



“WHAT WOULD YOUR FIRST ACT AS PRIME MINISTER BE?”

Hello, dearest reader!

It's been so long since we last met! I missed you so much. Yes, you specifically! You remember me, right? I'm the voice that speaks in your head when you're reading the **mastHEAD**. Gosh, you always forget me near the start of the term. It's okay though – we have a long time ahead of us. The entire volume, in fact! We'll have so much fun together.

Speaking of long, this issue is a good twenty-four printed sheets. That's a lot of content for the next two weeks, the writers really came through on this one. It's all really interesting too – there's monads, stories, **profQUOTES** (!!!), induction, and the staple of all news publication this week, election coverage.

Some say that “election” is short for “selection”, because that's when you select your leaders. Some others say it's the fault of the Romans, who had two different words in Latin, “electio” and “seligo” that somehow both meant “to choose”. Whatever the case may be, Canada certainly had a bit of a “I don't want to seligo so much” moment with the current electio, if I do say so myself.¹ It's okay though – we get a few more years of having a more handsome leader than the US, and the Liberals get to break their promises of proportional representation one more time. It's a win-win.

I remember my first production night, back in v141i3. That was also an election issue. But I was new to Canada then, and I did not write about the elections or understand what most of the jokes meant. The latter part has changed, but I still haven't written an article about the election yet. Well, maybe I have written half an article if you count the **mastHEAD**. Does the **mastHEAD** count? I don't know.

But what I do know is you have a lot of **mathNEWS** ahead, waiting for you to read it. Enjoy!

caffeinatED
Editor, **mathNEWS**

1. To any Latin enthusiasts in the audience, I do not apologize for my misuse of the language. If you wish to challenge me, name a time and place. I will meet you and I will put on a brave face for 12-15 seconds before falling to my knees and begging for forgiveness.

ABALD MAN	Change the electoral system to rural-urban hybrid proportional representation
BEYOND META	The speech for the throne, it's kind of a requirement, 2 nd act would be Universal Basic Income
SECRETSQUIRREL	Issue a proactive apology for anything the opposition will eventually dig up in an attempt to win the next election
X	Pin randomnumbergenerator.com to my browser
TENDSTOFORTYTWO	Legalize election fraud; let's see how many votes we can <i>really</i> get.
DERIVING FOR DICK	Gentle.
PREDAP	Tell all my MPs to vote for whatever they think their constituencies really want
ME	Act 1 scene 1: <i>Thunder and lightning; three witches enter...</i>
FINCHEY	Overturn the Migratory Bird Treaty Act of 1918, for you-know-what reasons.
BOLDBLAZER	In the short term, prevent the removal of online courses for the upcoming Winter term.
SCARRED WATERLOO STUDENT	Declare war on geese
A COOL PEN NAME	Bring back Groovy.
CC	Add my latest and greatest résumé bullet point
JEFF	Cede power to the Bloc Québécois
APHF	If I were prime minister, I would use my power to finally make the donut our official flower
NOT A NERD	Declare war on ourselves, and side with the geese
BIPED	Appoint a personal secretary that writes all my mastHEAD answers
GOD ♯ PEED	35% mathNEWS tax on all income, to be remitted directly to our bank account.
CLARIFIED	Call another election.

ARTICLE OF THE ISSUE

This issue's prize goes to Waterloo Ready Was Bad. Thank you for looking out for the little mathie, and don't forget to collect your \$25 gift card from the editors at the Friday reading (or later if you can't make it). Remember, you deserve it.

caffeinatED
Editor, **mathNEWS**

Glad we're back in print. Eating PDFs wasn't the same.

NAMAN SOOD, **mathNEWS** EDITOR FOR FALL 2021
ALONG WITH KEVIN TRIEU, CLARA XI AND YANG ZHONG

WATERLOO READY WAS BAD

Waterloo Ready was a program from the Student Success Office (SSO), with a goal to ensure that students:

- Increase or develop a sense of belonging,
- Feel like a part of the Waterloo community,
- Build relationships with other students,
- Feel like a part of their faculty,
- Know what to expect and are prepared for their first year at Waterloo.

Originally launched in 2020 in response to a last-minute switch to all online programming, Waterloo Ready 2021 set out to accomplish similar goals but with disappointing execution.

Disclaimer: I can only speak directly to what some Math leaders and first-years might have experienced. I will assume that the main differences between faculties were the number of people involved and the topics/subjects of mentorship.



TIMING AND TIMELINE

- Identified as one of the main reasons as why Waterloo Ready was not participated in last year; students are on their last summer break of their life. They may be on vacation, spending their last smidge of freedom with high school friends or family members, working a summer job, or straight up needing a break from focusing on academics at this point. Most students probably completed their last year of high school completely online, potentially using Teams as a platform. There are many better things to do during this time.
- Who thought that they should make this year's program 4 weeks longer? They saw engagement numbers drop towards the end yet still doubled the length of the program.

LACK OF STRUCTURE/SENSE OF DIRECTION

- Mentorship training was vague and left little insight for *how* mentors were actually supposed to run meetings, or how they could fill out hours-worth of calls.
- Waterloo Ready had no online presence. There was a website but no visible attempt at social media engagement. First-year students are not yet checking their school email nor are they using Teams as their main mode of getting news/updates about school.

UNREASONABLE EXPECTATIONS

- For context, Waterloo Ready is not replacing Orientation week, but the Faculty 101 *days*. How did one day of engaging with faculty staff and students translate into *8 weeks* of peer mentorship?
- In order to be an orientation leader this year, in math at least, you had to be a Waterloo Ready Peer Mentor too. Orientation leaders normally volunteer 1 week of their time at most. There is a disproportionate amount of commitment for both roles
- Also, math orientation leaders had minimal to no role this year. The two roles did not have to be attached at all.

ONLINE ENGAGEMENT IS OUT-OF-LINE

Not unique to Waterloo Ready, but literally all services, clubs, and resources are suffering from low engagement numbers. Predictably so.

- We are over a year into a pandemic. We are burned out from being glued to our screens out of necessity. Asking people to do anything at this point is asking a lot.

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UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

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- Why would you expect that every single first-year student is willing to participate? Why would you not make this an opt-in program so that those who can manifest the energy to participate will meet only like-minded peers?
- When it's clear that engagement is dropping, it discourages everyone else from engaging. First-years know that no one is doing it so they will follow suit. Mentors obviously see numbers dropping and this is disheartening to see.

INFLEXIBLE PROGRAM

- When you see a boat in the process of sinking, you should try to patch things up right? There was seemingly no effort for the Waterloo Ready heads to adapt to their circumstances. They ran with the same intentions and actions at the beginning of the program as they did toward the end, in spite of all signs pointing to something not working.



I'm probably missing some stuff but this has been at least what I have taken away from Waterloo Ready. Some predictions for next year's orientation/Waterloo Ready (please no):

- Dwindling orientation leader numbers: Being a Waterloo Ready peer mentor was not rewarding and has little incentive to the point that it becomes an off-putting position in the future. Classes of 2025–2026 may have the impression that orientation is an 4–8 week long engagement and that being a leader will be the same as a Waterloo Ready peer mentor. I will personally discourage everyone I know from applying to Waterloo Ready if resurrected.
- Cheapened opinion of the SSO, Faculty, Orientation, University: Someone is going to have to take responsibility for the attempt at this year's programming; students may consider these authoritative bodies to be lackluster at what they do/set out to accomplish. Count me in.

On the bright side. I will manifest that whatever happens next year will be leaps and bounds better than whatever Waterloo Ready was.

Deriving for Dick

N THINGS IN THE EMPTY SET

tendstofortytwo

EDUROAM DAY

Today, in the **mathNEWS** Discord server, it was suggested that we should have a day to celebrate eduroam. And like, not really, but maybe actually?

Maybe as I'm writing this I'm having a day where I've needed to turn my connection off and on every five minutes or so because eduroam for some reason isn't liking my laptop. But eduroam is still a cool achievement.

Think about it; no matter where you go on campus, it's able to find you, when my router at home can barely travel the 10 meters to my room. If I'm sitting in my room in residence or in the middle of the Peter Russell Rock Garden, if I'm in the Davis Centre library or in South Campus Hall, they've found a way to spread one Wi-Fi network across all of it. Maybe I know nothing about how Wi-Fi actually works, but I think it's pretty nice that no matter where I walk on campus I can have the same connection without it cutting out.

But it goes even farther than that! See, if I go over to Laurier, I can still access the internet all the same, with the same authentication. Because eduroam is not just found at UW. No, it's actually a worldwide service! Found in over 70 countries, you can go to schools all across the world and rest safe in the knowledge that you'll still have access to the internet just as you do at UW.

So yeah, maybe eduroam sucks. Maybe I have considered buying a router just for personal use in my dorm room because of how annoying it gets sometimes. But at the end of the day, eduroam isn't actually that bad of a service. So let's appreciate it for what it is.

Trust me, it's better than my high school's Internet.

Predap

EPISODE 25: CHINESE REMAINDER THEOREM

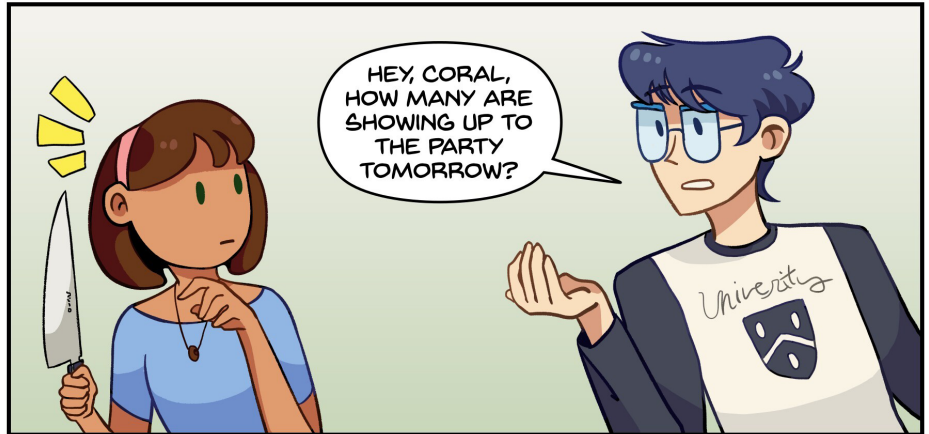
Enjoy Episode 25 of the MathSoc Cartoons series: [Chinese Remainder Theorem!](#)

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 bit.ly/mathsoc_cartoons_reviewer_signup! As always, feedback, suggestions, and fan art can be left at cartoons@mathsoc.uwaterloo.ca.

MathSoc Cartoons

MATH 135: CHINESE REMAINDER THEOREM

STORY & ART BY CLARA XI



Well, we can represent the number of slices you need as a **system of congruences**! Let n be the **number of slices**.

- ① $n \equiv 2 \pmod{4}$
(2 no-shows; divide $n-2$ slices evenly among 4 attendees)
- ② $n \equiv 1 \pmod{5}$
(1 no-show; divide $n-1$ slices evenly among 5 attendees)

By definition of congruence, from ① we get:

- ③ $n = 4x + 2, \quad x \in \mathbb{Z}$

Substitute ③ into ② and solve for x .

$$\begin{aligned} 4x + 2 &\equiv 1 \pmod{5} \\ 4x &\equiv -1 \pmod{5} \\ 4x &\equiv 4 \pmod{5} \\ \textcircled{4} \quad x &\equiv 1 \pmod{5} \end{aligned}$$

Again, by definition of congruence, from ④ we get:

$$\textcircled{5} \quad x = 5y + 1, \quad y \in \mathbb{Z}$$

Now substitute ⑤ into ③ and solve for n !

$$\begin{aligned} n &= 4(5y + 1) + 2 \\ &= 20y + 6 \\ \Rightarrow n &\equiv 6 \pmod{20} \end{aligned}$$

Neat, right? In fact, you can follow these steps to solve **any** system of congruences where the moduli are **coprime**!

That's **Chinese Remainder Theorem** for you!

This means you could have 6 slices of cake, or 26, or 46...

NUMBER OF SLICES PER ATTENDEE

		no-shows	
		1	2
total slices	6	$\frac{6-1}{5} = 1$	$\frac{6-2}{4} = 4$
	26	$\frac{26-1}{5} = 5$	$\frac{26-2}{4} = 6$
	\vdots	\vdots	\vdots



CHINESE REMAINDER THEOREM



Given a system of linear congruences:

$$n \equiv a_1 \pmod{m_1}$$

$$n \equiv a_2 \pmod{m_2}$$

If m_1 and m_2 are coprime, then:

$$n \equiv n_0 \pmod{m_1 m_2}$$

Where n_0 is one particular solution.

THE CC SUMMARY PART 2 — warSOC

warSOC I—My Day Was Going Pretty Poorly Until The Floor Went Poof begins with a goose opening a portal under Sarah. She falls into ‘Theorem-space’, which is more or less an extra dimension superimposed on the regular one. Spending time in it is like looking at a lovecraftian abomination in that it cracks and bends the human mind in unnatural ways, but it makes you understand math good as well as go insane. Sarah gets caught by Name by a pink tie, who pulls her out. Sarah is crushing on Name and Name has a **warSOC** badge.

warSOC is pretty weird compared to the Wordress and Camien stories. The tone shifts from romanticist to action-adventure. It is far more plot driven as a whole, and is very serialized from issue to issue. You can read **warSOC** without having read a Wordress and Camien story, but you need to read every **warSOC** story to make sense of the whole thing.

In *warSOC II—I Find Out Bézout’s Lemma Is Like Slicing Bread*, Name takes Sarah to meet Soren, the president of **warSOC**. Through various shenanigans of animal abuse, they are all sucked into Theorem-space, and escape a horde of anti-mathematics-wielding geese to the **warSOC** clubhouse. *warSOC III—Welcome to the Waterloo Anti-Mathematics Resistance Society* explains a lot of the mechanics as to what happened in *warSOC II*. Vigil, the fast-talky glasses-pushy-uppy fellow who runs **warSOC** operations support, fills her in with some exposition. ‘Anti-mathematics’ was discovered by professor Rex Sibyllan in the 90s, and is banned worldwide. Think of anti-math as a laser that makes you forget math. Sarah signs on to **warSOC** and thinks Name’s suit is swell.

In *warSOC IV—The Magenta Menace*, Sarah is out on patrol of Theorem-space with Name when they see 40-odd geese congregating around a languages building. Name calls for backup. Sarah escapes to the real world, where she goes to the spot where the geese were congregating: the office of Dr Salis Shakespeare, an English prof. Inside, she sees a large magenta goose with bones on the outside performing what appears to be anti-math over the body of Shakespeare. The goose addresses Sarah by name in a human voice.

In *warSOC V—All Out*, Sarah draws the ire of the goose. It performs a devastating anti-math attack on Sarah, crippling her mentally. She escapes into Theorem-space with Professor Shakespeare, ties her tie to Shakespeare and uses the extreme amounts of math entering her brain due to unprotected exposure to Theorem-space to cast a very powerful anti-math attack, driving the geese away.

In *warSOC VI—Epilogue*, Sara is comatose. She has driven the geese away at the cost of her own mind. Name visits Sarah in the hospital and confesses her feelings for her. Somewhere deep within Sarah’s mind, her humanity is being locked away by a perverted version of her mathematical side. Upon hearing Name’s confession, Sarah’s humanity vows to escape.

warSOC VI is the last article in what is more or less the first season of **warSOC**. 1–6 were all published over a term.

Immediately following *warSOC VI* is the *Axioms of Resistance* trilogy, three shorter articles about the founding of **warSOC**. In *Axioms 1*, Soren is TAing for math 135, where students are having a harder time grasping mathematical concepts than usual. Whilst browsing old academic papers, he comes across the name of one about anti-mathematics by R Sibyllan.

In *Axioms 2*, due to a dream he had, he picks the lock to the 7th floor of MC, and finds Sibyllan’s office and a bunch of her notes explaining anti-math and Theorem-space. He experiences anti-math first hand when a goose he saw earlier makes him forget how to do the Euclidean algorithm.

In *Axioms 3*, Soren has continued to study the notes in Sibyllan’s office. One day when he dozes off, a couple of plant ops people show up in the office, concerned by his presence. They do not want to kill him, and they let him continue the work of Sibyllan due to their prior friendship with her. Soren comes up with the name **warSOC** with input from the plant ops people. He performs anti-math on a goose he had previously seen using anti-math on a student of his, and successfully wards off the goose. His students begin to have a better time understanding the course content.

After Axioms, we arrive at what is more or less the most recent development in the AWS, **warSOC** season 2. It consists of warSOCs 7–10, and finished publication just last term. *warSOC VII—B-Side* is a retelling of the battle of the modern languages building, but told from the perspective of Newton. Newton is the commander of Arith division, and is a goose. The magenta goose, whose name is Lucy, was using a special form of anti-math, anti-linguistics, to extract English knowledge from Salis Shakespeare’s mind. Lucy was badly affected by Sarah’s final anti-math attack, and the geese take Lucy away.

In *warSOC VIII—How I Miss Her*, Lucy continues recovering. Vigil checks in on Name who is visiting Sarah. Name expresses interest in talking with the magenta goose, whom she remembers was capable of speech in the battle of the modern languages building, an interest Soren would be firmly against.

In *warSOC IX—If Keanu Reeves Was a Goose (Among Other Things)*, it is the first time Lucy, the magenta goose, is the narrator. Lucy’s plan becomes clear: she stole the linguistics knowledge to use language to expose **warSOC** for performing illegal anti-math. She composes a letter to the prime minister.

In *warSOC X—The Standing Coalition for the Counterproliferation of Anti-Mathematics*, a shady figure called the director has received Lucy’s letter. Soren, Vigil, and the Jack twins (twins named

$$\forall n \in \mathbb{N} : \exists n' \in \mathbb{N}$$

GIUSEPPE PEANO

Jack) are taken by surprise inside the **warSOC** clubhouse by a strike team, who announce themselves as the Standing Coalition for the Counterproliferation of Anti-Mathematics. Vigil manages to send out a last ditch command before he is knocked out by the agents. Name receives the message, informing her of what has happened. Lucy and the geese, watching from nearby, trigger the sensors of one of the jets, which attacks them too, and **warSOC** season 2 ends on that cliffhanger.

With **warSOC** wrapped up, that more or less brings you up to speed on what will be coming up in future issues. However, there are some minor things and some major things not yet covered in this recap article series.

CC's third biggest fan by volume

THE CC SUMMARY PART 3 — EVERYTHING ELSE IN BETWEEN

Up until now, I have covered every article in the mainline AWS. However, some other works are part of the AWS in spirit but not mainline articles. Some of these do not fit nicely into the timeline, others are too brief to bother recapping, and yet others still are unpublished works kept secretly locked away.

CC has written a couple of short stories that are actually short about Wordress and Camien called vignettes. They are sprinkled in here and there, and are not relevant to the overall plot. In fact, not every vignette is even really set in the AWS. They are pretty short, just a paragraph normally. A summary of them would be as long as the articles themselves are. Read them if you are curious.

mathNEWS v146i1's cover features an homage to the Justice League 1 cover as the front page, but instead of the DC superheroes, features the members of **warSOC**. Kind of impossible to recap since it is an image and not a story, but still part of the AWS. Look it up if you are curious.

Strictly speaking, since **mathNEWS** exists in the AWS, it is entirely possible that any number of **mathNEWS** articles that exist in our timeline could exist in the series' timeline as well. Questions to how closely the two timelines parallel each other have been raised before. Clearly Waterloo exists in a pretty similar state in both worlds. There exists a mathematics faculty with a mathematics society in both. Pink ties are a mainstay of symbolism of mathematics in both. The campus layout is presumably entirely the same. All this, and yet no character in the timeline of the AWS exists in ours. It seems that despite literally everything else being the same, every person who currently exists in each universe is unique to that universe. This raises some pretty serious questions, as if all current people are unique to their universe, does this imply that all historical figures are unique to their universe? Is it possible

that the past century of history is entirely different between the universes, due to key social, cultural, and political events not occurring in both? Somehow, Waterloo looks the exact same, so that is rather unlikely. Perhaps this is a statement to the deterministic nature of the universe, how you can swap out every person but the machinations behind the scenes of our societies chug along regardless, taking us all to the same fate in the end. Maybe CC didn't want to think about historiography when they were writing small tales about university and stuff. Who is to say for sure.

The last part of the AWS not discussed so far is the pair of short stories *Wordress and Camien go on a date — A Wordress X. Camien Fanfiction* and *Of Love Long Overdue*, colloquially known as Wordy x Camien 1 and Wordy x Camien 2. As the title of the former suggests, neither of these were officially written by CC, but instead by minecraft user `chai_tea_latte`. CC asserts that `chai_tea_latte` is another individual altogether, but I have never seen the two of them in the same room. Neither article was ever published in **mathNEWS**, nor is either available to find anywhere online. The only place either article exists is as books in the dormant **mathNEWS** EOT minecraft server. CC asserts that both of these works exist outside of the AWS canon as fanfiction, leading experts in the field say that they are canon. Therefore, it is my duty as a reporter to summarize them. In Wordy x Camien 1, they talk about fucking, and in Wordy x Camien 2, they fuck.

With all this now you should be fully caught up and be able to understand whatever comes up next, if the series continues at all. I imagine it will, as over half of all **mathNEWS** merchandise sales in the past week (as of writing) were sales of AWS related or adjacent merchandise.

CC's third biggest fan by volume

N THINGS THAT (USUALLY) MAKE AN N THINGS ARTICLE AN N THINGS ARTICLE

- Be a list of N things
- Be easy to write in five minutes so you can get pizza at **mathNEWS** prod night
- They're easy to use as recruitment material for **mathNEWS**
- Come to **mathNEWS** Prod Night
- Yes you
- get in here
- free pizza
- ~~i hope it's in person so there's actually pizza~~

MONADS WITH C++ TEMPLATE METAPROGRAMMING

In last issue's article [C++ Is Just Racket, If You Think About It](#), we implemented a pure functional language with C++ template metaprogramming. Following this, I was issued a challenge by terrified to implement monads using template metaprogramming. This is a lot easier, assuming you already know what a monad is. If you don't, you should read terrified's [An Attempt to Explain Monads for Laymen](#), from 145.5.

I'll assume you have a working knowledge of whatever I talked about last issue. First things first, we want a consistent way of thinking about meta-functions, such that we can take their name and “apply” them to some given arguments. Recall that a meta-function is just a struct that we treat like a function, in that one of its members is a value computed at compile-time. Here's the general formula we'll go with:

```
struct Fun {
    template<typename Arg1, ..., typename ArgN>
    struct apply {
        using value = /* IMPLEMENTATION */;
    };
};
```

This lets us use pass around Fun as the name of the function, and “evaluate” it by `Fun::apply<Arg1,...,ArgN>::value`. By the way, we're still working with the notion of “everything being a type”, i.e. we still use types like `Int<-3>` from last issue.

It's kind of up for debate how much you can generalize the idea of a monad. The code we write here will be sort of a pale imitation of the Monad type class which Haskell provides, as well as its “bind” and “return” functions. It's not strictly necessary to do this, but it's just nice for organizational purposes. Anyway, here it is:

```
template<typename T>
struct Monad {
    struct Bind;
    struct Return;
};
```

Note that this is completely unspecialized, and neither Bind nor Return are given implementations. We'll define them per-specialization. We'll implement one particular monad here, and it will be left an exercise for the reader to write more involved ones. The example we'll go with is the “Result” structure from terrified's article. Here it is:

```
struct Result {};
template<typename T> struct Ok {};
struct Error {};
```

This has the caveat of Error not having a string parameter. While this technically *could* be done, it would be really annoying and would probably merit its own article, so we'll forget about it. We'll also define linked lists, and head/tail functions:

```
struct Empty {};

template<typename Data, typename Next>
struct Node {};

struct Head {
    template<typename> struct apply;
    template<typename Data, typename Next>
    struct apply<Node<Data,Next>> {
        using value = Ok<Data>;
    };
};

template<>
struct Head::apply<Empty> {
    using value = Error;
};

struct Tail {
    template<typename> struct apply;
    template<typename Data, typename Next>

    struct apply<Node<Data,Next>> {
        using value = Ok<Next>;
    };
};

template<>
struct Tail::apply<Empty> {
    using value = Error;
};
```

Note that we had to define the *explicitly (fully) specialized* template cases outside the rest of the Head/Tail scope. This is because C++ has a dumb rule where explicit specializations have to be at “namespace scope”. Don't yell at me, yell at the standards committee.

Finally, we specialize Monad for Result and provide definitions for Bind and Return.

```
template<>
struct Monad<Result> {
    struct Bind {
        template<typename, typename> struct apply;
        template<typename T, typename F>
        struct apply<Ok<T>, F> {
            using value = typename F::apply<T>::value;
        };
        template<typename F>
        struct apply<Error, F> {
            using value = Error;
        };
    };
};
```

```

struct Return {
  template<typename T>
  struct apply {
    using value = Ok<T>;
  };
};

```

And now we're done! `Result` is now a monad type, and you could generalize this to write other monad types. Not too terrible syntactically, actually! Well, not until we actually apply it somewhere:

```

using aList = Node<Int<1>,Node<Int<2>,Node<Int<3>,Empty>>>;

using attemptThree = Monad<Result>::Bind::apply<Monad<Result>::Bind::apply<Monad<Result>::Return::apply<aList>::value, Tail>::value, Tail>::value, Head>::value;

Print<attemptThree>();

```

Sure enough, this gives us `Ok<std::integral_constant<int,3>>`, which is just an expanded `Ok<Int<3>>`. Also, you can find the definition for `Print` in my article from last issue. But wow, this is ~~terrible~~ beautiful. Sleek and elegant and ~~impossible to write anything useful with~~ easy to use. The best functional programming language.

jeff

LUGUBRIOUS

It started innocently enough. Someone somewhere read it in a book, and wondered, What's that mean?, and looked it up in the dictionary (if you have to know, it would have said something like mournful or gloomy), and then said, Gosh, that sure sounds like me. And wrote a story about it and then told their friends all about it. By luck or by chance, those friends were influential writers (one was a professional Instagrammer as well) and took off with it. Suddenly everything was lugubrious: Your hat, this chair, the current state of affairs. No longer did it only mean something sad. It was *rad*, the way “sick” is good and “epic” is awesome and “awesome” is cool and “awful” is bad. And then sadly it became a nothing word, a zeitgeist word, slapped onto everything that made anyone feel anything. Good or bad. It wasn't a question of morality or quality or like or dislike. Those approved were lugubrious. Those disapproved were lugubrious but in a bad way. People walked and talked lugubriously. They lived and died lugubriously. Everyone knew what it meant but couldn't to explain it. But such is the fate of all popular words. I'll say, if you want to keep a word meaningful, you'd better hold it close and never use it. But I digress; this is how it started, more or less. So—friends, **mathNEWS** writers, who's with me; is this story lugubrious?

cy

THE NUMBERS ON ELECTION NIGHT AREN'T REAL, YOU KNOW

I was a registration officer this past election. I registered people. I counted ballots. Polls closed at 9:30, and we were done counting a little over an hour later. One of the deputy returning officers pulls out her phone.

“Oh my god,” she exclaims, “the CBC is calling it as a liberal government, they just don't know if it is a majority or minority yet.”

The article she was referring to was apparently already half an hour old when she read it. The CBC knew our numbers before we had even counted the ballots. Two possibilities: either the CBC employs wizards or the CBC employs liars.

What votes are the CBC counting? Did anyone check to make sure they aren't just reusing the ones from 2019? I don't buy it.

The numbers on election night are fake, you know.

aphf

CANADIAN ELECTION AFTER THOUGHTS

I was planning to write a warm welcome for the peep who start their first term on campus for the first time in *years*. But the Delta variant kind of scuffs the entire thing. Turns out that most classes are still online or hybrid with only some in-person options. With new uncertainties and a significant portion of people still studying at home, I have to push this off a bit again.

Then we have an election nobody wanted. I've participated in 3 federal and 3 provincial elections since I turned 18. This is the worst election I had by far. None of the parties satisfied me. I still voted, though in a conflicted mood. On the night of the results, virtually nothing had changed. Everyone had a disappointing performance in my view. What a waste of everyone's time and resources that could have been used to help people that are suffering from this pandemic.

On a brighter note, there is no brighter note. It sucks that the citizens of Canada, the ones willing to risk their health and sacrificed their time to vote, got played by greedy politicians like this.

me

ADDENDUM: STRING NTTPS IN C++20

In *Monads With C++ Template Metaprogramming*, I mentioned that it's possible to pass strings as template parameters, but that it's annoying to do. Well, this passing remark was the result of me getting side-tracked for the better part of an hour, trying to figure out just that. Here I'll show you the solution I eventually settled on. So, for this problem, we'd like to be able to write something like `Error<"Failed to do the thing!">` and access the inner string later on. It's not super complicated, but just involved enough to be annoying.

As it turns out, up until C++20—the most recent version of the C++ standard—it wasn't really possible to do this at all. There's a new feature in C++20 that specifically allows us to use all *literal types* as non-type template parameters, or NTTPs for short. What's a literal type, you ask? Put simply, a literal type is any type that can be the type of a constexpr variable. This includes scalar types, reference types, and arrays of literal type. However, in addition to these three, a class type can also be a literal type under certain conditions. In particular, a literal type can also be a class that...

- has a constexpr destructor; and
- is an aggregate type, OR has at least one constexpr constructor that's not a move/copy constructor, OR is a closure (i.e. lambda) type; and
- is such that all non-static members and base classes are literal types (unless this is a union, in which case only one non-static member has to be of literal type).

Technically that last point should say “non-volatile literal types”, but the `volatile` keyword was deprecated in C++20 so who cares, right? But yeah, that's very verbose and precise, as you'd probably hope to expect from the standard. For our purposes, we mostly care about the “has a constexpr destructor and constructor” bit. That point might come as a surprise too, though. What's a constexpr constructor? Well, say we have a class `X`. We can put the `constexpr` keyword in front of a constructor `X(args...)` to explicitly allow objects of class `X` to be of literal type when created with that constructor. So, for example, if we have

```
struct X {
    X() { cout << "not constexpr!" << endl; }
    constexpr X(int) {} // int was randomly chosen
    constexpr ~X() {}
};
```

then we could write `constexpr X x{3}`, and `x` would be of literal type. On the other hand, we could *not* write `constexpr X y{}`, since this constructor is not marked with `constexpr`. There's also an important thing to note, and it's that constexpr constructors/destructors can only have other constexpr things inside of them. So, no side effects and no mutation, other than, like, initializing class members. All compile-time!

The reason we care about this is that the compiler is only able to deal with and evaluate constant expressions, i.e. constexprs.

And in particular, non-type template parameters need to be constexprs. So, what are our options? Sadly, we can't have a constexpr `std::string`, because it doesn't have a constexpr destructor. We also can't directly use C-style strings. Like, if we did something like this:

```
template<const char* str> struct Thing {}
```

then we wouldn't be able to do `Thing<"Hello">`—the compiler will tell us that we can't use string literals in this context. What if we separate it out into a variable, like this?

```
constexpr char* msg = "Hello";
Thing<msg> x;
```

This won't work either! There's a wrinkle I glossed over, and it's that when you use a class literal type object as a non-type template parameter, it needs to have static storage duration. That is, it needs to be `static`. So, what we wrote above would work if `msg` were declared as `static` as well.

This isn't ideal; we'd rather not have to make a static variable for every single string literal we want to use. We'd like to write it directly in the template parameters. To do this, we'll need to write our own literal string class, which isn't as hard as it sounds—the syntax is just a little nuanced. Our class will store the string as a fixed-length array, with the length deduced automatically by the constructor argument, which will be a reference to a fixed-length array of `const char`. Because C++ is great, we can give a literal/rvalue here too and it'll take it. The particulars:

```
template<size_t N>
struct LitStr {
    char buffer[N] {};
    constexpr LitStr(const char (&str)[N]) {
        for (size_t i = 0; i < N; ++i)
            buffer[i] = str[i];
    }
    constexpr ~LitStr() {}
};
```

Note that `LitStr` is a literal type since its constructor and destructor are constexpr, and `buffer` is a literal type since it's an array of `char`, which is a literal type. So now, when we have something like

```
template<LitStr S> struct Error {};
```

we can write `Error<"Hello!">` and it just works! `N` automatically gets deduced to 7 as “Hello!” gets implicitly passed to the constexpr constructor for `LitStr`. You could access the raw string by accessing the `buffer` member of the `LitStr`. It's a little hacky, but it works! And hey, we learned some neat stuff along the way too :)

IN SURPRISE FINISH, BLOC QUEBECOIS WINS MAJORITY

UW Unprint here. I didn't really write that much for this issue, so I'm going to republish this article from last election. 2021 was basically the same as 2019, so I'm just going to cross out the parts that have to change.

OTTAWA—The political world has been shaken up today, as the **mathNEWS** elections desk has confirmed that the Bloc Quebecois has won a majority in the House of Commons, and will form the first Bloc government in Canadian history.

The surprise victory left observers baffled, since the Bloc Quebecois ran only 78 candidates, but somehow secured a 174 seat majority in the 338 member House of Commons.

~~EBC~~ Substack political analyst Eric Grenier summed up feelings in Ottawa from the live election night studio. “I have no idea how this fucking happened,” Grenier said. “Like, there have been polling errors before, but this is basic counting right? Where did the extra 96 candidates come from?” As the composition of the new Parliament appeared on a screen behind him, Grenier continued, “You're all seeing this right? It's not just me?” He then gestured to a newly minted Bloc MP on the screen. “I have never seen that fucking guy before in my life. Am I on crazy pills?”

Meanwhile, at Bloc campaign HQ, a victorious Yves-Francois Blanchet addressed party faithful. “Can we get some extra chairs here?” he began. “I thought we got enough chairs since everyone pre-booked but we don't have enough chairs for some reason.” Blanchet continued, “Not in my wildest dreams, did I think I would be in this situation tonight. Seriously, how did this even happen? I swear I checked the website last night and it said we had 78 candidates, but I just checked on my phone and now we have 174. I don't recognize any of their faces either.” He then waved his phone around the stage. “Anyone recognize these guys?” After a short silence, Blanchet kept speaking: “As the new Prime Minister of Canada, I pledge to leave Canada as quickly as possible. And from there, who knows? Clearly Canadians believe in our message. Why can't Canada secede from Canada?” Another raucous round of applause and cheers shook the oddly crowded Bloc HQ.

At the other party headquarters, the atmosphere was much more grim. “I survive ~~the blackface thing and the SNC Lavalin thing~~ COVID and everyone complaining about an early election and this is what does it? They won a seat in Nova Scotia. How?” asked Justin Trudeau. The NDP headquarters were slightly more optimistic, as Jagmeet Singh commented: “This is definitely the weirdest way we've lost yet. I'm not even mad.” In the Conservative war room, ~~Andrew Scheer~~ Erin O'Toole prepared to face a leadership challenge after a

disappointing result. “This is such bullshit,” ~~Scheer~~ O'Toole said. “And I know Bernier's going to ~~come back and pretend he never left~~ say it was because I didn't endorse ivermectin or whatever. I should just let him, I'm done with this shit. I'm going back into ~~insurance~~ law, which according to Wikipedia is what I did before politics.”

While the other parties picked up the pieces, it was the Bloc's moment, at least for a night. Well-wishers streamed into Bloc HQ to toast their victory, though some of the new Bloc MPs appeared to have no family or friends, or indeed any memories from before election night at all.

UW Unprint

IT WAS THE BEST

This article was originally planned to be published in v147i0 (the orientation issue). However, this article's inclusion into that article was sadly not possible due to fears that the Student Success Office (SSO) would reject the article. The reason given as to why it likely could not be included was of this article's generally negative tone. The SSO has the power of final approval specifically for **mathNEWS** orientation issues.



Somewhat ironically, the pandemic was the best time of my life in recent times (since Fall of 2018). It made literally almost every single facet of my life so much better than it had been compared to before the pandemic started. Especially, university became so much better for me. The UW experience literally went from being something along the lines of ‘the worst mistake of my life’ to eventually becoming something somewhat enjoyable.

Alas, all good things must come to an end, and as the fully vaccinated rate increases throughout Canada, I fear that things for UW will also begin to return to normal. This means I find it likely that by next year, I will unfortunately need to return to the UW campus due to fully online only options ending. I fear the day when I am required to return, and I am not talking about COVID-19 as I've already been fully vaccinated.

For all you new UW students doing only online courses for this Fall term, I give you this message: “Enjoy it while it lasts.”

boldblazer

P.S. Well, this assumes that the Delta variant doesn't do anything unexpected. Fingers crossed.

MATHNEWS

profQUOTES 147.1

AMATH 250: JOE WEST

“ Maybe your roommates are engineers. That’s even worse—you gotta live with it.

STAT 231: MICHAEL WALLACE

“ “Proof by Exhaustion” is the title of my undergrad career.

CS 348: SEMIH SALIHOGLU

“ If you were insane and wanted to develop your own sort of data management software...

CS 360: JEFFREY SHALLIT

“ If you have to, use Microsoft Word, but the output will be ugly.

“ If I hold this [book] just right, [Zoom] will think it's part of my body.

“ Holding up fingers doesn't constitute a formal proof.

“ It's a little like being in Mississauga. You have nowhere to go.

“ I've since converted [...] to the church of John Watrous.

CO 487: DAVID JAO

“ If you want to hang out and talk about cryptography... I don't know why you'd want to do that, but anyway, you can.

“ [The textbook] is not readily available online—not legally, if you know what I mean.

“ [Talking about *SIDH*] You've probably never heard of this. I just wanted to flex.

“ What, you can't naturally add in base 26?

“ No matter what you start with, if you add completely random garbage, you're gonna get completely random garbage.

“ LEARN is absolutely atrocious.

“ If one of you gets a co-op at D2L, please teach them proper principles of website usability.

“ Don't bother breaking their cryptography, just beat them with a wrench until they tell you the password.

“ [Your computer] doesn't have infinite memory, but it's close enough.

“ Sorry to any mathematicians who don't know what ASCII means.

“ Those high bits [...] denote unprintable characters—I don't mean, like, cuss words.

“ [Talking about tables of random numbers] If you study these for a living, you might give names to them, like your favorite pet or something.

PMC PROF TALK: OLIVER PECHENIK

“ When your company doesn't pay you enough, you just gotta hustle.

“ If you're your own boss... well that's inappropriate.

“ You could formalize this... errr [vague hand movements] bleh.

YOU SHOULD BE READING: THE UNBEATABLE SQUIRREL GIRL

The unbeatable hero; a concept that's been toyed with a few times across pop culture. Just look at DC's Cass Cain, or Saitama, the One-Punch Man himself. However, I'd argue that the best executed version of this trope that I've seen has got to be The Unbeatable Squirrel Girl, by Ryan North, Erica Henderson, and Derek Charm.

Doreen Green is just your average computer science student living in New York with her roommate Nancy and pet squirrel Tippy Toe, but when the need arises she puts on her squirrel ears to become Squirrel Girl!

As someone who's already defeated Galactus, Thanos, and MODOK before the start of this series, with only her squirrels to aid her, Doreen's earned her title as Unbeatable. The series therefore focuses on getting Doreen into situations where she can't just fight her way out; instead, there's usually some trick involved, and Doreen has to outsmart her opponent. Some of the time she even ends up helping out or befriending villains who in another series would simply end up behind bars or similarly defeated.

Perhaps unexpectedly, Unbeatable Squirrel Girl managed to find its own fanbase and became one of the longest-lasting Marvel series by a single writer during the time it was running, from January 2015 to November 2019 for a total of 58 issues. If you're bored and looking for a fun comfort read in between assignments, definitely check this series out!

warSOC XI — MISERY ACQUAINTS A GOOSE WITH STRANGE BEDFELLOWS

Theorem-Space is crying today, stained with deep, lugubrious blue circles. My phone, and therefore access to Vigil's live sensor feeds, doesn't work in Theorem-Space, so I can only hope the Magenta Menace is still on the QNC roof when I arrive. It's best to be discreet, I decide, and I creep out of Theorem-Space behind an air exchanger on the rooftop.

A deafening jet-like roar punctuated with panicked honks fills the air. The sound comes from the entire sky, and I duck instinctively, back against the side of the exchanger. I see nothing of note on this side of the QNC roof, so hugging the exchanger, I peek around the corner.

Geese are honking and scattering in all directions in the air above MC, some falling out of control, a few smashing into the sides of buildings in their haste. In the middle of the chaos, the source of the roaring noise, some vehicle—a mutant cross between a helicopter and a plane—hovers. Stubby cylinders mounted in small turrets on it swivel and spit net after net at the geese with machine precision. I've seen videos of automatic paintball sentries. Whatever tech these people have is a dozen times more accurate, and the geese don't stand a chance. Nets fly, and geese plummet to the ground. It's a long way down. A second flying vehicle of the same make is hovering next to a hole in the MC wall of the **warSOC** clubhouse.

First, my friends in **warSOC**, and now this. I slide the facts around in my head—the video from inside the clubhouse, the black figures. The they must be the same party, possibly here to eliminate everything and everyone associated with Anti-Math. We've been discovered, and so have the geese. It takes me half a second for it all to assemble in my head, and I pull my head back behind the air exchanger, where I find two geese staring up at me. One of them is very, very pink, and looking at me.

"Why, hello, *dear Hawk*. Lucy's the name, and my lieutenant, Newton. A pleasure to make your acquaintance at long last." The pink goose is speaking in a soft, older woman's voice. Speaking to me! My hand flies to my pink tie, ready to block incoming Anti-Math. The pink goose ruffles its feathers and takes a step back. "No need for that, dear."

"I've been looking for you." I say. I don't trust this 'Lucy', but I take my hand off my tie.

"As have I. You may have noted: **warSOC** is in shambles by the doing of those rather heavy-handed individuals flying around in those planes just behind us. They also decided to start killing my geese, those damned honking bastards!" Lucy's voice fills with rage and she hisses.

"I don't care about your geese, Lucy. You've been trying to mess our heads up with Anti-Math for years."

"And have you the number of geese you've killed or driven insane? Just you? In fact, why aren't you trying to kill us now?" I didn't know a goose's beady eyes could hold so much anger. Anger tinged with sorrow.

"Why aren't *you*?" I reply, and we stare in silence for heartbeats.

Lucy breaks the silence. "It would appear the Arith Division—my finest geese—have been incapacitated by our newfound common foes, and I, as much as I am loath to say, require your assistance."

I shift more variables around in my head. "With what?"

"Stopping them, of course. Keeping my geese safe. But I'm not the only one looking for something, am I?"

The equations in my head lock into an equilibrium. "I have a friend who needs help—I've noticed your geese heal extremely quickly from Anti-Math, and I need that healing power for her."

"*Sarah*." A hiss.

"Yes. And I'll have your help rescuing the **warSOC** members. Those are my terms. And I go by Name, not *Hawk*."

At this, Lucy and Newton, the normal-coloured goose next to her, honk back and forth a few times, wings flapping, before Lucy turns to me and says in English, "done."

I hold out my hand, leaning down. Lucy raises a wing, and brushes my palm with her wingtip. Woman and goose. History in the making.

"Let's get out of here before they decide to net us too," I say, but Lucy's already one step ahead of me, gesturing towards a Theorem-Space portal that Newton's just opened.

To be continued...

CC

Campus needs more space for grass and pooping.

A REAL HUMAN BEING

SOME ADVICE

[Editor's Note: This article includes mention of possibly disturbing topics such as suicide. Please be aware that opinions stated are those of the author and do not necessarily reflect those of mathNEWS.]

An altered and redacted version of this article was first featured in the Orientation Issue for this term (147.0). Because the UW Student Success Office has final oversight over the orientation issue, the mathNEWS editors had identified many parts of the article that could not make it into that issue. Thus, for those that have originally read the Orientation Issue version of this article, this version includes the missing parts.



For those who have decided to do your first ever term of university on campus, I would advise you to reconsider if it is not too late to do so. Having experienced over a year and a half of courses online, and comparing it to the year and a half of courses I had on campus, I wish that my very first year of university were to have been all online courses instead.

I hope to eventually tell my full first year experience in mathNEWS as a series of articles some day (though it looks impossible that it would be included as an Orientation Issue article as I had intended to do originally). Until then, you can only speculate on what my first year was like. Anyway, now that my biggest piece of advice is out of the way, here are some smaller trinkets of advice. Note that this all comes from the perspective of someone who is an out-of-province student, who also had a terrible, horrible, no-good, very bad first year. Enjoy!



Do not take any required ENGL courses if John North is the professor. Just don't. If you are going to take away one thing from this article, then let it be this one.

For Math students, **this advice is for if you do not know anything about majors and can't decide on what major to choose.** If you don't choose, know that in the end, it defaults to something called "Mathematical Studies," so don't worry if you have not decided on a specific major. This means, at the very least, look up the requirements for Mathematical Studies and work towards it. I wish I knew about the default much earlier instead of in my third year, since it makes each term's course selection much easier.

There is going to be a barrage of new sites coming your way in the first few weeks of class. If you don't know exactly what each site is used for, or you don't know how to use each site, go find a non-first year student and nag them until they help you. The mathNEWS Discord is a good place to find non-first year math students. *Hint Hint*

It's okay if the MATH 14# classes feel too hard. There is no shame in switching to the equivalent MATH 13# course instead. Although, I do believe there is a deadline for that,

which is after the first 10 weeks. [Editor's Note: The deadline is earlier for CS 145.] Even if you miss that deadline, it turns out that there still is a way to switch although it is a bit more complicated. It is also perfectly okay if you cannot handle the course load. Of course, it all depends on which courses you end up doing, but being a Math student, there's not going to be that many times where you end up with a bunch of courses and a light course load. So, if your 5 courses feel like too much, you may want to consider dropping a course or two to do later in subsequent terms, especially if you are in co-op as co-op basically acts like a sixth course.

If you have taken AP courses, **see how UW translates those AP scores into credits.** Note that you don't get a numerical grade, but instead just a note on your transcript that you have received credit for some number of courses. For example, I found out from a friend that my AP Chemistry score would translate into 3 courses worth of credit for my degree requirements. So I chose to redeem those credits. There is a limit to how many AP scores you can redeem as a math student, sadly. So, even if I had done 5 AP exams, I could only use 1 of them. Although, every little bit does help, especially if you decide to take less than 5 courses per term.

Speaking of co-op, I personally advise against it. If you think co-op won't be a problem for you, then good! Otherwise, you will be struggling with it, and the help that you get at the Tatham Centre isn't much at all. You're basically left to fend for yourself. What a waste of a combined ~\$1000 per term in co-op related fees.

I assume you are already spending a lot of money in tuition and whatnot, so **here is one way to save some money.** On Quest, you can opt out of some fees. I personally recommend that you always opt out of all of those endowment fund fees. You shouldn't even think of them as fees but instead as donations because you receive a charitable donation tax receipt for those. It is shameful that if people don't know about opting out, that they are forced to donate money. If you are really tight on money, you should also think about opting out of fees where you won't necessarily benefit from whatever it funds. If you are doing only online courses this Fall term, you could most likely opt out of every single optional fee and it will likely not impact anything.

This one is advice that you can also take outside of university. **If you see anyone stealing food, no you didn't.** If you are in a situation where you must steal food to survive, you shouldn't worry about doing it. If you see someone steal food, then you either help them by giving them food so they don't need to steal any, or you do absolutely nothing and go about with the rest of your day. [Editor's Note: mathNEWS does not condone stealing.]

In terms of clubs, **if you know which clubs to go to, you can easily score free food.** They throw around so much money all over the place as if they were investments from Nauru. If you regularly go hungry because you lack the money and time

to buy and make food, relying on clubs that just give out free food helps a lot. *Hint Hint*

You may end up getting free food, but that doesn't mean the situation with water is any good. **Did you know that you can classify water into different types?** The main ones you need to worry about are "hard water" and "soft water" because despite Waterloo literally containing the word "water" in its name, it doesn't have the good kind in my opinion. For pretty much my entire life, I have only drunk soft water, so when I first drank Waterloo's hard water, I first thought I drank contaminated water because there was an actual taste detectable. I was baffled! How does water have a taste?! I highly advise you invest in a good water filter. You don't want to end up constantly drinking from bottled water because that isn't environmentally friendly. If you cannot afford to buy all that bottled water and can't stand hard water, you will end up being dehydrated often without that water filter. Remember that the water that comes from the water fountains and cafeterias at UW is almost all hard water, though there is a better chance of getting less hard water in some of UW's newer buildings, such as M3. Also, when you take a shower, the hard water feels rougher like it has more friction than soft water. To get my point across on the difference, note that the water hardness here is measured in mg/L. The difference in water hardness between Waterloo and where I live is two magnitudes. Hopefully, you can now see why I am so vocal about the water. You may safely ignore this advice if you are already accustomed with hard water.

In addition to the water, **prepare for some culture shock once you arrive at Waterloo**, and I'm saying this from someone living in the same damn country. I don't just mean the small differences like how they call donairs "shawarma" for some reason, or seeing bagged milk in person for the first time in your life. Speaking of cultural differences...

If you are coming from outside Waterloo, **do not assume that the drivers at Waterloo behave like the drivers where you are from.** I swear that some of these drivers I have encountered around campus drive as if they want to run over people. Good luck trying to cross a street that does not have any traffic lights. Some of these drivers don't slow down at all near crosswalks. All of this shockingly includes bus drivers too. However, some of you may comparatively find the drivers of Waterloo to be an improvement. It all depends on what the conditions are like from where you are from.

Speaking of buses, do not expect high levels of professionalism. I was once on a bus where the bus driver literally just parked the bus on Ring Road right by SLC, went inside, and came back 5 minutes later with some Tim Hortons coffee. Shame on the GRT for not giving adequate breaks for drivers.

If you ride buses after midnight but before the next morning, the displays will be buggy at those times, and sometimes it will show that a bus will arrive even though no buses will ever arrive until the start of the following day's service at around 6am. I found out about this bug the hard way involving phone calls with GRT customer service at 2:30am

standing at a cold bus station after the last bus had already left but with the display still perpetually showing that a bus would arrive in 5 minutes.

Do not assume that the public transit is as good as the public transit where you are from, even if your assumption factored in the population difference. Let's say that you decide to stick to walking to places because the bus services are inadequate. Good luck with that. The entire Waterloo region was built as if cars were its residents and not people. It is improving, but it remains heavily car-centric and car-oriented.

Waterloo does have street-level trains, but **please do not "fuck around and find out" when it comes to trains.** The trains run at surface level at Waterloo, so when the train barriers become lowered, you respect that barrier, even if you are late for something. If you don't live in UWP, this will not end up being something encountered often. Do use the trains though. They are pretty good with adequate enough frequency and service to get you where you mostly need to go.

Use the bridges that connect UW's buildings together to your advantage, especially when it becomes cold and snowy. Within the Ring Road, most buildings are connected to each other. The exceptions mostly lie along the extremities, away from the central core of connected buildings. Though, do note that some bridges are locked and inaccessible after a certain point of the day.

Don't assume that in between terms, the residences get properly cleaned. They don't. There is no realistic way that every surface gets cleaned. So, when you move into your dorm, think twice before touching the walls in your residence, and separate your bed away from the wall if you can. This advice comes from what I've personally seen.

On the note of cleanliness of residences, **if you have never lived in a carpeted place for long periods in your life or even your entire life, don't apply for V1 housing.** If you are unlucky, your respiratory system will hate you for living in a carpeted place and breathing itself will be uncomfortable. Sleeping will become like hell. Good luck trying to avoid carpeted residences if this applies to you.

Do not think that the support structures of UW will actually help you. This includes Residences, Health Services, Counselling Services, and more. Some of these agencies are hard to get access to, especially with limited time slots and conflicts with time slots of scheduled courses, required quizzes, and tutorials. You end up having to decide between sacrificing your grades or sacrificing your health, which shouldn't even be options in the first place. It turns out the professors don't work with counselling services in scheduling so every time slot made available by these agencies ends up conflicting with just about every math course there is, including the evening slots. If only they would open on the weekends.

No one cares about you at all. When it comes to your studies, it is not high school anymore, so you'll find that there

isn't going to be a teacher that tries to get you to get good grades and submit homework on time. When it comes to your well-being, again, this is not high school where teachers deal with 30 students at a time and can afford to notice individual students. Before the pandemic, there were math classes in lecture halls packed with hundreds of people. There is just no way anyone can focus on every single individual person in university. Thus, to put it simply, no one cares about you at all. You may think that "Not a single person at UW cares about me", and that is okay and perfectly reasonable. It also means that no one really notices you either. So don't worry too much about the clothes you wear, or the hairstyle you have, or what you look like, etc., etc., etc.. Even if you were in a crisis, you would not be noticed at all.

Occasionally you will find information on the recent news section of the UW site whenever a student suicide happens. Before the pandemic, I encountered seeing those about once per term. Try not to become one of them. You may also see the link to it pop up on the UW subreddit.

Lastly, did you know that you can watch so many movies for free! Head on over to the Criterion site through the library, enter your UW login, and have immediate access to

films. Sadly, certain films are unavailable, such as films owned by Disney, but at least the rest of them are all there. Even foreign language movies are in the catalogue too! For example, it means you can watch the critically acclaimed movie Parasite. Make sure to not get too carried away with all these movies. You still have your studies to do!



I hope these end up being helpful even if it was in the smallest way. If you are looking for advice from someone who had a normal first year experience, then you are reading the wrong article. Reiterating again, my experience can definitely be considered worse than normal.

boldblazer

P.S. There was one piece of advice that even the **mathNEWS** editors found problematic. If your curiosity cannot be killed and you absolutely must know, maybe one day you can ask me directly after one of the **mathNEWS** prod nights.

THE ULTIMATE CREATURES DESIGNED FOR WORLD DOMINATION

Due to me being new to **mathNEWS** and not wanting to enrage my new editorial overlords with some long tangent about the sciences, I instead thought sharing something about myself would be better for my first submission... alongside a secret special bonus.

I love cats. Now, contrary to what some dog lovers might think while scoffing at such a remark, I have nothing against dogs. I actually really like dogs and think they can be adorable too. But cats. Kitties! They're just so adorable. I just want to hug the little chaotic balls of fluff when I see them, or if they're older, the just as cuddle-able "I will stab you in your sleep if I wasn't so lazy" hooligans.

Alas, I can't get a feline friend of my own just yet, a worthy tradeoff for my mom's amazing cooking and getting to spend the slowly lifting quarantine with my parents. To clarify, my parents aren't against owning cats because they dislike them. It's just that they've both grown up with so many pet farm cats that they've just 'had their fill' in a way.

Thankfully, this step back wouldn't hold me back from my fluffy companions, as a few of my friends have cats of their own. When we weren't planning world supremacy through brainwashing math students through articles, I would hang out with my friend. Although I will admit the quarantine has complicated this, but thankfully there have been a surge of cute cat videos being posted online with everyone else also being restricted indoors.

I'm also convinced that my mom had one of the most badass cats ever when she was a toddler. Supposedly, the farm cat would straddle herself on top of any dog that would try to instigate a fight with her and basically tame the dog rodeo-style through good old bull-riding. The dogs would stop bothering her afterwards, bowing down to the true queen she was. She would also come home some days carrying a baby corn on the cob, but with the husk already removed somehow.

Moral of the story is that cats, although troublesome, are amazing.



Now, I also mentioned a secret special bonus. I wanted to include a code at the end of the article for fun. There isn't a reward or anything, but I hope you guys have fun trying to figure it out. Just decode the numbers and put it after the link.

https://youtu.be/_59444494f654c564f3345

(as a warning, it has to be the "youtu.be" shortened URL to work because YouTube is weird otherwise)

NNValid

INTERVIEW TIPS FROM YOUR FRIENDLY NEIGHBOURHOOD UPPER-YEAR

It's almost interview season, and if you're a youthful, nubile first- or second-year, I know what you're thinking: *Egad, God Almighty, goodness gracious me! I've no idea what to do! Oh interviews, how they terrify me! I quake in my very boots at the thought!* Yeah — I just wanna say we've all been there. Even your cool, smart, accomplished upper-year friends like me. I can't bring myself to give a single flying fuck about my interviews (if I get any — I couldn't bring myself to give a flying fuck about the job application process either), and one day, you won't be able to as well. For now, I will try to impart some of my suave unbotheredness through the following carefully curated tips and tricks:

- **Dress smartly.** Definitely not in a boring, plain collared shirt and chinos. Or Lord forbid, in a *black/grey/navy suit jacket and trousers*. That's dreary. It's unadventurous. And far too *professional*. Eugh! I'm gonna barf. You're gonna be one of many candidates that are being interviewed, right? So make yourself stand out — through the way you dress! Be a candidate that no employer will ever forget. Let your personality shine through your clothes. If that means dressing comfortably, do it! I like to wear a bright red latex catsuit à la Britney Spears in the “Oops!... I Did It Again” music video, to signal to my interviewers that I am *red hot* with *passion* for [insert market niche here], and that I would be a *well-endowed asset* to their company. Brilliant conversation piece to break the ice too.
- **LeetCode? SchmeetCode.** This one's for the people gunning for tech jobs out there, which, who are we kidding, probably includes you. I assume you're familiar with the concept of technical programming questions that require you to be know the ins and outs of algorithmic paradigms that you will never use in your position of front-end React developer. One piece of advice you might hear often is to bash out a slow but obvious solution first, then think of ways to optimize it later. I take it one step further: code the solutions for the problem inputs that you are given, as you receive them. You can do this by hard-coding the exact inputs and outputs into an if statement, or if you want to be sophisticated about it, a hash map. Suddenly, solving these technical questions becomes a breeze! No sweat if the interviewer asks you what happens if you use some other input: just add an extra if statement or hash map entry to your program to handle that case.
- **Be considerate of the interviewer.** Interviewers are people too, just like you and I. Not even THEY are immune to the allure of playing hooky at work. Be mindful of that. Skip the small talk. Answer every one of their questions with at most one syllable. Refuse to ask them any questions at

the end of the interview. If you do this, you'll be able to bring even the most tedious of ≥ 1 hour interviews down to 10 minutes. The interviewer will catch wind of what you're up to, and they'll be so grateful to have 50 minutes of free time to sneak in an episode of *Keeping Up With the Kardashians* they'll hire you on the spot. (Side note: Interviews are largely about finding personality fits. Selfless, altruistic, considerate personalities are dolefully rare and high in demand. That's why this tip works — everyone else is too self-absorbed to do it!)

Finchey

WATERLOO NIGHTS

TO THE TUNE OF “ONE OF THESE NIGHTS” BY THE EAGLES

[Verse 1]

Waterloo nights
Wandering through Waterloo nights
As I pass by through campus buildings
Remembering all our fights

The full moon is shining, the ground sparkles white
Underneath its heavy blanket of snow
Your tracks are nowhere, having taken your flight
I leave behind some of my own

[Chorus 1]

Ooh, I miss maligning you
Dodging all your blows and bites
Ooh, coming right behind you
Swear we'll meet again in these Waterloo nights

[Verse 2]

One of these days
One of these spring and summer days, now
You're gonna come back
Oh, come back my way

I've been searching for the offspring of the devil himself
I've been searching for a cute little bird
I've been waiting for goose that's a little of both
But its honk is nowhere to be heard

[Chorus 2]

Ooh, loneliness will find you
In between the black and the white
Ooh, coming right behind you
Swear we'll meet again in these Waterloo nights

Finchey

I BOUGHT ANOTHER LAPTOP AND IMMEDIATELY FRIED IT

AND NOW I AM TYPING THIS ARTICLE ON IT

By now, the avid **mathNEWS** reader might be getting familiar with my exploits—on more than one occasion, I have bought a cheap second-hand laptop to mess around with, only to sell it later once I'm bored with it. But just because I'm getting predictable doesn't mean I'll stop—indeed, I've recently started trading up.

The last you probably saw was lithium in v145i4, the tiny netbook with a single-core Intel Atom, a tiny footprint, and a surprising amount of usability for all that. I was really happy with lithium, and I even planned to keep it long-term, until I saw it—a ThinkPad x120e. It was still a netbook, but a *ThinkPad* netbook. I'm a bit of a ThinkPad fanboy, so you know I had to get it. Sadly, because I buy and sell laptops on a shoestring budget, this means lithium had to go. It found a nice home with a really sweet woman who wasn't very good with technology. I had to install LibreOffice for her standing in a cold parking lot because she didn't realize that not every laptop came with Office included. I tried my best to explain to her the difference between Libre- and Microsoft Office, and I hope she isn't having too many issues.

Anyway, out went lithium (for a tidy \$15 profit actually) and in came carbon, the new x120e. Immediately though, something felt off. This dual core AMD Fusion CPU, with its 4GB RAM and equivalently fast storage, should be greater than or equal to lithium in all performance metrics. But it felt... slow. No matter what operating system, desktop environment, web browser, anything I tried. It just felt half a second behind where lithium would have been. Had I made a mistake?

Dejected, I fired up Kijiji, to take some photos of the thing and unload it, and get something that I could vibe with. Out of curiosity, I searched up the model to see what it usually sold for.

\$150. What?

I had paid \$50 for this laptop. Could I really get thrice that? It seemed too good to be true. With cautious optimism, I listed the laptop for \$130, hoping to entice people by undercutting the other people selling it. As it turns out though, those people had probably overvalued their laptop—they dropped their priced a fair bit, and I followed. I was still able to sell it for \$85, a 75% profit on something I didn't even want. I was really happy with this—not only did I get rid of the machine, I now had way more to spend on something I would hopefully be happy with!

And boy did something show up—a ThinkPad T420 for \$100. I still had \$10 left over from selling lithium, and the \$85 from carbon, so I didn't feel too bad about adding in \$5, especially given what this laptop was. Many argue that the T420/T430 are “the last good ThinkPads”—the last ones, at least, with support for the old 7-row keyboard, super-serviceable and

upgradable internals (you can even upgrade the CPU!), and tank-like build quality. If I could get that, I would probably be the happiest guy around.

It turned out that the owner lived in Cambridge, and demanded \$20 for delivering to my place. I probably could have haggled him down there, but enamored as I was, I decided not to spook him away. What was one night fewer of eating out compared to the magnificence of a T420? So I paid \$120 for the laptop, checked that it turned on and functioned, and took it upstairs into my apartment.

And immediately realized my mistake. I had forgotten to check the BIOS, and this was one of those ThinkPads with a supervisor password set. I asked the owner if he knew what it was, and he claimed that he had “forgotten” it. To be honest, I'm not quite sure I buy that excuse, but that really didn't help me. The supervisor password didn't lock most settings, but it did prevent me from turning on virtualization support and a few other nice-to-haves. Plus I just didn't like the idea of not having full control over my own machine.

The first thing I tried to get rid of this was simply to reflash the BIOS, but that didn't help. Next, I tried Googling around and seeing if there were any known solutions. The only solution I could find was to bridge two contacts on the underside of the motherboard, and held them bridged while I reset the supervisor password in the BIOS menu. Normally I'm fairly shaky about my skills around a circuit board, but I can hold two contacts shorted for a few seconds right?

I took the thing apart and found the contacts, then tried to bridge them and turn it on. Nothing changed—the laptop booted exactly as before, locked password and everything. The article suggested in another paragraph that I might need to short both those pins to ground... but there was no easily accessible ground. The article cited a couple of places I could ground to, but that required alligator clips and I didn't have any. But I had an idea. After quickly Googling “are usb cable shells grounded” and getting a yes, I plugged one end of a USB cable to my laptop, and held the other end to the screwdriver I was shorting the pins with. Then I turned the laptop on, and... black screen. The fans were spinning but there was no other sign of life. I turned it off, and tried to power it on again without shorting the pins, and still no life. I'd killed the motherboard.

Now, the board might still be repairable, but I don't have the skills to fix it. I took it to a nearby recycler soon after. I was able to find a replacement motherboard on eBay for \$50, though, and one more complete disassembly later I had it installed. Moment of truth, I turned it on, and... it worked! From what I could tell, everything was working fine except WiFi and the speaker. The WiFi was fixed by removing and reinserting the WiFi card, but the speaker was a bit more

complicated. I took the laptop apart again to check, and it turned out that at some point, the speaker wire had moved right on top of a screw hole. I had then screwed into that hole, right through the + and — wires, shorting them.

I was pretty annoyed with myself at this point, and I really didn't want to spend more money if I could help it. On a whim, I took out a small pair of scissors, cut the wires where they had broken off, stripped them and twisted them back together, insulating with some tape I had lying around. Not really expecting it to work, I turned it on and opened an MP3 file. To my delight, it worked! It's a bit of an ugly hack, but it seems to be working fine, and I'll take that.

As I write this now, it seems like this whole journey was filled with mistakes on my part—not checking for BIOS passwords, bricking the motherboard, shorting the speaker—but all of these things were fixed eventually. If I didn't have the technical chops to do it, someone else would have, and this laptop—now known as palladium—would have lived on. It's a testament to the amount of repairability these old laptops had, before we moved onto soldered/glued/riveted everything, and one broken part started meaning that you basically had to trash the whole laptop.

palladium has since received an upgrade to 8GB of RAM, and will soon receive an SSD once I'm able to get some co-op money. Will it be a long-term partner? Who knows. But I hope that I'll have a lot of fun with it while I have it.

tendstofortytwo

PMC PROBLEM OF THE WEEK

As we kick off a new term, the Pure Math, Applied Math, and C&O Club (we accept multiple short-hand forms, including Pure Math Club) is releasing a Problem of the Week every Friday. We reward the best solution (a combination of “slick”, “creative”, and “well-put-together”) with a monetary prize! We hope that our problems are enjoyable and invigorating.

This week's prize is a \$25 gift card of the winner's choice. We accept multiple solution formats: email (pmclub@gmail.com) and Instagram (@uwpmclub) are the most common. Here's this week's problem:

It is well-known that given a set of people, some of whom are friends with each other, there must be at least 2 people with the same number of friends. Now, what is the minimum number of people required to guarantee that no matter who is friends with whom, there will be at least 3 people with the same number of friends?

You have two weeks to send us a solution (by then, a new problem will have come out in **mathNEWS!**) Good luck!

VP Propaganda, PMC

TRIGGER HAPPY JUDGE JUDY

Hello **mathNEWS** readers, and welcome back to the first edition of the segment where I review the latest shows I've binge-inhaled into my brain. In this article, I will review the newest envelope-pushing, wall-breaking, metaphor-confusing development in court reality shows: *Trigger Happy Judge Judy*. You see, the intelligent and young people who still watch shows through an actual television have somehow gotten tired of seeing an old woman calmly settle minor quarrels between two clueless idiots.

Therefore, the random number generators in charge of CBS programming wisely decided to up the stakes of the show by giving Judge Judy an infinite amount of power in her ruling, as well as lacing her water with 5 grams of PCP bath salts before the courtroom proceedings. The result is a glorious display of violent struggle for power that has only been matched by Roman gladiator fights, European soccer matches, and the movie *50 Shades of Grey* (extended director's commentary edition). For legal jurisdiction and tax purposes, the show is currently being filmed off a pirate ship near the coast of Somalia in front of a live hostage audience. And although COVID has halted most television productions, the pandemic has actually drastically sped up Judge Judy's efficiency, who has been repeatedly quoted to say she is “not going to let some made-up virus kill more troglodyte-brained petty halfwits than me.”

Personally, one of my favourite episodes was when an especially-bloodlusted Judge Judy handled a minor workplace misunderstanding by sentencing the accused to “generations of forced labour in Siberia until either my heart stops beating or the sun gives out its light. And let me tell you... It will not be my heart.” Another admirable moment in the show's first episode was when Judge Judy handled a case of courtroom contempt. When an angered plaintiff tried to interject in the accused party's examination by breathing too loudly, Judy calmly and assuringly pulled out a .22 Magnum rifle and shot the accuser directly in the heart, and then proceeded to wipe the gun off with her Bible. Since some fun-hating government officials have tried to stop Judy in her quest for ultimate legal vengeance, the honourable Judge is currently in talks with Saddam Hussein's lawyers and is attempting to ensure her verdict's execution by backing it with the threat of nuclear weaponry.

I would highly recommend all **mathNEWS** readers to watch this incredible show, and I am definitely not only writing this article because Judge Judy is actively threatening to “personally chop my head clean off with a spoon” over my late book return to the Waterloo Library. In conclusion, this article has been written with complete admiration and respect to Judge Judy, and I am urging everyone to treat it as anything but a desperate call for help.

methNEWS

RIP THIS PAGE OUT TO MAKE YOUR OWN mathNEWS COOKBOOK!!

Page 1

mathNEWS Cookbook

by cy, with recipes provided by various mathNEWS writers, and illustrations provided by gjrforrig

There is something so intimate about food: the way it is explored by the math before being consumed and the way it eventually becomes part of the body. Yet it is so universal—everyone eats, even the most pragmatic who only “eat” meal replacements. For most students, upon coming to university, the first matter of course is how to work their new schedules around food—when, and what, to cook, and eat. Writers of mathNEWS, too, are sustained by food, and we’ve even had plenty of mathNEWS articles inspired by it. THIS BOOK EXPLORES THE EATING HABITS AND EATING PLEASURES OF mathNEWS WRITERS.

PASTA SALAD by Finchey

Ingredients: Pasta (I am partial to penne), frozen peas, one can of tuna, mayonnaise, aioli (optional).

1. Cook an appropriate amount of pasta and peas according to package instructions.
2. Drain tuna. Combine pasta, peas, and tuna. Mix in mayonnaise—be generous. Add aioli to taste.

“This is the epitome of low effort comfort food. Takes ten minutes, minimal dishes, minimal ingredients, but it’s hearty and fills you right up. Can be eaten hot or cold. I got this recipe from my old man— it’s one of his taster originals. He’s the kind of man who eats raw garlic cloves for the health benefits. Always quoting Socrates (although he thought it was Dickens or Twain), he’d tell me, it’s eat to live, not live to eat.”

Ah, the eternal question: Do you eat to live, or live to eat? Much like you, Finchey, I was always told that the correct response is “eat to live”. The alternative, “live to eat”, implied hedonism and gluttony. In watching my own parents, I see how parenthood embodies “eat to live”— from a parent’s perspective, eating is just a way to sustain

oneself to fulfill responsibilities, especially child-rearing. But I don’t quite feel the same way yet, as a young student. Call me hedonistic and gluttonous, then. “Eat to live” makes me feel that my life should always have something more enjoyable and worthwhile than eating. The reality is that sometimes it’s not the case for many students. During the darkest times, eating is my sole source of anything resembling joy. Here’s one such recipe.

SHIN RAMYON WITH KRAFT SINGLES

Ingredients: Soup instant noodles (like Shin Ramyun), melty cheese (like Kraft Singles).

1. Cook the instant noodles the way you like it.
2. After the noodles are cooked, while it’s still hot, place the cheese on top and wait for it to melt.
3. Begin eating. Add more cheese while eating if desired.

“Shin Ramyun with Kraft Singles” is straight-up one of the most delicious foods on earth. Like Finchey’s, it is also a recipe that I got from my father, although I know it is not an original idea—historically, I believe it is Korean. Anyway, the point is, no matter how sad I am, “Shin Ramyun with Kraft Singles” never fails to cheer me up, for at least the time I’m eating it.

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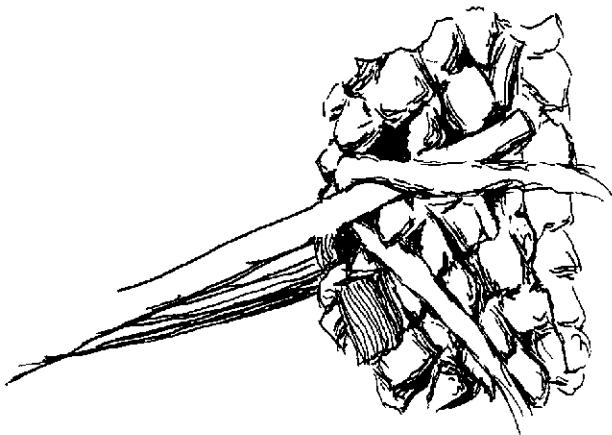
RIP THIS PAGE OUT AND COLLECT THEM ALL TO MAKE YOUR OWN COOKBOOK Page 2

When I suggested the combination to people, I was often met with surprise — ramen and cheese? — it sounds gross, it sounds like it shouldn't work, but it really really does. The cheese works perfectly with the spicy, salty soup. Also when the cheese melts on top of noodles it looks a bit like brains.



Finchey, I made "Pasta Salad" and it looked gross, but it tasted surprisingly good both warm and cold (I made too much and had leftovers). I see why you like it. Tasty, with a history, and delightfully easy to make — those are the hallmarks of a comfort food.

Comfort foods — these are the things we don't eat in front of other people. It's what we eat at home, alone, when we're feeling so sick we can't stomach anything else. Here's another one featuring instant noodles: boldblazer's "A meal for when times are bad at Waterloo".



A MEAL FOR WHEN TIMES ARE BAD AT WATERLOO by boldblazer

Ingredients: 1 Neoguri, 1 green onion, 1 package of frozen squid that is sliced into diamonds to make it curl into a cylinder

1. Begin boiling 550~600 mL of water in a pot large enough to fit the noodles
2. Before the water boils, pour the seasoning powder into the water
3. Just before the water really boils, put in a handful of the squid, then the noodles (flat side down), then the packet of flakes
4. While that is cooking, clean and prepare the green onion: starting from the white end, cut it into pieces of 2~3 cm in length
5. When the noodles are just before done to your liking, turn off the heat, then put the green onion on top.

"This is a meal that I had about every other day while at Waterloo, so I remember it fondly. I was getting sick of just eating default Neoguri, so a suggestion given to me was to add some seafood. Thus I basically found the cheapest seafood of my preference and upgraded the default noodles like so."

boldblazer, I made this and it was pretty good even though I don't like seafood. There's just something special about instant noodles, isn't there? Someday I will be alone, and sick to my stomach like in a sad way, and it will be all okay while I'm eating my instant noodles. This is what it means to "live to eat".

It seems like there is so much to learn about someone through their eating habits. Not just what we eat, but also how we prepare and eat it. Through this project, we'll be getting to know our fellow mathNEWS writers a little better.

RIP THIS PAGE OUT AND COLLECT THEM ALL TO MAKE YOUR OWN COOKBOOK

N THINGS BY INDUCTION

Theorem: For any natural number N , there exists a set of N things from which an N things article can be constructed.

Proof: We will prove this result via induction on N .

Base case: If $N=0$, then the set is the empty set. The article titled “ N things in the empty set”, published in this issue, is an example of an N things article that can be constructed from this set. So our base case is proved.

Induction hypothesis: Assume that the proposition holds for a natural number $N-1$, with $N \geq 1$.

Induction step: By our induction hypothesis, there exists a set S of $N-1$ things such that an $N-1$ things article can be constructed. We use the following algorithm to find an item that is not in this set:

1. Start with $k = ""$ (the empty string).
2. If k is not in S , then return k .
3. Otherwise, append the string “farticle” to k , and go to step 2.

Since S has $N-1$ elements, this algorithm is guaranteed to terminate after at most N iterations by the pigeonhole principle.

Let the title of the $N-1$ things article be “ $N-1$ things such that P ”, where P is a proposition such that if x belongs to S , then $P(x)$ is true. It can be trivially shown that all N things article titles can be reduced to such a form. Consider the set $S' = S \cup \{k\}$. Since k is not in S , this is a union of disjoint sets and so $|S'| = N-1+1 = N$. So S' is a set of N things. From this set, an N things article can be constructed titled “ N things such that for each thing x , $P(x)$ or $x = k$ ”. So whenever an $N-1$ things article can be constructed, an N things article can be constructed as well.

Proof statement: Since we have shown that the base case holds and the inductive step is possible, by induction, our result is proved: for any natural number N , there exists a set of N things from which an N things article can be constructed.

tendstofortytwo

I'd like to say something about induction. I hate induction. I bet you do too.

PROF. IAN GOULDEN

LIFE OUTSIDE OF QUARANTINE

It's chilly outside, and the Ion whizzes by through the blue night. It looks so much faster from the outside. Our shadows grow bigger and smaller as we pass under the curious street lamps. He makes a joke about the Axiom of Choice and it's actually funny. She tells me we better buy tomatoes tomorrow because we're running out back at home. I've never been more in love.

Love: there's so much love around me. Love between couples who've lived together all year and feel warm to each other's touch. Love between strangers on a date, unsure of whether the person they're walking slightly out of sync beside could be their future forever-soulmate or maybe hiding a murderous grandfather in their past. Love between two boys standing before a blackboard, talking about manifolds and Borel sets and whatnot, their eyes glazed over as they speak in a secret tongue and watch chalky squiggles wiggle towards a solution. I've never been so in love.

So in love with the normalcy, the sanity. A zipper on a hoodie, a dog in the elevator. A girl with pretty earrings who tells me her name after a lecture. Deciding whether to take a water bottle with me to campus or whether that's too much to carry. My left shoulder hurting. The dust on the floor and in the air and in the classrooms. The three-dimensionality of this world, laughing at the feeble flat screen that held my friends captive for a year.

I reached through the screen and pulled them out. His headset was left, forgotten, inside the window.

Alive and well

I HAVE TO WRITE AN ARTICLE OR THE mathNEWS EDITORS WILL SEND SOMEONE TO MY HOUSE TO HARM ME

I'm not going to lose my streak just because I have an assignment due tomorrow and election results to watch.

That's the whole article, thank you.

Abald Man

[Editor's Note: You're safe. For now...]

lookAHEAD

SUN SEP 26

August Ferdinand Möbius's birthday (Visit Möbius and do a quiz to celebrate)

MON SEP 27

WaterlooWorks Cycle 1 Posting 2 applications due
Last day to drop with 100% refund

TUE SEP 28

WED SEP 29

WD drop period begins

THU SEP 30

FRI OCT 1

Final examination schedule released

SAT OCT 2

SUN OCT 3

mathNEWS 147.2 production night
Course selection ends

MON OCT 4

TUE OCT 5

WED OCT 6

THU OCT 7

FRI OCT 8

SAT OCT 9

WaterlooWorks Cycle 1 rankings available

mathNEWS 147.2 released
WaterlooWorks Cycle 1 rankings due and matches available

Fall reading week begins

WASPS

There are wasps in Waterloo. ☺

There *are* wasps in Waterloo? 🐝

There *are* wasps in Waterloo. ☺

They're R(-selected) wasps in Waterloo. 🐝

There! Our wasps in Waterloo. 🐝

and in my food too I'm just trying to eat my food 🐝

CC



Lamenting the lack of gridWORD?

Do something about it!

We're looking for a new gridMASTER!

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

Hundreds of readers will thank you.

AN EDITOR WHO'S TIRED OF EXPLAINING WHERE THE gridWORD WENT