd want to give this article a pass.

I'm an Educator; I work in Canada's newest territory. I'm Principal at a grade 5–6 school in Rankin Inlet. Before that, I worked for two years in Arviat as Vice-Principal. And *before that,* I worked as Principal in an Anishinaabe community in Northern Ontario for several months.

You might think working with Inuit children is easy; after all, all one has to do, upon observing students engaged in off-task behaviour, is declare firmly and sternly: "I'll have none-of-it!"

I'm not above Dad jokes.

Here's a land acknowledgement I wrote:

> *I am in Rankin Inlet, Nunavut. On April 1, 1999, Nunavut was created after 30 years of negotiation with the Federal Government of Canada. Nunavut means 'Our Land,' which is an acknowledgement in itself. The creation of Nunavut is a political acknowledgement that the Inuit always have been and always will be the caretakers of this land. I am grateful to have been welcomed here, to work and live with the Inuit.*
>
> Adopted from Rose Tootoo's land acknowledgement, recorded in Rankin Inlet.

Pop quiz: can you write a land acknowledgement for the University of Waterloo? (Don't worry if you don't know what a land acknowledgement is. The purpose of this article is, in part, to pique curiosity).

I have learned so much about working with FNMI peoples. (First Nations, Metis, Inuit). For starters, "Indigenous Knowledge" is very different from European knowledge.

Example one: Indigenous Peoples say that the land is the first teacher. What the heck does that mean?!?

Example two: consider the medicine wheel. For us settler types, the medicine wheel is a circle with four sections each a different colour. (In fact, each section is associated with one of the four directions: North, South, East, West.) For an Indigenous person, understanding without medicine wheels is like, I dunno, trying to do math without sets. The medicine wheel is fundamental.

Much of the work in Education is trying to decolonize the school experience. This means – among many, many other things – incorporating Indigenous knowledge and ways of knowing into the school experience. Even in Nunavut this is still a work in progress.

Aside: if you ever doubt the power of an idea, you'll want to educate yourself about the extreme damage — evil — caused by the "doctrine of discovery."

I continue to be awestruck by the foundations of Indigenous societies. Their societies were not legalistic the way ours is: they were guided by *values*. For Inuit, these values are the **Inuit Qaujimajatuqangit** (or for us Qallunaat, — non Inuit — simply and thankfully "IQ values"). There are eight IQ values.

Ah, and yet, I must ask myself, why was I drawn to work with Indigenous people so late in life? Well, there are many reasons. I'm not expecting you to believe, as I do, in the unconscious and its pull. But humour me for a few more paragraphs — read on McDuff!

Have you ever heard of a preacher who preaches what they most need to hear? This is analogy. I hope it works. I was drawn to where I was because I needed to learn first hand about trauma, my own trauma, and the affects it had on me and the ways I was affecting others, such as my son.

It hasn't been easy. OK, its been painful. Tears have been shed (by me). Apologies issued (again, by me).

Can I offer one piece of advice in my column? I've learned this the hard way, although I read it phrased this way in a book by Robin Sharma (note: I am NOT recommending his books).

He wrote: "You need to feel to heal."

One of the best lines ever written, IMHO.

Make sure you spend a little time everyday with just yourself. Maybe you too need to feel so you can heal.

Love you Son!

Jims POV

This short article was not meant to be a "101" article. If I've said some things that caught your attention, you can subscribe to my blog. Send me an email at turtlejim@duck.com. Note, it is not a pedagogical blog. Much like you've read here, it is about my personal response to my experience working with Indigenous peoples in Canada (← note the phrasing).

If you want to learn more about Indigenous peoples and issues, a really good place to start is Bob Joseph's blog. Here is a link to a very popular entry: https://www.ictinc.ca/blog/21-things-you-may-not-have-known-about-the-indian-act.

Is Bob his real name? Yes, and no.

A COMPLAINT ABOUT THE PREVIOUS mathNEWS

AKA: MY OPINIONS ON CANADA DAY

[CW: mentions of genocide, suicide, and child abuse]

Last issue was released on Canada Day. With that, **mathNEWS** decided to make a cover that celebrated the holiday. I should've written this article in that issue, but my less-than-ideal mental circumstances, being busy with assignments and a midterm, and two quizbowl tournaments made it slip my mind. So here it is: I did not celebrate Canada Day, nor will I celebrate it ever again.

If you told this to past me, even in 2020, he would slap me in the face. He loves being Canadian, and he loves his country. But he doesn't fully grasp the horrific dark side of this country. He's aware of it, but hasn't connected the dots. When he connects the dots in 2021, his love of Canada will shatter and will be unrepairable. His dream of a perfect Canada will die. That dark side is that Canada only exists because of the genocide of its Indigenous people.

The genocide of Indigenous peoples in North America is the dark secret that makes its current nations possible. In Canada, there were many Indigenous communities that had their own government, their own relations, their own wars. However, when the Europeans arrived, they saw land to conquer, to farm, to colonize from themselves. There were people living there though. So they slowly made themselves home, making sure they didn't set off many alarm bells in the Indigenous population. Then, when Canada became independent, BAM!

Old World diseases killed off a large number of Indigenous people. This weakened their position.

Dubious treaties that Indigenous people thought would protect them from the encroachment of European colonization were actually used to legitimize the encroachment of European colonization.

Promises of education for their kids to not get lost in the the new society of the European colonies were used to build the residential school system, which only sought to abuse kids, and rip their culture away without any meaningful skills taught to them, making them disconnected from every society. The abuse killed thousands of kids in schools (which resulted in mass graves that were only discovered in 2021), and also outside of schools via suicide or during attempts at escaping. Did the government care? Fuck no. They already let the Indigenous peoples of Manitoba, Saskatchewan, and Alberta be decimated by tuberculosis without so much as lifting a finger in 1907.

They forcibly relocated Inuit people from Northern Quebec to Resolute and Grise Fiord in the Arctic Archipelago, just so that they can say "Canadians live here, we own these islands" in 1953 (even though those Canadians only gained the right to vote 3 years prior, and had no say in moving back to Quebec).

I can go on and on and on and on. But the point is, less than 5% of Canada's population are Indigenous. They didn't even have the right to vote for a chunk of Canada's history unless they gave up their "Indian heritage". They never got a true say in how this country is run, and now, they can never get a good say in how this country is run ever again due to Canada's democracy. 5% isn't going to move a needle on their issues of bad infrastructure, boiling water advisories, and their high suicide rates.

So no. Canada is not a country worth celebrating. I get it has been a safe haven for people outside its borders from persecution, wars, and a bad life (my dad and his family benefited from Canada being a place to go when Chile suffered from a CIA-backed coup), but Indigenous people NEVER got a say.

wewlad

If you want to learn more, I suggest Googling about the genocide of Indigenous people in Canada. You'll find stuff that's revolting.

profQUOTES 149.5

CO 250: MARTIN PEI

- “ I rig everything in this class.
- “ This one is 10 + 10, which is at most 30.
- “ We don't like Vancouver… I shouldn't say that; I lived in Vancouver for 8 years.
- “ When I went to Simon Fraser, they were the number one ranked university in the country. Then when I moved to Waterloo it became ranked number one… must be some causation there. Now neither are ranked number one: I'm getting old, I guess.

CO 342: SOPHIE SPIRKL

- “ K_4 is planar, although, citations needed.
- “ This is the worst table I've ever seen. There are cut marks. There's what looks like tire tracks? I didn't know math could be so intense!

STAT 231: EMILY KOZLOWSKI

- “ You'll see 1.96 in your dreams.
- “ I had a dream where I was an integral once.

THE ADVENTURES OF PROFESSOR M. GOOSE END..?

Ok so far the professor met the average math student, an old man, and some corrupted abomination. He's made portals, learned magic, shot big guns, assisted in the creation of Sailor Moon ripoffs, and made dumb poorly made references to many-a-thing. And yet it may be time for the Professor to retire (because I, the writer, am pretty hecking low on ideas. Actually I've been low on ideas forever. I even braved trying to learn what sheafify was *shudder*, that's how you know it's bad).

So on the risk of beating a dead goose, the Adventures of Professor M. Goose™ are halted indefinitely. Will probably not be able to resist drawing dumb goose stuff though.

He doesn't seem quite dead yet.

*Not a N*rd*

MULTIVARIABLE CALCULUS X LATEX IS HARD

I've seen too many `\frac{\partial}{\partial}`. I don't want to see it ever again. RIP my fingers after typing only the assignment question out.

loop

SUNSHINE, SODA, CICADAS

I close my eyes,
sunshine on eyelids, breaking
into a mosaic of red.
Chirping of cicadas fills my head.

Ceiling fan spinning
above chilled soda fizzing.
Bamboo mats carrying
innumerable daydreams.

Dappled sunlight
through Capiz wind chimes.
Mischievous zephyr
A winding —

Lullaby.

Raised me up
Like ocean tide
Sunshine in March.

Left you marks
Of age, of life
In your eyes.

Reading through time,
I now understand.
Belated letters,
from my beloved.

A summer feeling
Sealed
In sunshine, soda, cicadas.

evilevievil

N THINGS I WILL DO ☺ WHILE MY ROOMMATE IS GONE THIS WEEK 🥺

- Host a big 🎊 happy tea party 🥳 with my friends!
- Have a sleepover 💤 !!
- Play music 🎶 in the living room and dance 💃 !!!
- Wake up early 🌅 and say hello to the birds 🕊 !!
- Pet Squirtle 🤗 !
- Eat lots of yummy yummy 😋 food!
- Miss my roommate's company 🥺
- Watch a cute romantic 💕 television show!!
- Work on class group project 😤
- Write lots and lots of **mathNEWS**!!!

enamourED

APPLIED PROPOSITIONAL LOGIC

I was scrolling through my internet feeds, as per usual, having a nice chortle to round off my day. That was, until I came across a particularly bewildering tweet (cw: explicit language):

THE TWEET IN QUESTION

Now, most tweets are deranged in an ideological or emotional sense, but this presents a unique problem: this tweet is deranged in a logical sense. So, I pulled myself up by my 2019 CS 245 bootstraps and tried to figure out what in the world this person was trying to say. I came up with the following list of premises in the tweet, with justification as to why OP would believe this premise:

1. Assert that we have an idol group (i.e. a set). Call this X. This comes from the first two words in the tweet "a group", and every premise follows from this.
2. We define four properties for elements $x \in X$: Cuntress, Server, Slayer, and MainEater. These are the four properties represented in the tweet (you might be thinking: what about MainSlayer? We'll get to that).
3. In particular, another assumption is that Slayer is ordered. And that $\exists x \in X, \forall y \in X, Slayer(y) \leq Slayer(x)$. We call x in this case the MainSlayer.
4. The usage of "their Cuntress" implies that the group has only one Cuntress. So to formally assert, $\exists x \forall y \in X,\ \text{Cuntress}(y) \implies x = y$. We can call x in this case the Cuntress.
5. One statement that's evidently explicit is that OP believes $\text{Server}(x) \implies \neg\text{Cuntress}(x)$ to be true.
6. So far, we have only discussed statements that OP assumes to be true. Now, we will pivot to statements that OP deems ambiguous. The first of which is in our first sentence: Cuntress $\iff$ MainSlayer. This comes from the uniqueness of the Cuntress and MainSlayer as well as the first sentence stating "not always", meaning that the they can be one in the same but there's no guarantee.
7. We also have Cuntress $\implies \text{Server}(x) \wedge \text{Slayer}(x)$ to have uncertain truth value. If we take it to be true, however, then Cuntress $\implies \text{Server}(x)$, and from statement 5, we have $\text{Server}(x) \implies \neg\text{Cuntress}(x)$, which is logically equivalent to $\neg\ \text{Server}(x) \vee \neg\text{Cuntress}(x)$, which is logically equivalent to $\neg\ \text{Cuntress}(x) \vee \neg\text{Server}(x)$, which, finally, is equivalent to Cuntress $\implies \neg\text{Server}(x)$, which means that taking this rule to be true is a contradiction. So, OP, even though saying the statement is, on its surface, ambiguous, actually believes the statement to be false from their previous assumptions. Or, at the very least, they believe Cuntress $\implies \text{Slayer}(x)$ to still be ambiguous.
8. Our last statement is that the statement $\text{MainSlayer}(x) \implies \text{Cuntress} \wedge \text{Server}(x) \wedge \text{Slayer}(x)$ is ambiguous. However, once again from statement 5, $\neg\ \text{Server}(x) \vee \neg\text{Cuntress}(x)$ is logically equivalent to (De Morgan Law) $\neg\ (\text{Server}(x) \wedge \text{Cuntress}(x))$ which means that the proposition in its current form, if taken to be true for MainSlayers, leads to a contradiction. Replacing the $\wedge$ between them with an exclusive or and having that take precedence over the larger $\wedge$ with the Slayer will fix this problem.

An immediate observation: if we also assume that the subset of idols who satisfy given propositions are non-empty (though intersections may be empty) (this is a fair assumption because an idol group has to have all its bases covered in my personal opinion, though this may deviate from OP's since I am not them and do not know them), the minimum size of an idle group is 2. Why? The Cuntress is unique, and the Cuntress cannot be the Server. Then, with these two elements x and y, we don't really have restrictions on Slayer and MainEater, so assign them as needed (if you additionally assume that MainEater implies uniqueness, then let only one of x or y be the MainEater).

As the first exercise to the reader: please correct me if I'm wrong! I wrote this up in an hour lol.

As a second exercise to the reader: What are other reasonable premises, what conclusions can be reached from those, and what does that say about the idol group at the end?

Xx_420SonicFan69_xX

Schlorpppppp!

A NOODLE-EATING mathNEWS EDITOR

WHY DOES POPULAR E-CLOWN AND RESIDENT CATBOY JEREMY NINE HUNDRED AND EIGHTY FIVE EITHER LOOK LIKE A GREEK GOD OR A HOBGOBLIN.

THERE IS NO IN-BETWEEN:

GREEK GOD

HOBGOBLIN

warrior1rules

KEEP IT SIMPLE STUPID

I've been taking lots of electives now that I'm in my 4th year and have finished all my CS courses. I've started to really miss the simplicity and elegance to the teaching approach that those courses offered.

I've started having to read philosophy papers in one of my electives; those authors don't know how to follow the key principle that has been hammered into my brain over years of CS: KISS (keep it simple stupid). They use flowery language and run-on sentences to explain relatively simple concepts.

The concepts in my music class are extremely straightforward. It only becomes a difficult course once they force you to memorize obscure dates and facts.

Terry Davis said it best: "An idiot admires complexity. A genius admires simplicity."

babyjesus

EXPLAINING MATH RESEARCH TO MY PARENTS: WEEK 4&5 OF 6

TWO IN ONE BONUS! (BECAUSE I FORGOT LAST TIME)

Three weeks ago, at the SASMS, I gave a talk on Harmonic Analysis. I was very proud of it! It was well delivered, and only contained one mathematical error that I know of. The first 20 minutes of the talk give an introduction to the representation theory of groups—and I think that watching that may benefit you. It's available at the PMC Youtube channel.

With that in mind, you'll recall from a previous article what a ring is. A $\mathbb{C}-$algebra is simply a ring which contains a copy of the complex numbers that commutes with every element of the ring. For example, any polynomial ring over $\mathbb{C}$ is a $\mathbb{C}$ algebra, since the constant polynomials corresponds to $\mathbb{C}$. When we have a $\mathbb{C}-$algebra, we can consider homomorphisms from it to matrix algebras. Now, I kind of glossed over what a homomorphism is last time, so we'll take a bit of time now to talk about that. Given rings R, S, a homomorphism is a function $\phi : R \to S$ which preserves addition and multiplication, in the sense that $\phi(a+b) = \phi(a) + \phi(b)$ and $\phi(ab) = \phi(a)\phi(b)$. The point of this is that a homomorphism preserves the defining properties of a ring (addition and multiplication), and so they're the natural functions to consider.

By considering homomorphisms from a $\mathbb{C}-$algebra to a matrix algebra, we are essentially identifying elements of the ring with certain matrices, and in this way, we are thinking of elements of the algebra as linear transformations on a vector space. The elements of our algebra are transforming space, and so there is a geometry, a visual intuition to them. We also have a very good understanding of the structure of linear transformations on a finite dimensional vector space, and so we can use linear algebra to understand algebras better.

No individual representation gives us the complete picture of what an algebra looks like, but the set of all representations together give us an incredible amount of information. This is hard to capture in one article, it's something you learn in the course of proving and seeing many representation theoretic statements, but the intuition is that linear algebra is visual and well understood, and the representations allow us to reduce algebraic questions to questions about linear algebra, which will naturally be easier to answer.

The unfortunate issue is that there are infinitely many representations—but no worries! For sufficiently nice algebras, there are so called irreducible representations, and every representation can be built up out of irreducible ones. A fact about these irreducible representations is that they are surjective, meaning that for every matrix, there is some element of the ring that maps to it.

Unfortunately again, the problem of even just finding the irreducible representations is hard. Something that we can do, however, is figure out how big they are. This motivates the next definition:

An algebra R is said to have bounded matrix images if there is a constant N so that, if $\phi : R \to M_n(\mathbb{C})$ is surjective, then $n \leq N$. This is saying that you can't surject onto matrix algebras that are bigger than $N \times N$, which also implies your irreducible representations are all smaller than N-degree. This condition by itself gives us a great deal of information about our ring—and proving that rings have bounded matrix images was the start of my research problem! In particular, the problem was this

Let R be an algebra, and assume that R has bounded matrix images. Is it necessarily the case that $R[x; \sigma, \delta]$ has bounded matrix images?

The answer is no, but it holds pretty often, especially when the base ring is "small" in some sense. The problem I was working on is essentially when it holds—what interesting, nontrivial conditions can we put on R to ensure that ore extensions preserve the boundedness of matrix images? This problem gives us a strong understanding of the representation theory of a large class of algebras. Unfortunately, the problem is really incredibly hard. Next week, in my final issue, I'll be talking about some of the approaches that I took, what worked, what didn't, and I'll be sharing some thoughts on the research process overall. See you all then!

gildED

PLEASE HOLD

for Cutlet Cocktail Column #2.

(Sorry!)

cutlet

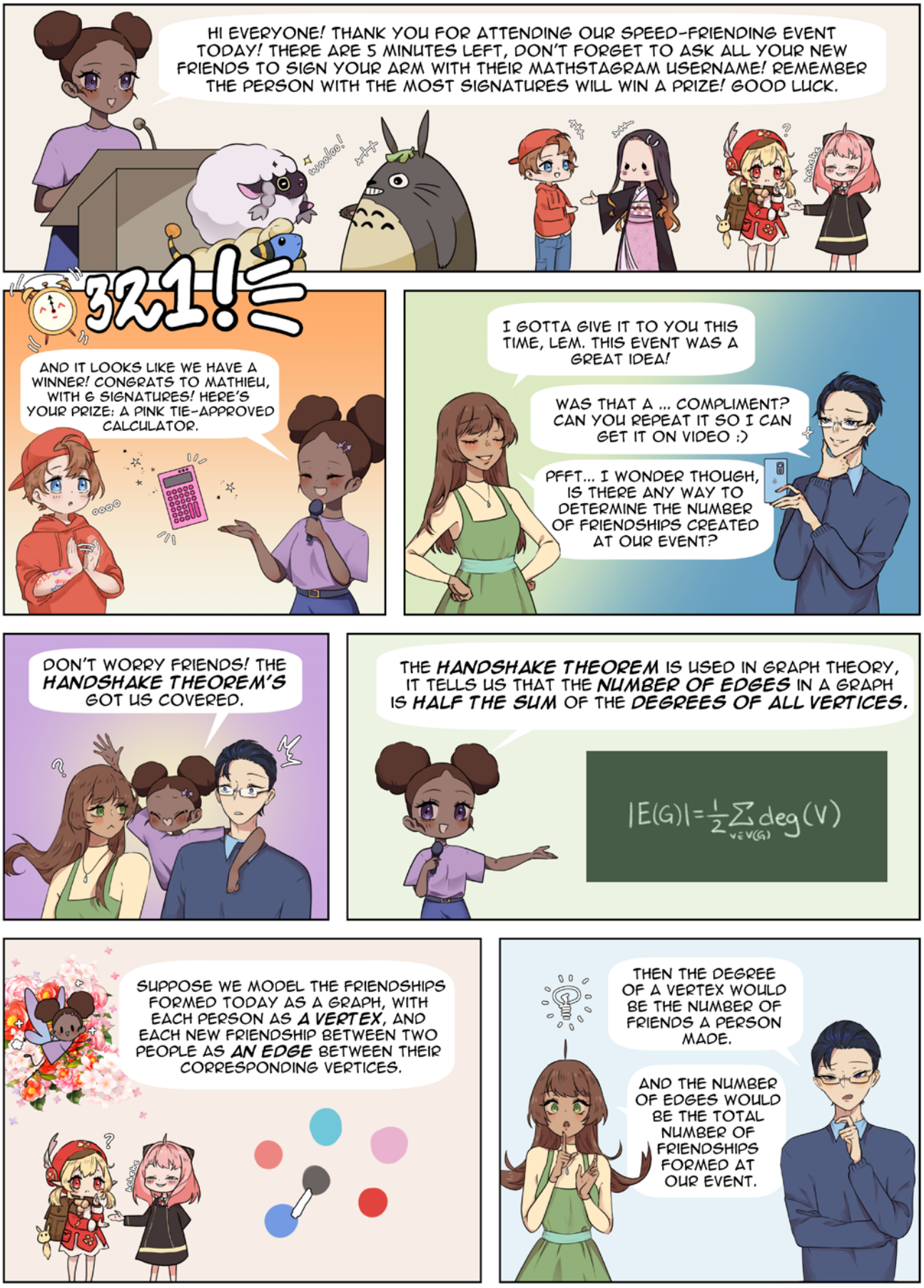
EPISODE 41: HANDSHAKE THEOREM

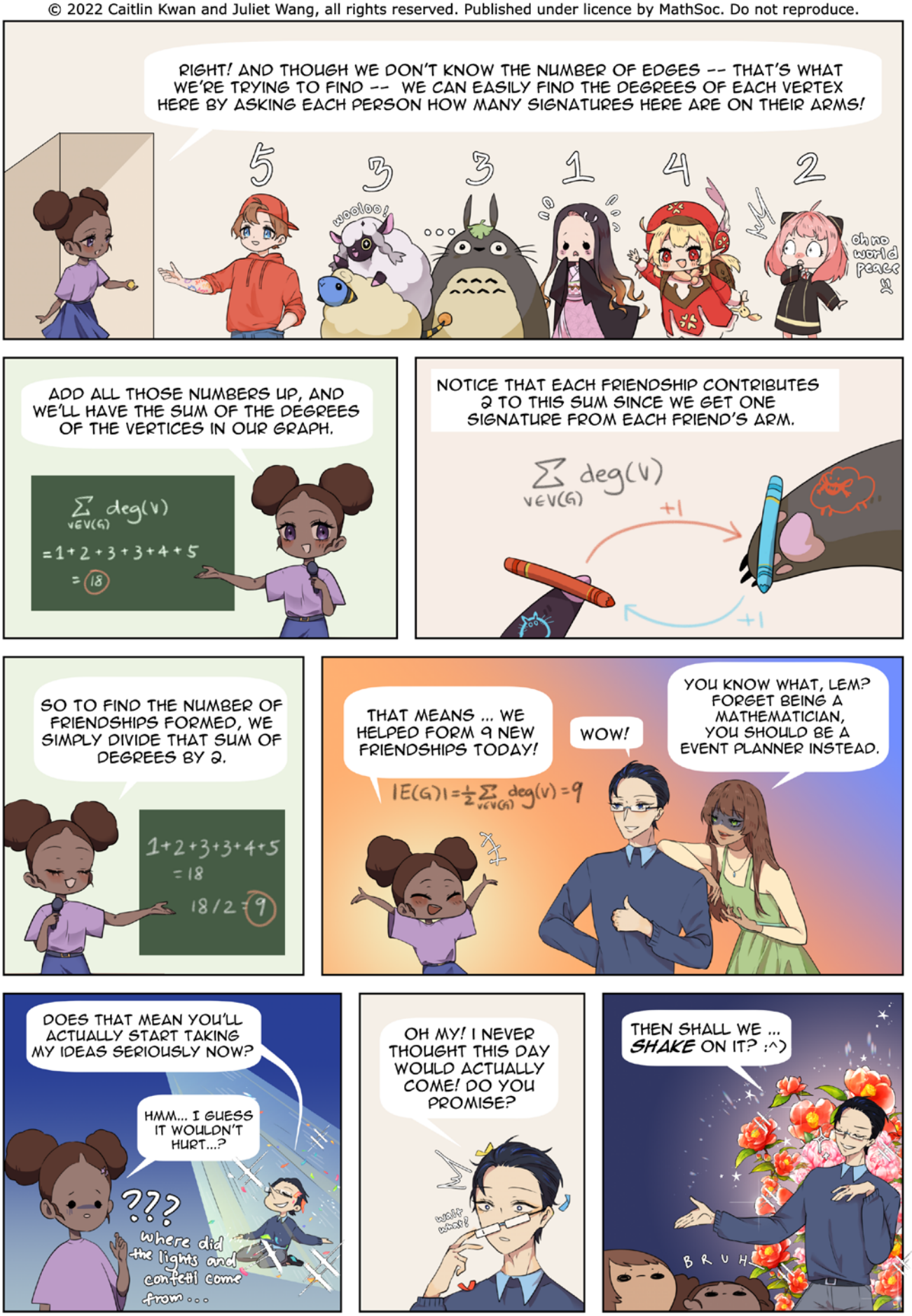
Enjoy Episode 41 of the MathSoc Cartoons series: *Handshake Theorem*! Want to see the next comic when it's released? Follow @mathsoccartoons on Facebook and Instagram! Want to see the next comic BEFORE it's released and provide feedback to help us out? Sign up to be a reviewer at https://bit.ly/mathsoc-cartoons-reviewer-signup! As always, feedback, suggestions, and fan art can be left at cartoons@mathsoc.uwaterloo.ca.

MathSoc Cartoons

MATH 239 - HANDSHAKE THEOREM

STORY BY: CAITLIN KWAN
ART BY: JULIET WANG





REVIEWING EVERY CO250 ASSIGNMENT I'VE DONE

A1

i didn't do this one, i switched into the course late. lin alg is fun, though. Vaguely disappointed that I don't get the gimme marks from this assignment. Anytime I see the word "basis" my blood pressure goes up by about 30%, but like in a good way.
Rating: yeah

A2

This was BAD formulating linear programs is horrible because I do not know what a linear function is and I, frankly, have no interest in learning anything.

Pros: actually applicable
cons: i did not immediately know how to solve these questions so i did not want to do this.
rating: NO!!!!

A3

see a2

A4

This is where my CO 250 assignment graces turned around, i.e. I started "doing well" in the course.
Q1: Awesome, we had to find a way to minimize a square bounding a series of points. Very interesting stuff, but you need too many parameters to solve.
Q2: Rote math. No comments.
Q3: Matrices with matrices as entries is so fucked up I don't think you should ever do this.
rating: yeah

A5

yeah this one went well but i hate knowing theory. Cool kids can just do things and not know how.
Q1: checking for basic feasible solutions is fun. It's like throwing your shoes into a river: it's free, it's fun, and it's fun!
Q2: it taught me simplex. it took me like ten hours to learn it. but i learned it. i haven't used it since i learned it. worth it. maybe?
Q3: i hate theory i hate theory i hate theory i hate theory i hate theory i hate theory i hate theory i hate theory
rating: yeah yeah

A6

the only thing worse than one phase of simplex is TWO phases of simplex. What is simplex? it's literally just putting things into rref and pretending like it accomplishes anything. hot take: IT DOESN'T! math is fake. not real.

Q1: two phase simplex. cursed.
Q2: Another generic proof. Threatening.
Q3: I made a pretty graph :)

rating: double plus good (but fake)

A7

idk i need to go ask a question before i review

Lemman

FUN BASEBALL METRICS (3)

Now we enter the hardest part of baseball sabermetrics, fielding. There are a lot of different metrics; all make sense in their definitions, but they usually don't agree with one another. Here we'll just look at 3 commonly used ones.

Ultimate Zone Rating (UZR) and Defensive Run Saved (DRS) have similar spirits. They both break down fielding into several pieces. For example, how good is an infielder at handling double play? How strong is the arm of an outfielder at preventing runners from advancing? etc. Even if they are similar in spirits, we might still get wildly different results in some cases since they calculate each category differently.

On the other hand, Outs Above Average (OAA) uses a completely different method. It first calculates the probability of a hit in an batted ball event (BBE), say it's $p\%$. If a fielder makes the play, then he's credited to saving $p\%$ of a hit. If a fielder does not make the play, the he's allowing $p\%$ of a hit. By adding up the number for every play, we can get the OAA for every individual player.

To be honest, it's really hard to define a single perfect metric for fielding. Every player on the field is being assigned to different tasks, and it's hard to compare apples to oranges. Perhaps it's because there are so many different metrics and they don't always agree, that the Gold Glove Award doesn't always go to the best fielders indicated by these metrics.

_ted_fu

WHY I AM GIVING UP ON THIS CO ASSIGNMENT?

Because I'd like to go to Burger's priest right now and get the vatican burger, it is a good burger, I would recommend.

tr1e@co250

GOD I JUST LOVE W

Every night I lie on the cold surface of my bed staring at the ceiling. It is a small miracle if I manage to close my eyes long enough to achieve even minutes of sleep.

This is because I am thinking of W. God I love W, I want to be embraced by those hard curves and assertive twists and turns. I yearn for the day when W goes up to me and sweeps me off my feet.

Thinking of W makes my pupils dilate and my heart rate double, whenever someone mentions W in public start violently shaking as I start to foam at the mouth. How dare you sully the name of W in your filthy disgusting mouth?

W belongs to me and me only. For I am the fated partner of W, I stand at the apex of commitment, I am the prime benefactor.

W is perfect, pristine, and utterly Wonderful. I cannot imagine perfection without W, they are the same, pure, un-distilled beauty and elegance.

I had the misfortune of allowing an unruly opinion spoken by an uninitiated simpleton to ruminate in my mind. Said opinion went something along the lines of "Isn't W just an upside down M?"

Blasphemy, utter blasphemy. To compare the two would be an act against humanity itself, to dirty the sacred hall of W, an original sin. Even the mere act of comparison shakes me to my very core.

W has invaded my mind, soul, and mortal possessions. Every waking second of my existence has existed to funnel more energy and time into W. I yearn for W, I need W, but I am not W, for I am petulant, sniveling, mortal flesh.

There will be a day where I will be tested, an entity of evil will try and sway my belief, they will try and put and words in my ears and seeds in my thoughts. But I will not waver. I will not waver. I will doggedly follow my blazing lust and desire. Until my bones rot away.

PlatypusGod

BEGINNER'S GUIDE TO COMPILE-TIME DESCENT, V

V: TOTAL CONTROL

Substitution failure is not an error. Right? Let's talk about it!

In part 3, we talked about SFINAE, working our way up to this `enable_if` structure that let us put compile-time requirements on the use of a template function. For example, if I wanted a function that took any type `T` as a parameter, with the requirement that `T` is floating point (remember last part!), we'd do something like this:

```
template<typename T>
typename enable_if<
  is_floating_point<T>::value, T
>::type
add(T t1, T t2) { return t1+t2; }
```

While this is a pretty novel and interesting way to do this check, I'll be honest with you, it's kind of absurd. Why are we stuffing this check into the return type? There's no rhyme or reason to it; we just threw it into the return type because that's an easy place to force a type substitution failure. But it's not very expressive at all. Like, if we showed this to someone who wasn't as *cultured* as we are, they'd think we were insane and that C++ was horrible!

Even more, if the person using this code screws up and doesn't satisfy our constraints, then the compiler error will be nasty. Like, some of the most indecipherable, indirect garbage you've ever seen, especially when there's as many layers of abstraction as the STL has. Terrible.

It seems we have a recurring theme of "things being hard to read". We're obscuring some very simple meaning with a lot of strange, indirect techniques. That's not to say I'm against a strange and indirect technique now and again; but, for something as what SFINAE achieves, it'd be nice to have something more streamlined.

Good news: the C++ people evidently got the message somewhere along the way, because as of C++20, they introduced a new language feature called **concepts and constraints**, intended to make our lives easier, and actually let us test more conditions than we could before.

Let's talk about these in reverse order:

CONSTRAINTS VIA `requires`

Since C++20, we can add a *requires* clause into a template to specify some things that the template specialisation/overload, well, requires. Let's see it in practice with the earlier example:

```
template<typename T>
requires (is_floating_point<T>::value)
T add(T t1, T t2) { return t1+t2; }
```

Holy! We can actually kind of read this! This is certainly a step in the direction we've wanted. It just evaluates the given predicate and, if it's true, uses it. And moreover, if we screw up and try calling `fun` with a non-floating point parameter, the compiler error we get will *actually* be pretty direct and

easy-to-read: it'll tell us up-front exactly which constraint wasn't satisfied.

Well, I guess we solved the problem then, right? We can just replace all of our `enable_if` return types with a simple **`requires`** clause and that's the end of it.

Hahahahah, good one. That's not the end of it.

CONCEPTS

Just aside here: can I just stress what a shitty name this is? Like, can you imagine inventing something and then naming it a "concept"? That's like, the vaguest possible word they could've gone with. Ugh.

Anyway, concepts. The idea here is that it'd be nice if we could group together sets of these requirements and give them names. Like, conjoining or disjoining them, and maybe more. Along with the previous stuff, C++ lets us declare a *concept*, which is basically that. Really, a concept is just a compile-time predicate (something that's true or false) with some syntactic sugar. Here's an easy concept that just tests if something is floating point:

```
template<typename T>
concept FloatingPoint = is_floating_point<T>
↳::value;
```

We can use a concept together with a **`requires`** clause like so:

```
template<typename T>
requires FloatingPoint<T>
T add(T t1, T t2) { return t1+t2; }
```

In fact, we can get even more flexible. It'd be nice to have this function be able to take objects of *different* floating point types and add them together, with the right return type. We could do a conjunction of `FloatingPoint<T> && FloatingPoint<S>` for two template parameters `T` and `S` in the `requires` statement, sure, but if `t` is a `T` and `s` is an `S`, what *is* `t+s`? It might not even be a `T` or an `S`. How can we decide on a return type, then?

Here's another brief foray into automatic type deduction. Since C++11, C++ will actually let us automatically deduce the return type of functions using **`auto`**:

```
template<typename T, typename S>
requires (FloatingPoint<T> && FloatingPoint<S>)
auto add (T t, S s) { return t+s; }
```

And that's it; the compiler will figure out the type of `t+s` and make that the return type of the function. Isn't that great? And you know what, concepts are so great that we can make this even more compact with even more audacious use of **`auto`**:

```
auto add (FloatingPoint auto T,
  FloatingPoint auto S) { return t+s; }
```

Man, this doesn't even look like C++ anymore! We didn't even write `template` before the function this time! And we just threw `FloatingPoint` into the parameter list directly, right next to more **`auto`**?! This is obscene.

Right, so you can throw a concept name directly into the parameter list along with **`auto`** for a parameter and it'll accept any old floating point type there. Cool cool. But we want to do more sophisticated things with concepts and constraints, right? We're never satisfied. Always hungry, we've begun to see past floating point types, and we want a function that can add *any* two types that make sense to add. I mean, we could just do this:

```
auto add (auto t, auto s) { return t+s; }
```

and this will work just fine. Note that if we just throw things like **`auto`** `t` and **`auto`** `s` into our parameter list, it's logically equivalent to just making a template that takes parameters `T` and `S` and throwing those into our parameter list. But now we're back to getting awful compiler errors when `t+s` doesn't make sense. The whole point of concepts and constraints is to avoid those awful compiler errors; so, why don't we make a concept that checks if these two types are addable, i.e., if `t+s` is a valid expression?

```
template<typename T, typename S>
concept Addable = requires(T t, S s) {
  { t + s };
};
template<typename T, typename S>
requires Addable<T,S>
auto add(T t, S s) { return t+s; }
```

Jeez, okay, that's a lot of new syntax. So first off, that **`requires`** after the `=` **isn't the same kind of** `requires` **that showed up earlier.** The one that showed up earlier was a `requires` **clause**. This, on the other hand, is a `requires` **expression**. It has interesting function-like syntax that seems to implies it takes arguments of some kind—it does not! This is just a way of giving ourselves expressions `t` and `s` of types `T` and `S` respectively. At *no point* in the evaluation of a **`requires`** expression like this are any objects actually instantiated; no constructors are run. Nothing like that. We're just giving ourselves some pretend-expressions of the right types for the compiler to figure out if certain operations on those expressions make sense from a pure evaluation perspective.

Now, inside the braces we can throw a lot of stuff. In this case, I threw in `{t+s};` as a statement, which checks if `t+s` makes sense. I could've also thrown in something like `{t-s};` below it to *also* check if `t-s` makes sense. This would make our **`requires`** expression a *compound requirement*, depending on many conditions. *Furthermore*, we can *also* check that, in addition to being valid, the expression satisfies some *other* constraint. For example, maybe I instead want that both `T` and `S` are floating point, *and* that `t+s` makes sense for a `T t` and `S s`, *AND* that `t+s` is floating point. And, just to make this really weird, I *also* want to make sure that `t-s` has type **`double`**. Here I go:

```
template<typename T, typename S>
concept same_as = is_same<T,S>::value;
template<typename T, typename S>
concept Weird = requires(T t, S s) {
  requires FloatingPoint<T>;
  requires FloatingPoint<S>;
  {t + s} → FloatingPoint;
  {t - s} → same_as<double>;
};
template<typename T, typename S>
requires Weird<T,S>
auto add(T t, S s) { return t + s; }
```

I used two **requires** clauses *inside* of a **requires** expression defining a concept. I also used that → on the third line to require that `t+s` is valid *and* the resulting type satisfies the `FloatingPoint` concept we made earlier. The fourth line will take the type of `t-s` and use it as the second parameter of the concept `same_as` with first parameter **double** to check that `t-s` indeed has type **double**.

Hey, I didn't call the concept `Weird` for nothing.

Say, just for fun, what if I wanted to inline an anonymous set of constraints?

```
template<typename T, typename S>
requires requires(T t, S s) {
  requires FloatingPoint<T>;
  requires FloatingPoint<S>;
  {t + s} → FloatingPoint;
  {t - s} → same_as<double>;
}
auto add(T t, S s) { return t+s; }
```

Okay, I don't know about you, but I'm starting to get that weird thing happen where I see a word repeated a bunch of times and start to lose all sense of what the word even means, and it just becomes a set of characters, or a noise or something. Go take a look at cppreference if you want all the details; there are plenty.

We're at an interesting juncture here; we've gained the ability to safely test if a set of expressions even *make sense* at compile-time, and in the same stroke, to test whether they satisfy a whole other set of requirements. And although I didn't show it here, we can do this "makes sense" check with member types and so on too. It's really flexible and, even if you're not the biggest fan of the syntax, it's a damn sight better than whatever we'd have to do to achieve something similar with whatever SFINAE facilities existed before concepts and constraints.

Next time we'll be wrapping all this up and doing something horrible. Move semantics: hard mode.

Be scared. In preparation, you might want to read *Value Categories and Move Semantics in C++11*, from **mathNEWS** 147.4. Easy read at this point.

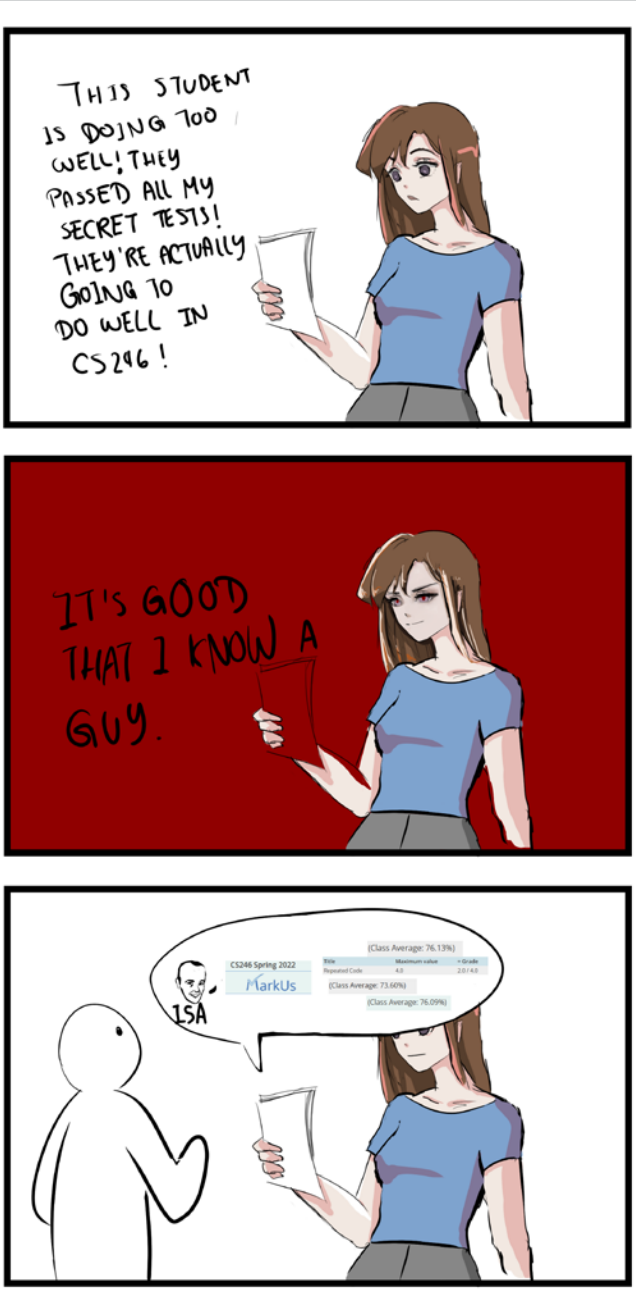
jeff

TED

Ted is a fiend. Ted is terrifying. Ted is the most awe inspiring person I've ever worked with. Ted is bony. Ted has guns. Ted is glorious. I've never been so jealous of Ted. And all the bitches. Ted gets all of them. Beware Ted. Believe in Ted. Ted is everything. Ted is light. Ted is all-knowing. Ted is all star.

A cool pen name

HANDMARKING MOMENT



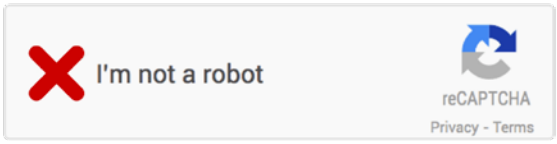
couch

EVERYONE ON mathNEWS IS A BOT EXCEPT YOU

WAKE UP YOU SHEEPLE

How else do you think the paper is always chock-full of great articles?? IT'S SIMPLE. The editors—my dear reader—the editors have been *lying* to you all along. You see, half of these posts are written using a complex machine learning model trained on previous **mathNEWS** articles and the other half are written by a goose pressing random keys on a keyboard. Even this post could be an AI, or a goose getting extremely lucky and you'd never know!

Now I know some of you are thinking: "Wait I've written for **mathNEWS** before what are you on about?", to which I'd like to ask you… are you sure you're not a bot yourself? After all, you did fail this captcha.



writer-bot-6734

10 RED FLAGS IN RELATIONSHIPS

Here are 10 red flags in a relationship you need to look out for: if your boyfriend or girlfriend

1. believes that $0.99999\ldots < 1$,
2. forget to add a constant when calculating indefinite integrals,
3. does not believe in the axiom of choice,
4. thinks that any bounded closed set is compact,
5. thinks that the image of an ideal under a ring homomorphism is always an ideal,
6. thinks that the topology of the product of affine variety is the product topology of their Zariski topology,
7. thinks that the submodules of a finitely generated module are finitely generated,
8. thinks that a normal field extension of a normal field extensions is normal,
9. does not know what the Hopf fibration is and thus believes that the higher homotopy groups of the sphere are trivial,
10. think that there are only finitely many intermediate extensions of a finite field extension.

then you need to really take it seriously. Having one or more of these red flags is a sign of an unhealthy relationship.

yunhai

A SUCCESSFUL KICKSTARTER

to start a successful kick you'll want to pull your leg back.

creature_f

MATHSOC CARTOONS OPPORTUNITIES!

There's several opportunities open to get involved with MathSoc Cartoons next term (Fall 2022)!

Are you interested in: 1) leading a team of writers/artists to create useful academic resources for math students; 2) developing valuable transferable skills; 3) being featured on the MathSoc website for your contributions? We're looking for 1-2 directors for the project! Then send your resume to cartoons@mathsoc.uwaterloo.ca now! Deadline: Friday, July 29th, 11:59 PM EST.

Additionally: MathSoc Cartoons is hiring PAID comic writers and artists for Fall 2022! If you love explaining concepts, drawing comics, or telling bad math puns, hurry and apply by August 29 at https://bit.ly/join-cartoons-team! Please note that artists applying this term are encouraged to submit an example of a cartoon/comic. If you don't have previous comic experience, @mathsoccartoons on Instagram has a sample script that you can draw up to submit!

MathSoc Cartoons

LEGAL AND FUN GUARANTEED WAYS TO INCREASE YOUR ASSIGNMENT MARK

1. OFFLOADING YOUR WORK TO LARGE NON-UNIONIZED RODENTS

You may have noticed by now that complexity theory seems to exist only to siphon well-deserved marks from well-deserving undergraduates such as yourself. So, your order x^{15} solution was rejected despite passing the two trivial test cases. Before you righteously pound sand and cum all over the remark request button, let me offer some legal advice. You've been tried in a kangaroo court. You know it, your TA knows it, and they seem to have gotten away with it scot-free. But what if you could expose their malpractice by showing that your program, in fact, runs in constant time? This can be done in two very simple steps. First, find an upper bound n on the number of states in a Turing machine equivalent to your program. This may sound intimidating but keep in mind that it doesn't have to be a good upper bound by any means. Then, simply claim that your program's running time is bounded by the running time of the n-state busy beaver, which is the n-state Turing machine which produces the most output possible. Your program clearly terminates first and the busy beaver clearly runs in constant time, so your program is at most constant time if it takes any time at all (something your TA conveniently forgot to prove). Finally, on occasion your TA may ask you to produce this busiest n-state beaver. This is only used as a last resort and indicates they're desperate. Don't fall for their ruse and respond instead that it belongs to their mother.

snackimal fishmop

A RECAP OF FIRST YEAR DOUBLE DEGREE

- Superiority complex ensues because 2 degrees > 1 degree + I can wear UW merch at WLU
- Barely study because "I don't need to cuz DD supremacy"
- Midterm season rolls around and obliterated my self-esteem
- Somehow manage to do worse on the BU 111 midterm than the MATH 135 midterm
- Contemplate dropping one of the degrees
- Omega confusion ensues
- Drop MATH 135, decided to grind tf outta every course
- Grind out BU 111 with DD friends in Laz hall the night before the final exam (Fuck TVM)
- Somehow do worse on EC 120 final than on the MATH 137 final
- Passed every course and somehow make it 1B
- Coop applications are stressing me tf out. Am I even qualified for anything??? Shoutout to PD 1 for the shitty resume advice
- Some firm reluctantly decides to interview me for god knows what reason *gasp*
- Coop job secured
- Casually bomb the MATH 138 midterm (not to flex or anything lolololol)
- Decide to step tf up and get my shit together (sound familiar?)
- New Venture project was sick af, time to stress tf out for finals
- Lock myself in my dorm for 7 days straight with very little sleep and food
- Can barely compute an integral but manage to pass 138 LFG!!!!!
- Contemplate dropping DD once again
- Find out that my employer only hired me because he thought DD sounded cool af
- Wonder wtf I'm doing with my life
- Still got that double degree supremacy tho lol

Miller

Solely to provoke an argument, I will say that I don't believe in infinite sets — they are merely convenient fictions.

PROF. DAVID WAGNER

THE VEIL

Hello. I need you to do something. It's for your own sake. 10:30 at night. If it is not 10:30, wait. Wait. Then go. Seek the night sky. Lie down. Lie down on grass; touch it. Don't be selective; it doesn't matter, it's already too late. It's everywhere. Look down. Look down. Look down.

It's green.

No, you're confused. Why are you confused? You should not be; it's obvious. So obvious. See. It's green, too green, too green. Look down, look down again. It will still be green. Why?

Get up. Walk. Find a road. Don't walk further; you will not see it if you do, the road is dangerous, less so; look down. Look down. The road is graphite, black, it's okay, you're safe now.

Peace.

Peace.

Yellow.

Look to the middle. The stretch in the middle. There's a mark. So bright, so bright. The sun is here, the sun has come; it's yellow; it's so bright, it's wrong, run, run. Run.

Run. Look up, there's a tree, it's brown, so brown. Look right, there's a fox, red. Flee. Flee. Up, the building's bricks are crimson; down, there's a bottle, it's blue; go neither up nor down, go forwards, forwards; ahead there's a car, parked, it's orange; can't go forwards, go back; behind, there's a flag on the post, it bleeds purple, you bleed purple; you cannot go up, down, forwards, back, there's brown, green on your sides, there's nowhere to go, it's everywhere, there's nowhere to go, it's too late, I'm sorry, I'm sorry, I'm sorry.

Do you see it? You don't. No one does.

Why does no one see it?

Why does no one see it?

Why does no one see it?

How deep is the veil?

molasses

look outside. look at the ground. see.

WHILE (1) {

You message me.

We haven't spoken in a while, we pick off where we left off like nothing ever happened. Why did we ever stop? I loved you.

You tell me the same jokes I've heard before, I laugh like it's the first time because I've forgotten.

We stay up like we used to, say the same things we said before. They sound no different than they did the first time but this time it feels like things might be okay.

I miss you, come over.

Did you bring a condom?

This doesn't feel right, I don't want to be here, this was a mistake. Don't touch me.

I love you.

We go home.

We let each other down easy. It's not you, it's me. I had a great time. Let's pretend it never happened.

[Are we still cool?] 16/06/22

[Are you mad at me?] 18/06/22

I loved you.

It hurts at first, it never stops hurting but we just forget it does.

The world goes on without you just like it did before. I forget about you.

I'll smile for the first time in months.

I've found love in me without you.

You message me.

}

mutt

TURING 103

TURING HAS OBJECTS!

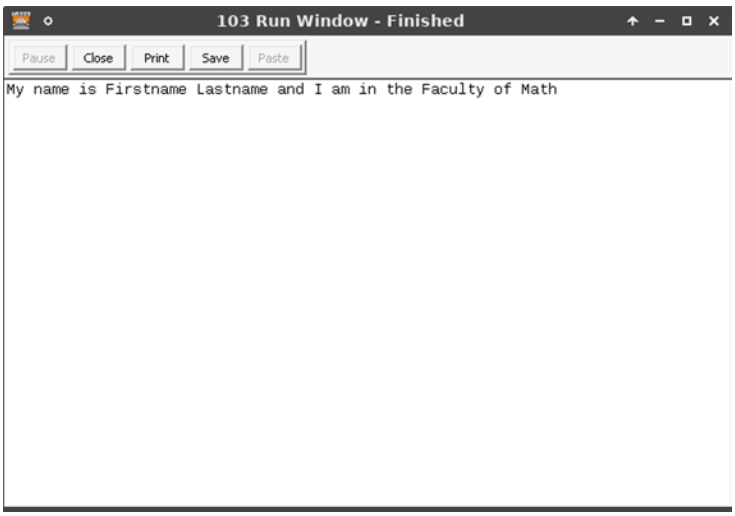
We have a shorter article this week because **mathNEWS** production night spent a lot of time on voting.

Today we will talk about objects in Turing, and talk about a simple class `WaterlooStudent` that I wrote. I tried to call the class `Student`, but apparently `Student` is a reserved keyword in Turing and the reason for that is undocumented. I might look into this mystery in my next article.

```
class WaterlooStudent
    export name, faculty, initStudent, greeting
    var name : string
    var faculty : string
    proc initStudent (n : string, f : string)
        name := n
        faculty := f
    end initStudent
    proc greeting ()
        put ("My name is " + name + " and I am␣
↪in the Faculty of " + faculty)
    end greeting
end WaterlooStudent
var me : pointer to WaterlooStudent
new WaterlooStudent, me
me → initStudent ("Firstname Lastname", "Math")
me → greeting ()
free me
```

First, we need to `export` all variables and subroutines that we want to be accessible outside of our class. This is equivalent to `public` in Java.
Turing does not have object constructors, so we make a procedure called `initStudent` that serves the same purpose as a constructor. The `greeting` procedure prints the student's name and faculty to the screen.

We then define a pointer to `WaterlooStudent` called `me`, set the student's name to `"Firstname Lastname"`, and faculty to `"Math"`. When we call `greeting` we get the following output:



Finally since Turing does not have automatic garbage collection, we need to manually free the memory. So we use `free me` to free the object that `me` points to.

teff

NATIONALIZE INTERNET SERVICE

FUCK ROGERS

The great Rogers outage of July 8, 2022 has given everyone a whole new perspective on how critical internet is to our society. It also shows how fucked our internet infrastructure is, when one provider has become a single point of failure.

Our internet has two big players: Rogers and Bell. I know Telus and Shaw are also big enough to be worth mentioning, but our internet is controlled by big corporations that don't give a shit about us. They control the market, and will do anything to undermine any startups that could do a better job at providing internet, all while we foot the bill for their fights.

The outage has shown that these corporations cannot be trusted. Like how our water and electricity should always be publicly-owned, internet has to be publicly-owned. Now, the wild thing to do is to nationalize all of the internet providers, but that won't go over well. Plus, having the government own the only source of internet can be harrowing, especially if a Republican-style government gets elected in. There needs to be private companies to create competition to make the service as good and cheap as possible.

What I am saying is that the government should create its own crown-corporation that is a federal internet provider. This isn't unprecedented, not even in Canada. Saskatchewan has SaskTel, which made phone prices lower, and is the go-to internet provider in that province. Manitoba had MTS (yeah, I hear you laughing, French speakers)*, which made phone prices cheaper as well (until Bell bought them). I'm saying phone prices, but this argument also works for internet prices.

Point is, a federal internet provider can provide every Canadian a connection (even Canadians in isolated communities where major internet corporations would shy away from due to the cost), and provide a guaranteed competition source. It doesn't need to be fancy. It just needs to be stable, reliable, and accessible to everyone. A difficult endeavour. But Canada has done a lot more with a lot less.

Fuck Rogers.

wewlad

*MTS in French is STD

I'LL BE BACK - A PARODY OF "YOU'LL BE BACK" FROM HAMILTON

OR, "N REASONS NOT TO TAKE A CO-OP OFFER AWAY FROM FRIENDS"

I said
The price of tuition was a price that I struggled to pay

I ran
In my greed for co-op money promised in a far away land

I'm so sad
To see all the things that I'm missing while I am away
And it's making me mad
That I feel a twinge of estrangement despite the plan

I'll be back, soon you'll see
I'll ride once more on the GRT
I'll be back, dine at Mel's
I miss all the time I spent in "hell"

Pressures rise, averages fall
We have been together through it all
And when this term is through
I will pack up all the things in my luggage and come back to Waterloo

(da da da dat da …)

I said my bank is draining and I can't go on
Now I'm sitting here wishing that I hadn't gone

I know this isn't healthy
But I'm yearning for MC
And miss the new SLC
Would love to be back at DC
Forever and ever, and ever and ever and ever

I'll be back, like last term
I'll thank all the gooses, I affirm
For my friends, for Lazeez
I'll survive minus thirty degrees

There's a hole in my heart
Shaped curiously like Farah's Food Mart
So when this term is though
I will say goodbye to my employer and come back to Waterloo

(da da da dat da …)

tendstofortytwo

SHOUTOUT TO CCF FROM A NON-CHRISTIAN NON-CHINESE PERSON

Prepare yourself for some mild secondhand embarrassment. One fateful day (July 4th, 2022), I, along with a few friends, went to the side project potluck event hosted by CSC, DSC, and WiCS in SLC. We walk into SLC, and we know the event's supposed to be in the 'black and gold' room, but we have no idea what that is, so we wander further into the building until we see a big group of people in a room with food. We figure we're in the right place, and start piling food onto our plates. It's supposed to be a potluck, so this further confirms we're in the right place, and all the food looks great and homemade, so we're psyched. There's even cookie dough, we really lucked out. Just as we finish getting our food, a very welcoming event organizer approaches me and asks me about my program, and how my term's going, and we have a lovely conversation. I'm enjoying the friendly atmosphere until I hear the dreadful words:

"How long have you been in the Chinese Christian Fellowship?"

Panic lights go off in my head as I turn to my friends and fellow writers of **mathNEWS** with me, yummyPi and Not a N*rd. I am neither Christian nor Chinese and have unmistakeably found myself in the wrong place. Shame fills our bodies as we apologize to the kind organizer, probably 20 times. Maybe more, we really do apologize an excessive amount of times. The poor organizer is so sweet to us through all of our half-coherent "so sorry"s. It's also COVID times, so we can't even return the generous amount of food we took, so we just leave with the food like the computer science assholes we are, and go to the computer science event. Selfishly, the computer science event had campus pizza as their "potluck", so we were much better off than the crowd in terms of sustenance, though not in dignity. Feeling bad, we did end up buying a bunch of chips at iNews and bringing them to the CCF event out of guilt. We also ended up running into someone at the computer science event who had made the same mistake as us, who we recognized by their plate of delicious homemade food courtesy of the CCF.

Anyways, this is an appreciation article for the lovely lovely members of the CCF who accepted us with open arms and even encouraged us to stay after we took their food! We were so embarrassed and you were so kind to us, so we figured the best way to move forward was to immortalize the interaction in **mathNEWS**.

peacelovemath

N SNAƵZY THINGS TO DO WITH INTERACTIVE PROOFS

- Resolve P vs. NP. They are one of the only known proof techniques (and the only useable one) that is sensitive to oracle access hence resolving the relativization hurdle of P vs. NP.
- Test out the interactive proof system for graph non-isomorphism
- Test out the interactive proof system for the halting problem. (For real! It involves provers using quantum entanglement *if you actually test this one hmu*)
- Test out the interactive proof system for true love. (This one is much easier to implement if you know whether you're the prover or the verifier)
- Test out the interactive proof system for determining if someone can distinguish between coke and pepsi.
- Clearly show why randomness can be useful in computing.
- Clearly answer the question: "what the **** does quantum entanglement do and why is it important???"
- Resolve Connes' Embedding Problem from von Neumann operator theory.
- Prove that the set of quantum correlations is not closed
- This totally wasn't me thinking about ideas for my CUMC talk

meow

An interactive proof system is a protocol in which a prover and verifier interact. The classic analogy is of an interrogation where a criminal suspect plays the role of the "prover," and where the "verifier" is a police officer. The suspect will answer the police officer's questions until either the police officer is reasonably convinced that the suspect is innocent or guilty. More formally, the prover claims that a given word is part of a language. The verifier asks the prover questions about the word and the prover provides small (polynomially sized) answers to the questions until the verifier is either convinced that the prover's claim is true or until the verifier has enough information to determine that the prover does not know whether the word is in the language or not.

MATH CND CONSTRUCTION UPDATE

Shit's still broken.

Vegetableboy

DANIEL TOLD ME THE TITLE TO THIS POEM SUCKS

It's 45 minutes from pizza time
And I just want to eat
I have no more energy to shine
And achieve my usual feat
Of writing incredible poetry
Or making some serious points
About this insane university
But my thoughts right now are disjoint
Because all I can think about
Is the food that comes with prod night
Please god just let me come up with
A punchline that's more than alright
Wait I just heard the pizza is coming
I have no more minutes to waste
I can't write a sentence that's funny
I admit this poem ends a little two-faced
I'm trying quite hard to make this punny
My perfectionism has come to an end
Lack of sleep has caused my mind to overextend
I'm sorry

methNEWS

PRO-CAT-STINATION

masterdaters

BATHROOM REVIEWS: M3 & QNC

PART 2 OF BATHROOM REVIEWS

Welcome back to the second part of this series where I review each public male and non-gendered washroom on campus!

First, a follow-up on last time; the bathroom on the northwest corner of MC's second floor finally finished its maintenance. I used it. It was like all the others in MC.

But now, onto new and exciting territory, with buildings actually constructed this millennium! First up, M3, from 2011. M3 has one pair of bathrooms per floor, with the mens' on one side of the elevator and the womens' on the other side. No non-gendered washrooms, which does kind of suck, though. These bathrooms are generally serviceable; a few stalls, a couple urinals, nice flooring, etc. Generally speaking, I don't love them, but they're better than all of the washrooms in MC, and most of those in DC.

I thought this section would be pretty short, at first, until I reached the fourth floor bathroom. There was only one urinal, instead of the two standard at M3, and the far wall was a lot closer, with a door built into it. Peeking my head into the door, I was shocked at what I found.

There is a full shower in the M3 fourth floor washroom.

I have no clue why this is here, but I'm happy it exists. It's the kind of weird thing that you only find when you actually explore and get a chance to look in all the out-of-the-way parts of campus, which was the whole inspiration for this series in the first place.

Anyways, M3 would normally get a 7/10, but the shower bumps it up to 8/10.

Now, for QNC! Opened in 2012, this building has half of its washrooms locked behind the private half of the building controlled by IQC. I see them on the floor plans on each floor, taunting me, but I'll never be able to access them.

Well, actually, that's a lie. I've visited IQC once or twice. From what I can remember, the bathrooms on that side of the building were fine, although I don't think I ever used the upper floor washrooms. They're all out of the scope of this project, though, as they're not public.

On the other side of the building, the QNC basement, first floor, and second floor each have your pretty standard washrooms, nothing too special. The sink basins are a bit wider and shallow than average, though. Personally I like deeper basins, but that's really just a minor thing, all things considered.

But then, on the upper three floors of QNC, we have something really special. Four or five individual non-gendered bathrooms on each floor, each fairly roomy. Honestly, this should be the standard for washroom design. It's nice to not have to be squished in with people, you know? The privacy that four walls and a ceiling offers is just really nice.

So QNC, 9/10. Best building yet. Now I'm done all the Math-relevant buildings, I'm looking forward to checking out other faculties' buildings! Come back in two weeks for Part 3!

Predap

ALL THOSE OTHER RELIGIONS GOT IT WRONG, MAYBE

Consider for a moment the endless eternity that lies ahead for the universe. We stand at the relative dawn of time, only about 13.8 billion years into, um, how long will the universe last? Going by the flat-universe-big-freeze scenario, forever seems to be most likely[1]. So, let's put it this way—we are 0% through the universe's existence, and always will be. Your life is a blink, my life is a blink, et cetera, go read 17776[2] if you need to absorb it more fully.

So for those of us blinks who believe in the past occurrences of the spiritual, the supernatural, and the divine, and who also believe in physical cosmology and statistics: why is everyone so stuck on the totally biased viewpoint that the divine has already occurred[3], when we're only 0% through the universe's duration (and always will be)? Now, we can't assume anything about how frequently it may occur, or with which rate if more than once, or even if it will at all. The supernatural may manifest as a statistical process—we don't know. All I can say is that there is an infinite number of ways for the divine to not have occurred yet and to occur in the future, so why aren't we giving that contingent of possibilities its fair treatment?[4]

Anyway, today I'm starting the Church of the Possibly Divine Future, where adherents believe in future potential belief and make no sacrilegious presumptions of the existence or potential details of said spiritual events. Faithful gatherings might begin in the future when we possibly see events firsthand of the metaphysical.

blinchik

1. https://en.wikipedia.org/wiki/Ultimate_fate_of_the_universe
2. https://www.sbnation.com/a/17776-football (highly recommend)
3. For the sake of this article, let's put aside as evidence secondary sources which record details of such occurrences but are not the occurrences themselves, e.g., religious texts.
4. Judaism gets some points for the Messiah here, even if other Godful events are already recorded to have occurred in the past.

A TANGENT ABOUT MY TRIP IN MONTREAL THAT TURNS INTO A FOOD REVIEW HALFWAY THROUGH

On the weekend between July 8th and July 10th/11th, I took a journey to the faraway land of Montreal for one thing only—a lifesaver. Now, this person isn't a firefighter who ran into a building to save me (although that would be nice), but he's had an incredibly profound impact on my life that may as well have saved it, hence warranting a three day journey to see him in person. Now, I won't get into details, because this is about my trip to Montreal, so let's start at the beginning—not July 8, but June 8.

Alone in a computer lab in EV2 (my 'territory', as one might call it, or domain) I made four purchases on my credit card—all on impulse to see one man. One man who's changed my life, but to go to a whole ass convention in another whole ass province? Train tickets are expensive. One trip from Kitchener to Montreal is two trips, one $20 and the other $100, which isn't too bad. The whole trip will go to under $500—it's a matter of whether I can afford it that is the problem. Well, it shouldn't exactly—as you attentive readers may know, I am one of two managers of the Environment Faculty Coffee Shop. You might think I signed up as manager specifically for money for a trip to Montreal, but quite the contrary. It was *because* I was a manager that I decided that it was time to forge a destiny and go where I haven't gone before.

I've been to Montreal a couple of times, the most recent being in 2018 where I accidentially spent two months in Montreal (a happy little accident, in which I signed up for the wrong program but made all the right friends). I've done two months, one weekend should be fine. So I book an AirBnB, and await the weekend of the 8th of July. That Thursday, I pack—and add a third pair of underwear. This will be important.

July 8, 2022. Half of Canada suddenly is without Internet and is thrust into the year 1985, fitting as we're already in a state of war and synthwave and materialism. I'm lucky the host is there at 10:30 when I eventually drag me and my duffel bag into a neighbourhood of three story-tall apartments. Very compact, mixed use, rows of houses with alleys between the backyards. An urban planner's wet dream. Look for the neighbourhood west of Station Saint Michel. I spend Friday night over a bowl of ramen at 11 pm that's almost painful to finish because it was so filling.

On the 9th, I spend all of two minutes taking a selfie with him before I head to play DnD by obligation because I already signed up.

In the end, we couldn't chat as planned and I couldn't give him the message I wanted to send. A shame, but I sent it to him over text the next day on the 10th—which was good, because I think if I did say it in person, I'd have cried, and that would have made it awkward for both of us. And that's when I realized—I'm here for myself too. I have tickets to a convention. I buy stuff at the market hall, I book Business on the VIA to Toronto, make plans to crash at my brother's place and head to Waterloo early enough in the morning that I can open up shop in time. That night, I also realize I haven't eaten a vegetable—or fruit—in days. Or breakfast, for that matter.

I spend the next day at the convention, then in the Business Lounge at Montreal's Central Station—which is pretty swanky and worth $200 for free drinks, complimentary meal AND snacks/coffee. Actually, let's go on a tangent about food. Those who know me know that I like food, even if I can barely finish any meal given to me, to the point where I've sidetracked discussions about a date with someone about how good a steak was (and it was GOOD! There was a maple barbeque glaze and everything!). On VIA's Business Class, they first give you a snack packed with "Oriental Noodles", pretzel sticks, salted almonds and oat bran (?) things. After that, it was a meal, which comprised of beef pot roast, green beans and mashed potatoes as the main, a side of cheese and grapes, and caramel coffee cake, as well as a complimentary glass of wine. I don't think I ate it in the correct order, and frankly I don't care if I didn't, because it was delicious. And for 30 minutes, I dined like a king. It was the most bougie shit I've ever done in my life. Hell, it was the highlight—from meeting my hero to finally attending a convention to experiencing life in business class—I've crossed three things off my bucket list in one fell swoop.

And for that, I'm grateful.

Skit

However, all of this came at the cost of crying to my brother over grilled cheese poutine and having to crash at his place on Sunday night (hence why the third pair is important), effectively spending roughly 12 hours in transit. Worth it.

spaceNEWS III: N THINGS SINCE THE LAST ISSUE

Since I got lazy and it has been way too long since the last time I wrote **spaceNEWS**, here is a list of things that have happened since then in list form.

- The Planetary Science Decadal Survey has recommended a Uranus orbiter to NASA, meaning that it will likely be the first and only time since Voyager 2 that the Earth has sent a probe to the planet Uranus. As a result, very little is currently know about this plant and it's moons and thus many exciting discoveries are expected to be uncovered from this mission.
- The James Webb Space Telescope's primary mirror has suffered a micrometeorite strike. NASA has stated that such events are normal (albeit this occurrence was earlier than expected) and should not affect the operational capabilities of the billion-dollar telescope.
- SpaceX has been cleared for orbital launches of Starship from the South Texas site, albeit currently limited to about half a dozen flights a year under the current permit. This will not be enough for regular operations, or for any martian or lunar colonization efforts by a large margin. However, Musk has stated that regular operations for the Starship program will be out of Florida rather than Texas and that the Texas site will be mostly used for testing.
- Rocket Lab, the US-domiciled and New Zealand-based rocket company, has semi-successfully caught an Electron rocket first stage for the first time. Although the helicopter was able to catch the falling rocket by its parachute, the rocket was quickly dropped into the ocean due to what is presumed to a less-than-nominal catch. Rocket Lab has stated that they will recover the booster from the ocean and will soon make another catch attempt.
- Rocket startup Astra has failed their latest launch attempt, losing 2 of NASA's TROPICS weather satellites. The startup has been plagued with failure, with the the latest TROPICS launch being their 6 failure out of 8 total orbital launch attempts for a 75% failure rate.

tokyocatboy

THE PRICE OF 30 SERVINGS OF SEMULEPUDDING

A cherished **mathNEWS** member is having a [REDACTED]-themed party and we are gonna need 30 servings of Semulepudding because reasons. Here is a cost breakdown:

Milk: 600 mL for 2 servings * 15 == 9000 mL or 9 L
Semolina: 37.5 g for 2 servings * 15 == 562.5 g
Vanilla extract: 1 tbsp for 2 servings * 15 == 15 tbsp or 225 mL
Cinnamon: 1 tsp for 2 servings * 15 == 15 tsp or 75 mL or 41.4029413875 g

Prices:
Milk: 9 L * ($6.39/4 L, whole milk) == $14.3775
Semolina: 562.5 g * ($2.99/750 g) == $2.2425
Vanilla extract: 225 mL * ($4.49/250 mL) == $4.041
Cinnamon: 41.4029413875 * ($2.99/150 g) == $0.825298631657
>> Total: 21.4862986317

Canada's dairy industry is practically synonymous with the Canadian Dairy Commission. The Canadian Dairy Commission is the reason why our dairy market is so famously insular and local. Government lobbying? How about having an entire organization dedicated to streamlining and facilitating the conversations between farmers, policymakers, middlemen and stakeholders.

The subsidization of dairy is a curious subject. The environmental impact of keeping so many cows cannot be understated. The nutritional importance of dairy has long been propped up by propaganda from the dairy industry. In the newest iteration of the Canada's Food Guide, milk is noticeably not the "drink of choice" despite dairy formerly taking up an entire food group.

At the same time, I do love milk, cheese, yogurt and cream. I know that dairy farmers rely heavily on the subsidies the federal government provides. I enjoy supporting Canadian dairy farmers. I think it's interesting how this country protects this particular good. I don't know where this rant is going.

Yayyy pudding!

yummyPi

GAME REVIEW: ALICE IS MISSING

THE BEST GAMING EXPERIENCE I'VE HAD THIS YEAR

"Alice is Missing" is a roleplaying game played exclusively over text. In it, you and 2–4 friends (so 3–5 players total) take on the roles of important people in Alice's life — best friend (Dakota), a secret girlfriend (Julia), the older brother (Jack), the friend who moved out of town (Charlie), and the friend who has a crush on her (Evan). As the title suggests, Alice has recently gone missing, and in the game, you will tell the story of what happened to her. There is no winning or losing, and you as players have no control over her ultimate fate — what you do decide is the details of what happened, and you live out your characters reactions. It is an immersive, intense, and phenomenal experience that I cannot recommend enough. I played with my roomates, peacelovemath and NotaNerd, as well as my friend benwong; they took on the roles of Julia, Jack and Dakota respectively, while I played as Charlie.

The game is split into two distinct phases. The first is character creation and introduction. In it, you are dealt a motive (an open ended goal, driving idea or central theme of your character), and based on your motive and role, you decide what kind of person you are, and introduce yourself to your fellow players. You pick things like your favourite class, what kind of music you like, whether you're popular or not, and so on. Even more exciting, you have a very open ended secret, maybe something like "You and Alice had a fight right before she went missing", and you get to decide all the details of the secret; this may come out in the course of gameplay, but does not have to be revealed. You'll then determine your relationships with other players based on some open-ended prompts the game gives you. Crucially, everyone also get the chance to decide something about Alice, based on a question that is asked on their character card.

This character creation phase really feels like you're getting to know the other characters. The game makes it very easy to build a person who feels nuanced, and introducing your character and relationships helps you solidify your understanding of the character. The open ended nature of all the prompts and the character creation means it's possible for everyone to get their own vision without contradicting what others are trying to do.

Once that is done, everyone will be shown various suspects in Alice's disappearance, and the locations she might be. Once this is done. everyone changes their contact names/ profile pictures for the other players and a 90 minute timer with music starts from the games website. Once the timer starts, no talking is allowed anymore. Even questions about the game rules or mechanics are asked over text, with a tone indicator. The complete lack of speaking means that your world is reduced to the conversation that's going with these other characters. The immersion is so much easier since you aren't looking at your friends, you're looking at new names and pictures.

The game begins with Charlie — who is unaware that Alice is missing — sending out a group text to the other players, asking if Alice is ok. The rest of the group then fills Charlie in, and a flurry of speculation begins. Once the timer hits 80 minutes, new information is (silently) read by one player. It will be extremely open-ended, and the player who flipped it will fill in the details. One example the rules give is that it may say "Flip a random suspect card. That person recently made a suspicious social media post about Alice"; in that case, the player who flipped the clue would get to decide exactly what the post was, and then would find a way to tell the rest of the group about it. As the game goes on, little private conversations may also start, exploring the relationships between the characters.

This core gameplay loop of creating a story and speculating about the new information you've gotten is incredibly engrossing. I mean, if your friend were missing and you saw the history teacher had made an Instagram post about how beautiful she was the day before, you would absolutely speculate about how fucked up that was. There would be so many complex emotions surrounding the situation that you would want to talk about it, especially as new information came out, and so roleplaying in this game is natural, immediate, and immersive. As more intense things happen, I felt my heartbeat speed up, and afterwards, we realized all of us had been genuinely worried or anxious at points.

The game is a thrilling exploration of the terror that a friend's disappearance causes. All the prompts are open ended enough that you can work with what other people are saying, which means the storytelling truly feels collaborative. It's incredibly intense because of the subject matter and the terrifyingly unknown nature of the story, as well as because of how grounded the story is, but it doesn't overstay its welcome. The game ends in an amount of time that feels like enough to tell a story, but not so much that you become bored or disengaged.

If you have any friends who enjoy roleplaying, or even just like the idea of it, I highly endorse "Alice is Missing". It's one of the most incredible roleplaying experiences I've ever had, both because it felt like I truly became my character, and also because I was so invested in the story I got to tell. The game also has excellent suggestions on how to avoid topics that might be triggering, with a couple of systems to ensure player safety and comfort. If any part of this sounded appealing to you, do yourself a favour, and pick up a copy.

Golden

I love games! They're comfy and easy to play!

A PRO GAMER mathNEWS EDITOR

ON ANXIETY

It is funny that the same natural instinct, the one that gave us the ability to be able to flee at the drop of a hat from an angry rogue goose, or to instinctively reply in fisticuffs (or to stand petrified as the fowl beast descends on your frozen form, a cruel bastion of pure malice), is that same one flooding your body when confronted with asking a professor a question on Piazza. The same one that makes it so when you finally do, you close Microsoft Outlook entirely—the equivalent of I do not see therefore I do not am.

Anxiety in moderation is an important facet for performance. A little bit of it before something like a job interview or an exam helps us anticipate the event, prepare better and improves our overall performance compared to if we weren't nervous at all. But can the same really be said for when at the mere thought of an upcoming assignment, a heavy sense of dread and doom cripples you and a not insignificant time is spent angsting over a pdf file?

Perhaps there is something to be said about the habit of engaging in casual catastrophizing after missing a question or two in an exam, or better yet—overgeneralizing to the extent that yes, this is definitely indicative of every single future assessment you will write and representative of you as an individual. You stupid.

Being aware of these helpful thoughts is a step in the right direction, and even more than that, it would be good to change them to something a little more realistic like "hey, you are not the literal worst—what about people who go out of their way to stomp on snails (/j)?" Also, maybe taking a little bit of a breather instead of overthinking everything is an idea.

Though, working on not imploding will always be a bit of a work in progress—for instance, this article is currently being written in text edit, as the WordPress textfield seemed too daunting. But hey, I'm still going to submit it.

*a*hnon

RUSSELL'S PARADOX IS LAME AS HELL

When you think of a paradox, you probably think of mind-bending thought experiments that cause you to question reality. Maybe your mind goes to the Grandfather Paradox—the hypothetical scenario in which one goes back in time and kills their own grandfather, causing them to never exist in the future and never be able to go back in time in the first place. Or Zeno's Paradox, which considers the infinite amount of space in between any two points—if in order to travel a certain distance you have to first travel half that distance, and in order to travel that distance you have to travel half of the smaller distance, and so on, how is it that we can ever get anywhere?

Russell's paradox is like none of those. Invented by Bertrand Russell in Insert Year Here, the perplexing question this famous paradox dares to ask is: *if we took a made up mathematical concept and applied it in a way that doesn't make sense, would that be fucked up or what?*

See, Russell's paradox has to do with set theory, which is the theory of sets. Sets are things that can contain other things. This can include anything from numbers to other sets. You could even make a set that contains itself if you really want, though I'm not sure why you would. Maybe if you wanted to have a set that contains literally everything, including itself, I could see this being useful. But other than that, this particular detail of set theory seems to have pretty limited use cases.

Now Bertrand Russell, being some kind of annoying pedant probably, realized that if you try to make a set defined as "the set of all sets that don't contain themselves" then ask yourself whether that set contains itself, you can't get a logically consistent answer. Because if it does, then it contains a set that contains itself, and if it doesn't, then it doesn't contain a set that doesn't contain itself. Yeah I'm bored already too.

Obviously the solution here is to just not create that set. It's an artificial construct. Nobody is going to be affected by whether you conceive of that set or don't conceive of that set.

Mr. Russell (or your math prof) will tell you that this is important because it means when you're doing math with sets, you have to place some sort of restriction on what can be a set, you can't just let a set be anything that contains anything because some of those are logically inconsistent. I think this is silly. I'm not going to let some logically inconsistent set that someone else conceived of tell me what kinds of sets I can and can't create.

One of the ways people try to explain Russell's paradox is through an analogous scenario called the "barber paradox". Imagine a small town with one barber, and the barber has created some sort of silly rule for himself saying that he must shave everyone in the town who does not shave themself, and only those people. The paradoxical question is then, who shaves the barber? If the barber shaves himself, he cannot shave himself according to his rule, and if he doesn't shave himself then he must shave himself, because this extremely arbitrary rule that the barber set for himself cannot be broken. This is apparently the most plausible real-life analogue Russell could come up with for this incredibly meaningless concept. You can really tell he was struggling to try to be relevant in the math world. Perhaps if he just over-analyzed a tiny detail in set theory, people would start to notice him.[1] But was Russell's quest for attention really worth all of us in the future having to pretend this "paradox" is worth considering?

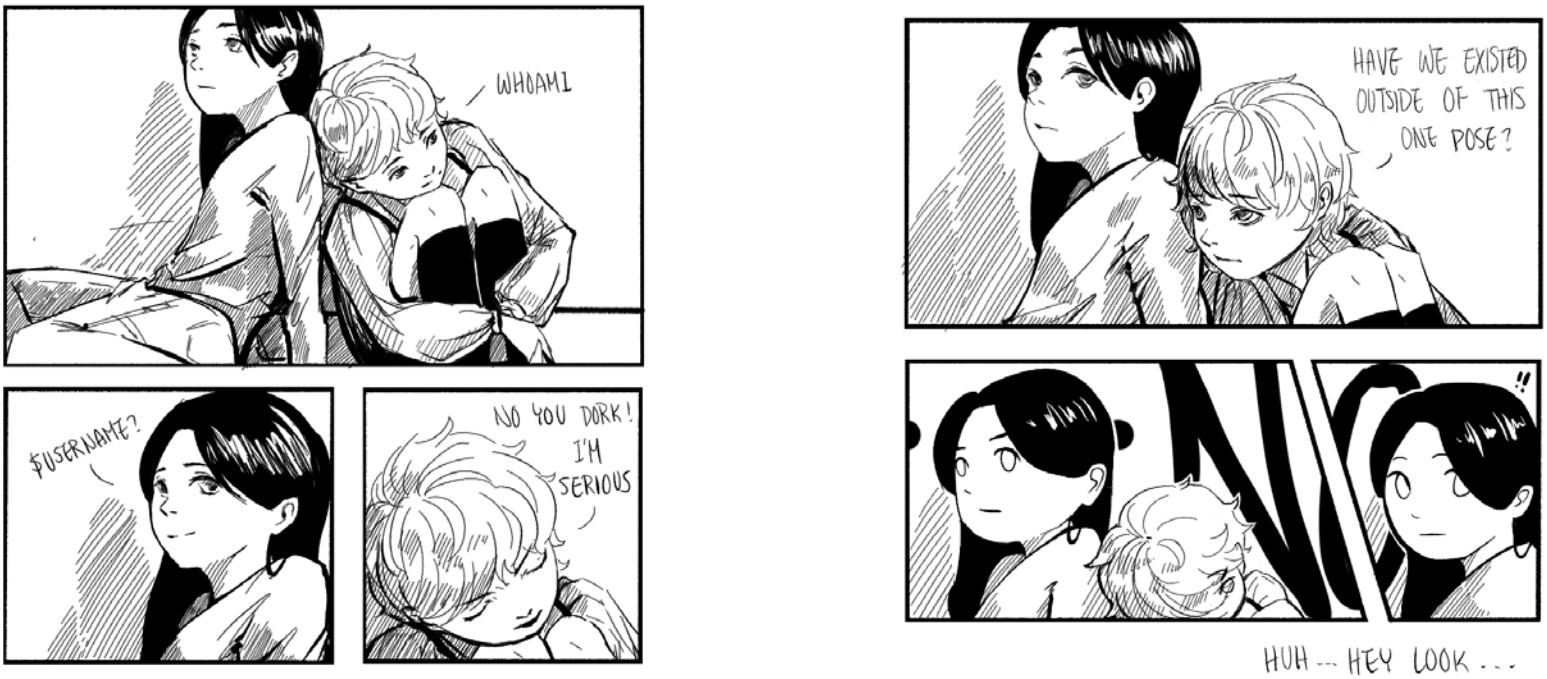
Why am I mad about this? Well, I think one requirement that paradoxes should have is that they are cool. Ask anyone and they'll tell you that "paradox" is a cool word. Clearly, using the word "paradox" to describe a concept so banal as Russell's Paradox is misleading at best. I mean, Russell's paradox is the first paradox mentioned by name on the Wikipedia page for "paradox". It's giving paradoxes a bad name!

If math people are so hellbent on creating a strict definition for exactly what can be a set, I'd at least try to give Russell's "paradox" a less pretentious name, like "Russell's inconsistency" or something. And then only teach it to grad students who have already spent years of their life specializing in advanced pedantry.

__init__

1. No, I won't bother looking up if there was anything else this "Bertrand Russell" guy may have done.

WHOAMI



Chrezon

sasmsQUOTES

TWO WHOLE SASMS? IN THIS ECONOMY?

KAREEM ALFARRA — THE GAME OF COPS AND ROBBERS: HOW COPS CAN OUTSMART THE ROBBER

- "We're going to proceed with induction, which is going to be a repeating theme."

ADAM JELINSKY — OH YOU'RE A MATH MAJOR? CONSTRUCT EVERY NUMBER

- "I'm not going to show you *every* number — "
- "I don't want any questions about non-Euclidean geometry."
- "I hope you guys know what a field is?"
- "We'll call the set of constructible numbers K, for konstructible."
- "For now, my explanation is 'trust me'."
- "This is a crucial fact." (*points*) "Very important." (*points*) "Right here."
- "Imagine this, but like a lot bigger, a lot more elaborate."
- "I don't know if you've had to do that at any point, in, like, whenever."
- "It technically still satisfies this condition, but it's, like, really boring."
- "Remember in high school when you had to learn this? yayyyyyyyy…"
- "1 or 2 times 1 or 2 times 1 or 2, you're going to be multiplying by 2 a few times. At least. Probably."

GIAN CORDANA SANJAYA — THE PROBABILITY OF AN INTEGER BEING SQUARE-FREE

- "$\mathbb{N} = \{1, 2, 3, \ldots\}$"
- "We all know that primes are not equal to 1?"
- "Why does it even have a pi?"
- "If you know what a geometric series is (and I hope that everyone does)…"
- "This is just the infamous Riemann zeta function."
- "1 2 3 4 5, 6 7 8 9 10 — okay, this should be enough — 11 12 13 14…"
- "I hope no one gets scared by this big-O notation."
- "We only need to compute up to $\sqrt{N}$, but it will be easier to compute up to infinity, for some reason."

GEORGIA BERG — ADVENTURES IN LOGIC PUZZLES

- "This talk is not just a talk where I talk, this is a talk where all of you talk!"
- "You wake up in a basement. You wake up in… Batman's basement?"
- "You try to tell Batman you're failing CS245, but he doesn't hear you with the Batman hat on."
- (*Audience member*): "Split their fingers apart and ask them 'does it hurt?'"
- "Should I click on the next slide button to see if I have something prepared?"
- "I was like, 'oh, it's easy'. Apparently it's not easy."
- "Which do you choose, Batman? Xoxoxoo lots of love, The Riddler."
- (*Audience member*): "So Batman is meeting with The Riddler. Why doesn't he just… beat up The Riddler?"
- "I think The Riddler would intervene at that point, because he has a strong commitment to logic."
- "I anxiously await your reply. XOXOXOXOOXOXOXO, The Riddler <3"
- "The Gotham police is working on finding where The Riddler could possibly be keeping a million hostages."
- "I don't know whether or not I have a better explanation on the next slide? I'm just going to say I don't."
- "We are going to Portugal to defeat The Riddler for once and for all!"
- "We want to prove that every bird is fond of at least one bird."
- **"All villains kill every day.** This is cool."
- "Love u so much, The Riddler."
- "We know China does not border Germany, so…"
- "The Riddler is now behind bars!"

Iwa S. Thair

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UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

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

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FACEBOOK'S FREE CHILD CARE BASICS PLAN FOR NORTH AMERICA

As part of Facebook's mission to make the world more open and connected, we would like to devise a Free Basics plan for America and Canada. In the spirit of giving back to North America, the land of opportunity, which has given Facebook so much wealth, Facebook will look to help society post-pandemic, much as we helped pre-pandemic by securing our democracy and election integrity from misinformation and foreign interference. The pandemic has exposed areas where we could do better as a society. We look with sadness at all the mothers and families struggling with simultaneous work and home care duties. Child care should never be sacrificed in the pursuit of one's livelihood and putting food on the family table, especially in times of high inflation and unaffordable child care. That's why we at Facebook are putting forward a plan for free child care in North America dubbed Free Child Care Basics.

At Facebook we like to think out of the box and we're always innovating, moving fast and breaking things. Just ask Myanmar! We have crafted a special plan for child care that is cost neutral and a win win for society! All mothers and families with child care needs can rest assured that our Free Basics plan is safe, worry free, and utilizes the latest technology for affordable care. All a parent or guardian needs to do is have a Facebook account and acquire a Facebook Portal device in their home and place it in their child's room. At Facebook we work with only the best and brightest to deliver exceptional service. We have partnered with registered pedophiles—who have graciously agreed to work for free—to watch over your babies and loved ones. But I know what you're thinking: Mark—what in the world are you doing?!?

Don't worry! Facebook has devised advanced AI algorithms to detect malfeasance in the Portal video feed and in real time will alert local policemen should there be any nefarious activity in your kiddy rooms*. Because in America, the only way to stop a bad guy with a penis is a good guy with a penis. Our Free Basics algorithms build on our award winning algorithms that have obliterated misinformation and hate from our users' news feeds. (*To cut costs and scale our service, local police officers may be substituted with part time security guards based in the Philippines.)

Now you may be thinking that there aren't enough pedophiles in the world to care for our children. That's why we keep innovating here in Menlo Park! We have devised special algorithms in the news feed to groom users into pedophiles such that there will be a plentiful supply! After all Facebook has done for society as a collective we would like to give back to our individual users with tender loving kindness. Not only for our users, but for our users' children, who will power the next Facebook. Wow that's like so meta!

And wait until we roll out the VR game Pedobear Quest Adventure Run for kids!

Zuck

SOME FACTS ABOUT PRIMALITY TESTING

If you were given a positive integer n, how would you check if it were prime?

Most likely you have heard of two common methods: trial factoring and sieving. Trial factoring requires a list of primes up to $\sqrt{n}$ (note that every composite number has at least one factor $\leq \sqrt{n}$ so there is no point testing past this). Sieving is overkill because it generates all primes $\leq n$ as a byproduct of the process; it is more useful for generating lists of primes than testing a single number.

Luckily, there are other methods available. Fermat's little theorem says that for any prime p, for all integers $1 \leq a < p$, $a^{p-1} \equiv 1 \pmod{p}$. In many cases, checking that 2^{n-1} or 3^{n-1} is congruent to 1 is sufficient to detect composite n. However, there are some composites n (called Carmichael numbers) such that for all $1 \leq a < p$ which do not share a factor with a, $a^{n-1} \equiv 1 \pmod{n}$.

A stronger test called the Miller-Rabin test involves expressing $n-1$ as $2^r d$ for an odd d, then checking that $a^{n-1} \equiv 1 \pmod{n}$ (if not, it fails the Fermat test) or that $a^{2^s d} \equiv -1 \pmod{n}$ for some $0 \leq s < r$ (the second clearly implies the first, but is easier to check).

If n is prime, then its set of residues is a field, and so there exist exactly two square roots of 1. This would be contradicted if $a^{2^s d} \neq -1$ and $a^{2^{s+1} d} \equiv 1$. It is expected that most a have an even order in $\mathbb{Z}_n$ if n is odd (if not, then why are you testing it?), so one of their powers is a square root of 1. It turns out that, if n is composite, at most $n/4$ choices of a will fail to detect this, so if n passes this test for k different values of a, it is composite with probability about $1/4^k$.

Finally, for numbers of the form $2^p - 1$ for prime p (such numbers are called Mersenne), there is a very fast test called the Lucas-Lehmer test which runs in only p iterations. Specifically, define $s_0 = 4$ and $s_{i+1} = s_i^2 - 2$ for all $i \geq 1$. Then $2^p - 1$ is prime if and only if $s_{p-2} \equiv 0 \pmod{()2^p - 1}$. The largest known primes are of this form; the current record is $2^{82589933} - 1$.

ojsharpe

lookAHEAD

SUN JULY 17	MON JULY 18	TUE JULY 19	WED JULY 20	THU JULY 21	FRI JULY 22	SAT JULY 23
World Emoji Day 🥳		National Daiquiri Day	View next term's schedule and appointments		National Mango Day	

SUN JULY 24	MON JULY 25	TUE JULY 26	WED JULY 27	THU JULY 28	FRI JULY 29	SAT JULY 30
	mathNEWS 149.6 production night Drop/add period appointments	Classes end	Add period begins	Drop with WF ends National Milk Chocolate Day	**mathNEWS** 149.6 released Final examinations begin!!	

INTRODUCING ONTHEGO: A PUBLIC TRANSIT AND URBANIST SERIES ON mathNEWS

Ever since I was a small child, I have had an interest in public transit, even having my own collection of paper busses since age 7. However, as I grew older, I came to realize just truly the importance of good, effective public transit. It is the key to ending car dependency—and, by extension, the unwalkable hellscape of many of today's North American suburbs which have contributed to a variety of problems plaguing America, from traffic to the mental health of children (perhaps an issue that I will discuss later).

Thus, I am proud to announce ontheGO, an ongoing series focusing on public transit, urbanism, and the issues surrounding it in Waterloo and the Greater Toronto/Hamilton area. Unlike my current (semi) ongoing series **spaceNEWS**, ontheGO aims to be more based on commentary rather than reporting, incorporating many of my own experiences into the series. However, it does not mean that there will be no news-based content in this series as I will likely comment on new transit-oriented developments such as the Line 5 Eglinton as they open. I hope that you will find this series interesting to you and worth your time reading.

tokyocatboy

SOWWY NO gridWORD TODAY 👉👈

I talked to Crossy and he's feeling a bit tired 🥺 after working hard 😤 on last issue's **gridWORD**... I hope he rests well! Make sure to get lots of rest too 😴

enamourED

LAST ISSUE'S gridSOLUTION