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"WHAT'S YOUR COMFORT FOOD?"

Hey! GildED here, with my first ever **mastHEAD**. Shameful confession: I almost never read the **mastHEAD**, and so I had no idea how I was supposed to write this. It seems like a collection of (potentially coherent) thoughts, followed by some description of the articles?

In important editor news, the war against the Oops, all olives pizza at prodnight is going well. Three different variants of the accursed pizza were suggested, and all were rejected, which is a major victory, but we must remain vigilant, for those on the side of Olive will not abate.

This issue is very exciting - we have two different graphic descriptions of bodily fluids, an absolutely brilliant **mathASKS** with some delicious sounding recipes, incredible (and slightly cursed) programming articles, one on a new language, art pieces and reviews, pieces on time and seasons, and the thrilling saga of a search for Finchey.

Unfortunately missing this issue is an anonymous editor's second article, since it was submitted after the deadline due to crippling personal incompetence, and a ton of **profQUOTES** due to insufficient submissions. Seriously, submit more **profQUOTES**! Email mathnews@gmail.com if you have any good ones.

GildED
Editor, **mathNEWS**

ARTICLE OF THE ISSUE

Before saying the winner, I would like to mention how much we all loved *The Epic Quest for Finchey*, for telling a compelling story and saying a beautiful goodbye.

Congratulations to molasses for your article *Three Guides to Home*! It was beautifully written, funny, and perfectly captured a struggle that so many of us have dealt with. Come down to MC3030 when an editor is around to claim your $25 Conestoga Mall gift card!

GildED
Editor, **mathNEWS**

PUPPY	The salt on the lips of a man who hasn't showered in two weeks (rookie numbers, really, but I can't afford to be picky.)
LEMMAN	Regular on the rocks, 5 lines
APHF	Cocaine, like kilogrammes of the shit. I bake it into pie, I blend it into smoothies, hell sometimes I just eat plates of the stuff with a fork and knife (because manners are important) You too can get some by calling 519 555 0194!
NOT A N*RD	Pizza with sprinkles
SOMEBODY	Pizza without sprinkles
BOLDBLAZER	곰국 with lots of green onion
PEACELOVEMATH	St Jacob's farmer's market butter tarts
X	The rice that gets stuck to the bottom of a hot bowl of bibimbap
CUTLET	гречневая каша с молоком
hu	Copious amounts of sugar
TENDSTOFORTYTWO	all food is comfort :3
GALE	miso soouuuup and also curry udon 🍜
FINCHEY	Chilli dogs.
JELLY BEAN	Jelly beans
DERIVING FOR DICK	Lobster Burger Bar's Lobster Chowder.
PREDAP	Not really a food person, but pasta
CC	A piping hot burger with tasty fries under a blanket
JEFF	Chicken, apparently
ME	Piazza with rice
YUMMYPI	Miss Vickies Salt and Vinegar chips. There is something so gratifying about melting off three layers of skin on your lips. Nothing hurts quite as good as a chip like that. Those who can tolerate it (and dare I say, enjoy it) are what Darwin meant by the "fittest," don't @ me.
GOLDEN / GILDED	Crepes
BIPED	Cereal
ENAMOURED	Minty mint yum!!
CLARIFIED	The blood of my enemies and all who dare oppose me... ...Or cheap supermarket sushi.
GOD⚡PED	Pasta and cherry coke.
TERRIFIED	Do you like green eggs and ham? I do not like them, Sam-I-Am. I do not like green eggs and ham. Would you like them here or there? It brings me to tears every time.

Bring back the 25F GO bus, you Brampton-haters.

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

mathASKS 149.2

FEATURING PROFESSOR SUE ANN CAMPBELL

hu: WHICH OF YOUR PUBLICATIONS DO YOU FIND THE MOST INTERESTING, AND HOW WOULD YOU EXPLAIN IT TO AN UNDERGRAD?

One of my favourite publications is "Dynamics of an Inverted Pendulum with Delayed Feedback Control." It was a collaboration with Prof. Morris from my department and two very talented undergraduate students. I like this paper as we had a lot of fun working on this project. Balancing an inverted pendulum is a classic control theory problem. The basic idea is like balancing a pencil or stick on your finger. How should you move your figure to keep the stick balanced? There are well-known answers to this question (which are studied in AMATH 455), which rely on knowledge of the position and velocity of the pendulum. Now suppose that you don't have access to the current position and velocity of the pendulum but only the values at some time in the past. In this case, we say the system has a time delay. This is exactly the situation in the stick balancing problem: it takes some time for the information from your eyes to get communicated to the brain and then for the brain to tell your finger what to do. How will the system react if it is designed to use current information, but only has past information? What we showed in the paper is that if the delay in the system is large enough then the nonlinearities in the system can cause the pendulum to oscillate about its inverted position. This was interesting as control theorists would generally think that if the time delay is large enough the pendulum will just fall down. The fun part was that we implemented our ideas in an experimental inverted pendulum system and showed that our predictions based on nonlinear analysis were correct! The pendulum did oscillate.

ABALD MAN: WHAT WAS YOUR THESIS ABOUT?

My thesis was about how symmetry in differential equations can affect the the types of solutions that occur. It was motivated by some models that arose in a study of fluid flow over airplane wings. In particular, introducing bumps on the wings of airplane changed the symmetry in the model differential equations and hence the solutions. For those who have taken some Group Theory, the symmetry changed from a continuous group, $O(2)$, to a discrete group, D_n.

BOLDBLAZER: I TOOK AMATH382 LAST TERM, TAUGHT BY BRIAN INGALLS. HOW SIMILAR WOULD YOU SAY THE TOPICS COVERED IN THE COURSE ARE COMPARED TO YOUR WORK?

The part of the course on modelling the membrane potential of neurons using the approach of Hodgkin and Huxley is very similar to some of my research work. We use this kind of framework to study the electrical behaviour of individual neurons and networks of neurons. I am also interested in how some genetic mutations can lead to neurological diseases either by affecting the function of individual neurons and / or the communication between neurons. So the parts of the course on genetic networks and intracellular communication are also relevant.

XX_420SONICFAN69_XX: HOW CAN ONE PREDICT WHAT NEURONS WILL GET ACTIVATED WHEN GIVEN LIKE AN INITIAL SET OF NEURONS AND HOW THEY PROMOTE/INHIBIT OTHERS (OR HOW DO YOU GO ABOUT ANSWERING THIS QUESTION)?

To answer this question, I would try to find out some important information about the structure of the system. How many promoting vs inhibiting neurons are there? What is the intrinsic behaviour of the promoting and inhibiting neurons, i.e., how do they behave when they are not connected? How are the neurons connected? Does each neuron receive inputs from both the promoting and inhibiting neurons? How many? Are there significant time delays in the connections?

SQRT(CAUSE): READING THROUGH YOUR JOURNAL AFFILIATIONS I WAS STUCK CONSIDERING WHETHER I READ THE TITLES CORRECTLY. MAYBE I'VE GOT STINKY ENGINEERING BRAIN, BUT ISN'T LIKE, MOST SCIENCE NONLINEAR? YOU CAN MAKE APPROXIMATIONS OVER REGIONS, BUT BREAKDOWN CHARACTERISTICS MAKE EVERYTHING INTERESTING AT THE EXTREME. THAT BRINGS ME TO MY QUESTION, WHAT PAPERS WOULD YOU REJECT FOR BEING ALL TOGETHER TOO DARN STRAIGHT-LINE-LIKE?

Although this wasn't technically part of the question, the point of the journal when it was created about 30 years ago was not that science is nonlinear, but to bring together scientists interested in studying that nonlinearity in different ways and contexts (theoretical, computational and experimental).

My main reasons for rejecting papers are:

1. The results are wrong, i.e, there are major flaws in reasoning that can't be corrected by revision.
2. The results are not new. This is not necessarily due to plagiarism by the authors. There are many, many journals and it can be hard to know if something has already been published. Some research crosses disciplines, say between Applied Math, Physics and Engineering. Each discipline tends to use their own terminology—which can make it REALLY hard to know if the same result has been published in a different discipline using different terminology.
3. The results give a very small improvement/change to previous work.
4. The work is not appropriate for the journal. In this case I usually suggest an alternate journal.

CIX: WHAT KIND OF MUSIC DO YOU LIKE?

Classic Rock, Alternative Rock

PREDAP: WHAT'S A PLACE YOU'VE ALWAYS WANTED TO VISIT THAT YOU'VE NEVER GOTTEN TO?

Nunavut, in the summer when the sun never sets.

CLARIFIED: WHAT IS YOUR FAVOURITE BIRD?

My pet lovebird, Hermy, told me I have to answer "lovebird" or she will bite me. (She is sitting on my shoulder as I write this.) As far as wild birds go, I do like the red-tailed hawks that can sometimes be seen flying over campus.

TENDSTOFORTYTWO: WHAT'S YOUR FAVOURITE COMFORT FOOD?

Chocolate.

profQUOTES

CO 380: LOGAN CREW

❝ 11 m is not 11,000 km; that is extremely bad math.

❝ This is another good problem solving [technique]: read the problem.

CS 338: MICHAEL LIU

❝ I'm so sad that you don't have a life.

EXTRA mastHEAD ANSWERS

maple-flavoured Heinz beans mixed with the cheapest sliced processed hot dog weiners, a dusting of black pepper, an shot of worcestershire sauce, and to tie it all together, an entire half cup of blackstrap molasses 😍

MOLASSES

Chef Papa Tea and Noodle's Hokkaido Shio Pork Bone Ramen (Sea Salt Original) with Japanese style ramen noodles, stew beef brisket, dried seaweed, it comes with an egg, right? Ooh, can I also get the Hokkaido Milk Tea and-

SKIT

stick

STICKENJOYER

CANADACTUS

DESCRIPTION: *A cactus with a goose head coming out of the top with a bandana. The goose is holding a balloon and there is a smaller blue bird on a branch.*

It's cold. It's really cold here. And the gooses, they honk. Honk, not honk, they scream! And hiss! Can you imagine, 29° in MAY? The sweet stabbing hiss of the flightful bird right in my face, neck lengthening threateningly. The cactuses are no more, but the spikes of the beast's tongue is seared into his memory. Dive bombing like the fumes of the onions that don't stop balling. And they don't stop coming. But the swallows are nice, not the kind in your throat but the kind that sits on the wood by the tree and grows and shrinks, sometimes plopping down with a nice blue halo. Perhaps the beats aren't all that bad, for they helped eradicate their food. What do they even eat? As a non-native I'm not sure. But have you seen the ice that replaces the sand and the Justin that replaced Paul Rand? This sure is a place. Is Chicken Florentine the same thing as chicken fluoride? What's my name again? Can we discuss the syrup? I've never seen it's tree but I've heard they're big. Do they have the same honey, the same bees? The same butterflies running through the leaves? Where my longhorn becomes a warrior and my work becomes soft soft bed and friends, the sanity is conserved but the rest is not. But alas I have forgotten that the sand is still here, and the beaches are still here, and they're not very good beds but they'll due. (Or is it do?) For those brave enough to look, there is a secret message encoded here.

COMFORT FOOD

profTHOUGHTS *149.2*

Since midterms are approaching, it seemed like a good time to share some of my recipes for my favourite comfort food—chocolate. These are all old recipes and so the measurements are not metric.

CHEWY BROWNIES

From *Food that Really Schmecks* by Edna Staebler, which is a cookbook of Mennonite recipes. Edna Staebler was a journalist and author from Waterloo. There is a local public school named after her.

- ½ cup butter
- 1 cup brown sugar
- 1 egg
- ½ cup cocoa
- 1 teaspoon vanilla
- ½ cup flour
- pinch of salt

1. Preheat oven to 350F. Grease an 8"x8" square pan or 9" round cake pan.
2. Mix the ingredients in the order given and bake for 20 minutes. Cut into squares. The brownies will be soft and seem to be not finished but that's how they are meant to be. This is why they are called "chewy" brownies.

VARIATIONS

The original recipe calls for 1 cup walnuts. I never ruin my brownies with nuts, but some people like them that way.

If you want to up the chocolate level, replace the cocoa with 2 squares (ounces) of baking chocolate, melted.

CHOCOLATE CHEESECAKE MUFFINS

From *Muffin Mania* by Cathy Prange and Joan Pauli, who are also Waterloo Region locals. If you like muffins this is really great cookbook, which is unfortunately out of print. You can still find used copies online.

Makes about 12 standard size muffins.

- 1 3 oz. package of cream cheese, softened
- 2 tablespoons granulated sugar
- 1 cup all purpose flour
- ½ cup sugar
- 3 tablespoons cocoa powder
- 2 teaspoons baking powder
- ½ teaspoon salt
- 1 beaten egg
- ¾ cup milk
- ⅓ cup cooking oil

1. Preheat oven to 375F.
2. In a small bowl, beat cream cheese and 2 tablespoons of sugar until light and fluffy. Set aside.
3. In a large bowl, stir together flour, ½ cup sugar, cocoa, baking powder and salt.
4. Make a well in the centre of the dry ingredients. Combine egg, milk and oil. All all at one to dry ingredients, stirring until just moistened. (Batter should be lumpy.)
5. Spoon about 2 tablespoons of chocolate batter into each greased muffin cup. Drop 1 teaspoon of cream cheese mixture on top and then more chocolate batter.
6. Bake for 20 minutes.

CHOCOLATE CAKE THAT MAKES ITS OWN SAUCE

This is my mother's recipe. I'm not sure of its origin.

Makes 4–6 servings.

BATTER

- 1 cup flour
- 2 teaspoons baking powder
- ½ teaspoon salt
- ¾ cup white sugar
- 1 ½ tablespoons cocoa
- ½ cup milk
- 1 teaspoon vanilla
- 2 tablespoons oil or melted butter

TOPPING

- ¾ cup brown sugar
- 1 ½ tablespoons cocoa
- 1 ¾ cup hot water

1. Preheat oven to 350F. Grease a 1.5 quart casserole.
2. Sift flour, baking powder, salt together. Mix in white sugar and cocoa.
3. Add milk, vanilla and oil. Blend well and pour into casserole. Mix together brown sugar and cocoa and sprinkle over batter. Pour hot water on top (do not mix in). At this point, it may look like a kid has been playing with mud in your kitchen, but have faith and put it in the oven. It will turn out fine.
4. Bake for 35 minutes or until toothpick inserted in the centre comes out fairly dry. Serve warm. You can reheat the leftovers (if there are any) in the microwave.

Prof. Sue Ann Campbell

PMAMC&OC WEEKEND UPDATE

RETURN OF THE KING

Hello hello! It's been a while since we've done one of these — *we* being the Pure Math, Applied Math and C&O Club, or PMAMC&OC, pronounced P-M-C). Can you believe that clubs used to just post updates like these *every issue* in **mathNEWS**? That was just the normal thing to do back in the day. Seriously, read through the archives! In any case, I'm of the belief that this is a tradition that ought to be brought back, if for nothing else but to further expand PMC's ceaseless propaganda machine. Let's see what's new this term…

CUMC

PMC is once again (in a loose, associated way) banishing 30 students — this time to the depths of Quebec City — to learn about cutting-edge math, at the Canadian Undergraduate Math Conference. What's that, you say? For free? July 13–17th?? And the deadline to apply is— TODAY?! Today! Friday! Why haven't you applied already?! Go on, get to it! https://bit.ly/UWCUMC2022

SASMS

Short Attention Span Math Seminars! We here at PMC pride ourselves on our excellent acronyms. If you're in the market to give a 20–30 minute talk about some cool math, send an email with a talk title and (very short) abstract to pmclub@gmail.com, or let me (Evan) know in-person or over Discord. Serious Math is welcome, as well as Math That Mostly Exists To Make People Laugh, and anything in between. The date will be announced at the leisure of the executives… And while I'm here, pro PMC tip: a SASM is a Short Attention Span Math. Keep that in mind next time you call a singular SASMS talk a SASM…

PROBLEM OF THE WEEK

PMC's all-knowing VP {PM, AM, C&O} are working 'round the clock this term to produce Weekly Problems which are Of The Week, and which offer to some correct solutions a prize which is estimated by our in-house analysts to be of a higher value than the empty/trivial prize. Sometimes, the prize is a drink from Tim Horton's. Sometimes, it's the friends you made along the way. The only way to find out is to try! Join the club Discord to see the current one… a link to the Discord can be found in the club office (MC 3033).

RETURN OF THE POP

The beloved, merciful PMC executive had a successful outing to Costco Wholesale a few weeks ago, acquiring various snacks for MathSoc Clubs Day And Also For Other Events I Guess. A smaller strict-but-still-all-powerful subset of the PMC executive, {VP Pop}, more recently successfully summoned a wide selection of pop for distribution in the PMC club room. Pop and other sugary drinks are now for sale in MC 3033 for very cheap prices, even cheaper if you're a PMC member — just like old times. If you're not already a PMC member, now's the perfect time to turn a new leaf!

That's it for this week. The Over 9000 contest is also happening this term. Plus something else maybe. Keep on the look out for prof talks; there may be one in your future…👁 In the mean time, we invite you to make the customary pilgrimage to the PMC club room in MC 3033 to witness the blackboard during irregular service hours.

'Til next time,

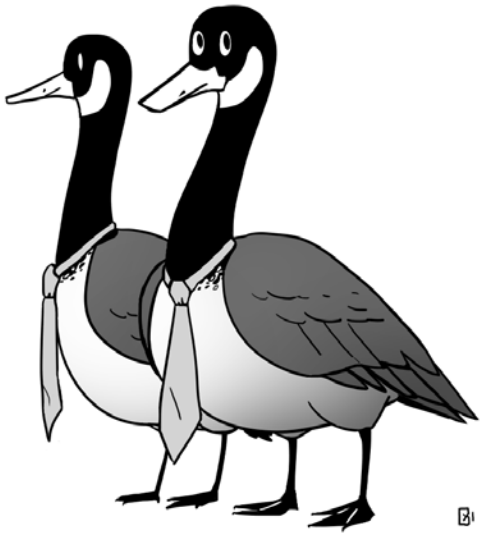
Evan Girardin
President, PMC

MC IS THE BEST SMELLING BUILDING ON CAMPUS

A GENUINE STATEMENT FROM THE BOTTOM OF MY HEART.

For real, when I stepped into M3 third floor through the channel from MC, I immediately smelled at least three types of toxic scents typically found in newly renovated buildings. Like god how could the statistics people work in this environment? What happened to people's awareness of working health issues? In comparison, MC smells not less awful than M3, but at least sweat is organic and could've done nothing to your long term health. I would rather finish this article among a bunch of old classic chalkboard and math students frying their brains out for midterms than sitting in this shining and fancy new building while breathing the air that's only less toxic than that from my developing home country. SOMEONE PLEASE FIX THE AIR QUALITY IN M3!

loop



THE GOOD TIMES

When I was a writer, we had grit. We never complained the way the writers today do. We didn't need coddling from the elements. When the Submit button sent our articles into oblivion we didn't whine, we didn't cry. We picked ourselves back up. We typed it out again, and we submitted it again, and again, and again, until by Christ the Submit submitted. What didn't kill us made us stronger.

Back in my day, there was no such thing as "issue size." No one suffered from "Temp Reject" then. We halved the font size, we slashed the margins, we redacted our lines and read between them. There were no flimsy excuses standing between us and publication. We had editors back then, true editors, constitutional editors, elected-by-the-people editors, stood-for-the-flag-and-knelt-for-the-cross editors. God, where are they now?

We had work ethic then. We tagged our articles manually. And when we didn't know the volume or edition number, we looked for it ourselves. We didn't wait to be spoon-fed. We put our subtitles at the top and our pseudonyms at the bottom. We didn't need any special fields or buttons or whatever Devil-incarnate whatnots the kids nowadays have concocted. We didn't shy away from good, honest labour.

In those good old days, we were free. We wrote wherever and whenever we pleased. Articles were never locked, before or after completion. With red blood rushing through our veins we would type away on Tuesday noons, back and forth, wrestling for editing control from the EDs. We were alive. It was our birthright, and they took it away.

I still remember when the blues were bluer. From the buttons to the hyperlinks down to the littlest of UI elements, it was darker. It pulsated with life, it fed our words. It's diluted now. We're diluted now, shadows of what we were.

When I was a writer, we were writers.

hu

[Editor's Note: Submit. 😷]

No, UW is not the MIT of the north. What a ridiculous idea. If anything, MIT is the UW of the south.

BRAD LUSHMAN

NOT GONNA BE ACTIVE ON PROD NIGHT TONIGHT

Not gonna be active on prod night tonight. I'm writing an novel (a real one) in half an hour in Scrivener (wouldn't expect a lot of you to understand anyway, you probably only use Wordpress) so please don't DM me asking what I'm writing (im writing my novel, at starbucks, in Scrivener, on a MacBook Pro 2022 16 Inch in Rose Gold, ok) you'll most likely get aired because I'll be writing the novel (again I don't expect you to understand you n things writing beta) it's actually very interesting and my Scrivener organization habits and Vente Vente Lavender Oat Milk Frappe is not a situation i can pass up for some meaningless Discord degenerates (to write an novel, in Scrivener, not that you are really going to understand) this is my life now. Writing novels at Starbucks and not wasting my precious time online, I have to move on from such simple N things and branch out to writing Real Literature (you wouldnt understand, because you are alone and afraid of the spell checker tool)

CC

HOW TO GET COOP

1. Cry
2. Do CS240 and not finish
3. Cry
4. Cry
3. Please someone give me a job please
6. please
17. I only want 50/hr USD in cali tho
5. Cry

Buterin

FIXING A MEMORY LEAK

Hi! You might remember that in the article *Operation Memphis: Installing and Using Windows 98 in 2020* in **mathNEWS** 143.1, I said:

> *You might notice that 1 GB = 1000 MB is a bit bigger than the maximum 768 MB. Keep that in mind for later.*

And then I never referred back to this fact again. If you followed these instructions dutifully, you have one fact allocated in your mind that I never told you to deallocate. For two years this fact may have laid dormant in your thoughts, taking up space but remaining inaccessible.

If that's true for you: I'm sorry, memory management is hard, you're `free()` to stop keeping that thought in mind now.

tendstofortytwo

THE PERFECT CONVERSATION

Little known fact about me: I have a somewhat peculiar hobby. This is a hobby I take very seriously. Maybe not quite at the professional level, but trust me, I'm no amateur. This hobby of mine, it's about having conversations.

As a girl who has been told at every stage of her life (by parents, friends, and ex-boyfriends alike) that I need to "think before I speak," I am OBSESSED with choosing my words precisely. A conversation is serious business! It requires preparation, editing, and careful reflection. In a world of tic-tac-toe and connect-4, a conversation is a chess match.

My curiosity about communication naturally started where any 13-year-old girl finds excitement: sexting. This curiosity blossomed into an infatuation while boys on the other end of a texting chain were gripping their still-hairless members in between Minecraft speedruns. Oh the power of words! Words words words, Hamlet had said. Wasn't he right? With less than a hundred characters, I could feel such vivid emotions, and make another human being as well. And not to toot my own horn, but I was quite the slick sexter. Oh, have I composed essays in my head about the conventions of punctuation in sexts! The importance of not capitalizing texts, the arousal of three little dots in a row, or the visual aesthetics of a spelled-out moan! Let's move on before this gets out of hand.

I'd like to say I'm all grown-up, and my childish days of sexting are over. Nowadays, all of my texts are crafted with the precision of a woodpecker (my writing really only lacks in longer prose pieces and published articles). It's become practically instinctive to imitate someone's texting style, their punctuation, their density of emojis per word, et cetera et cetera. But I think everyone does that. I think that is a technical skill which anyone with a digital device and two opposable thumbs (or less) has picked up already. Now the trickiest thing is excelling in the hardest course in university: PEOPLE 101.

So texting is great! You get to think about what you'll say. But that's like playing every note that's written on a piece of sheet music slowly, on your own, in the damp basement of MC where no one can hear you practice. Nobody got time for that while you're improvising a blues scale in the middle of a performance! No, no, the challenge in conversations is when they're happening in real-time.

But where there's challenge, there's reward. Good improvisation is beautiful because it is just that: improvised. And just like a professional trumpet player can improvise a beautiful solo on the spot, all it takes is practice—and knowing the pentatonic scale inside and out. Boy, I'm really digging these jazz metaphors.

I practice. I practice having conversations everyday. Not just by talking to people, but by actively thinking about what I'm saying and what others are saying. There is an art to being an interesting person to talk to, and I am on a mission to master this art.

❦

"I'm meeting some friends way back from high school later today."

A. *Oh, nice. Which high school did you go to?*

Fucking hell, this is the most uninteresting question about the most uninteresting information that no one gives a crap about anyway. Biggest missed opportunity since that caveman sat beside his bread with a knife in his hand but didn't invent sliced bread.

B. *Cool! Yeah I met my friends from high school too recently…*

Aha! Classic misdirection, and only a taste of what my inner narcissist is capable of saying.

C. *High school? That was so long ago! How have you kept in touch with them for so long?*

A little more personal; still superficial. Think!! I can do better than this.

D. *Oh wow, I bet so much has changed since then, I mean, you're a different person, they're different people, how do you think it'll go?*

I like this one. A bit wordy and maybe philosophical but at least it's interesting!

Fuck-ups. I'd like to talk about fuck-ups now. Because as high-handed as this article has seemed so far, the reason I'm writing it is because I have fucked up so much. There's a timid person inside of me that gets out when I lose track of what's going on. I wish there was a pause and replay button. See, because I know when the conversation's not gone where I wanted it to go! And all of a sudden it's off track and I'm behind trying to catch-up but they've moved on and I was thinking about this and I open my mouth—

They're looking at me. What did I say? I just fucked up. Scratch that, erase, delete. Let me have a moment to collect my thoughts. That was wrong. I want to go back and replay my moves. This chess match is a losing game, and suddenly the conversation is over and the people have moved on and I screwed it up because people aren't forever and the time to talk with them is not forever but that memory you have trapped in your brain is forever.

A good conversation is a tree in my mind, and you can't always control where the branches go. Sometimes a branch gets stuck in a whirlpool and I don't know how to get out. Like when two people are excitedly talking about courses (superficial nonsense but obviously still relevant to discuss because lives are complicated and superficial and it can't all be spiritual nonsense, no, there's a time and place for that) and the others are blankly staring, listening, unable to change the flow but

having no interesting input either. I can't get out of this one, oopsie doodles.

But I don't believe that people should go back in time in conversations. I have a hard and fast rule that if I get interrupted, then I move on. Whatever it is I wanted to say probably wasn't life or death, and there's no reason to derail the natural flow of a conversation just to finish telling that story about your great aunt's cookies or whatever. Let it flow, it's alright.

That's another thing—stories and anecdotes are like eggshells. Me me me me me I wanna talk about me. It screams in my head. You have to captivate your audience. Attention is a fragile thing, oh so fragile. You are honoured with 3 seconds to prove yourself a worthy speaker. A sideward glance and suddenly you've lost it. Finish your sentence, wrap it up, let's go! The crowd has lost interest. And there's very little to say after a punchline. You ever notice that? A punchline will either end in confusion (shoot, go fish) or laughter and then silence! No one pats you on the back for making a room laugh. Great. Now what?

Now I practice. Practice again and again. You have the vocabulary and you have the thoughts to make communication more empathetic and exciting than *Foundational Training Program for Peer Leaders: Module 2*. I'd like to be a charming, charismatic (British) person when I open my mouth, not a timid awkward teenager or loud obnoxious child. Sorry, what did you say?

❦

"Oh hey, I didn't see you there! How's it going?"

A. *"I'm good, how are you?"*

B. *"Monday morning—boy it feels early!"*

C. *"Not bad. How was the Celtics game this weekend?"*

D. *"Absolutely famished, let's go have lunch together."*

E. *"Just sat through the most unbelievably dull class. You ever wish God would smite you right on the spot?"*

F. *"Hi! Yeah I'm quite tired, I've been walking around this building for seven hours hoping to bump into you."*

X Student

Answer Key:

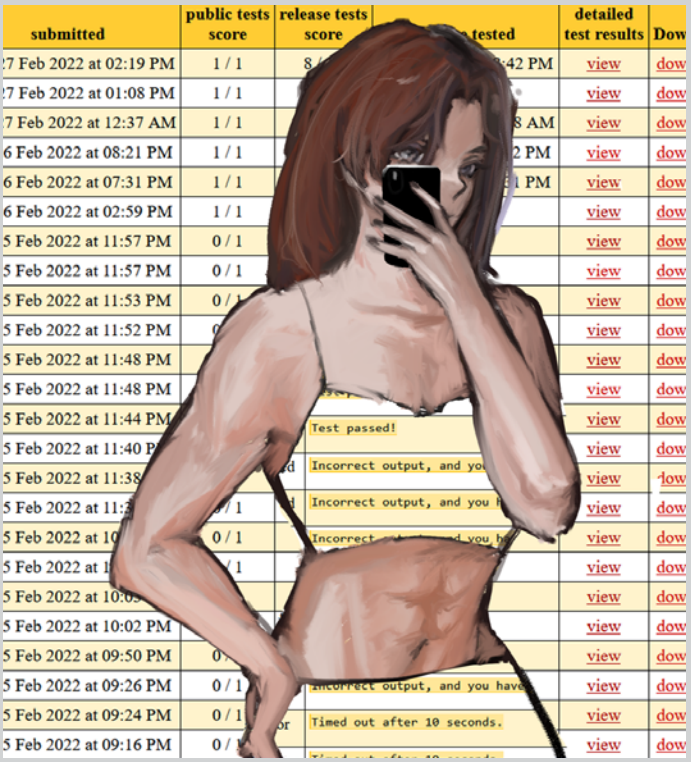
A. The single most boring response in existence
B. Guaranteed to get a polite smile and fulfills the role of an empty but charismatic answer to a useless question.
C. Only works if your conversation partner *really* likes the Celtics.
D. I'd use this to flirt
E. Might be a bit too intense. Use sparingly.
F. Perfect

N INSULTING PICKUP LINES

- Hey, let's exchange numbers. You're a 2, I'm a 10.
- Did you fall from heaven? Because wow, your face is messed up.
- Hey, wanna go back to your place? Because you are really killing the vibe here.
- You're so beautiful, I can't put it into words. But I can use numbers. 4/10.
- You remind me of a flower. Because something about you is bugging my allergies.
- Hey, wanna fuck… ing leave me alone?
- I had the most wonderful dream about you. You were dead.
- If being sexy was a crime, you'd probably still end up in jail for unrelated reasons.
- On a scale of 1 to America, how free are you tonight? Taking into account all the sociopolitical issues America has, of course.
- What does it feel like to be the most gorgeous person in the room? Let me know once everyone else leaves.
- Hey, doing anything later? Yeah, didn't think so.

someBODY

MARMOSET-CHAN GOES ON TINDER



couch

THE EPIC QUEST FOR FINCHEY

Over last term's break, I was reading **mathNEWS** issues
With one term left in 'loo, I was reaching for the tissues
Then I got shocked by an author, in surprise almost spat
Cause I saw Finchey wrote a poem, a pretty great one at that

I said "I'm the poem guy!" and was furious
But even more than that I was curious
Who could that author be, so shrouded in mystery
Taking my territory so their finder must be me

I embarked on my journey and began my pursuit
To the one place on campus that could give me a clue
I reached the **mathNEWS** office where an editor read
For the sake of this poem I shall call them editED

ME

Hello editED, we have been friends for a while
Could you help me track down someone who stole my style?
Finchey started writing poetry so for my own peace
I want to know who they are, and ask them nicely to cease

EDITED

This info can't be divulged for both of our sakes
Once an author is exposed their name can't be faked
So instead of finding Finchey focus on your own submission
mathNEWS is a hobby paper, don't you make it competition

You write many poems in your volition
But they aren't yours to claim
So if sonnets got you bothered you're the only one to blame
What is being hidden is way bigger than pen names
You should quit this search or things will never be the same

ME

I'm begging you editED, please don't get me discredited
I only came down to you since it's my last term in 'loo
As I think I have shown I really love writing poems
And I just wanted to know who could be stealing my show

EDITED

I feel like I should help you 'cause you wrote here a lot
Though I could not answer you whether I wanted or not
So this is what I'll say for this insane quest to stop:
Finchey's name is kept a secret by someone at the top

❦

Once I received this hint I knew they couldn't be lying
So what I heard has sent shivers all the way down my spine
Only one man at the top could ever keep such a secret
No one would dare to speak it, but I knew I must seek it

This man had to be Feridun, who I somehow have found
And he came to confront me once I made a slight sound

FERIDUN

In the past, a time vast, my name would spawn fear
Now I'm tired, retired, I've made it so clear
So it's true that our students are bored in fourth year
'Cause you come down to my town
What brings you forth here?

ME

Honoured Feridun, the greatest Waterloo president
I would never dare disturb your sacred house and its residents
I came to ask for your help and right now I'm quite hesitant
But would you tell me Finchey's name
And provide me some evidence?

FERIDUN

I should have known a student with an ego so brash
Could only come from the math club with way too much cash
I once tried to close **mathNEWS** but I quickly got threats
By your first author who controls all like marionettes

So if you're looking for someone to help your silly game
You should go and find him. John **mathNEWS** is his name

❦

I wasn't sure if that's the truth but I still wasn't bothered
Finchey's poems would stop if their identity's uncovered
So I was willing to climb all the mountains and hills
That hid away the first writer, if he was even real

And suddenly in woods remote I noticed a cabin
Shaped exactly like MC, and inside he was hiding
I knocked on his door and said my apologies
He was sitting and waiting behind stacks of anthologies

JOHN mathNEWS

I'm the creator and **mathNEWS** inventor
I wrote the first issue on my pen and paper
So I have my issues with procrastinators
Whose time is so misused to ask me for favours

You don't need to bother begging. I know who you are
And I know what reason took you to this place so afar
You asked around for Finchey but nobody would speak
But be honest with me, what is it truly you seek?

ME

I thought I wanted to bring Finchey's name to the light
But I can see how this quest can come off full of spite
I wanted all to know the poems as mine right on sight
'Cause I truly just want readers to remember me right

JOHN mathNEWS

Your need for legacy, it's so logical
But let's dive into the psychological
Your care for **mathNEWS** is pathological
It's just a student journal, not your chronicle

ME

Writing poems for this paper helped me find my spark
Which I'm afraid that post-grad will turn off and go dark
So before I will go I wanted to leave a mark
That at least will be good ending for my character arc

JOHN mathNEWS

Finchey's poem made you sore like all of poetry's yours
But we both know you're not a purist poet at core
So there's for sure some unique aspect ignored
That made the poems that are yours distinct than any before

ME

I guess you are right, so far I've tried to write stories
To show what I've been adoring
With badly veiled allegories
And I have tried my best to stop the readers from snoring
By using what I find funny to make my poems bit less boring

That's my unique angle, my own place in this paper
But how does this relate to Finchey's name in this fable?

JOHN mathNEWS

I think you can see that Finchey isn't an author
It's a concept—not person, that shouldn't cause you to suffer
But it will always exist to make our writers go further
To see the pieces they've written are all unique and therefore art
So keep this in mind next time your thoughts are disparaging
Who else in right mind would write their verses VS. Feridun
And now you should go outside, forget the burden you carried in
Because the truth I'll provide is **mathNEWS** will be within you still
When uni's behind you, it'll remain in your heart fulfilled
Because it is a state of mind, you can't forget it all like a skill
And it will always remind you of the writers who helped you feel
So keep the memories you piled, I know the others forever will

❦

So that's my thanks to the Fincheys, and my thanks to **mathNEWS**
Now I've found what's within me, and I know what's my muse
And I'm nowhere near done here, got 3 months left to lose
But concluding this brought tears, left me slightly confused
Cause I know it's not over, I can always write more
There's no reason to sober, prod night has open doors
But it won't ever be matching what it had felt like before
So each new issue we're passing makes me more thankful and sore

I hope I have been clear, this club can turn lives around
Despite my leaving causing fear, I'm glad it's one that I've found
It feels so weird to treat a poem like a goodbye to your friends
But I don't have to. I'm still here

I will be here again

methNEWS

YABBA DABBA DOO

Is a video game based on the Flintstones. Today I learned!

Other things I learned today:

1. Sometimes, your lips look really gross, dry and chapped after eating half a family-sized bag of Miss Vickie's Salt and Vinegar chips. You know, the bad boys in that iconic blue bag.
2. I have no self control when it comes to chips that burn your lips on impact.
3. *The Princess Bride* is playing on June 3rd, 2022 at the Princess Cinemas (Original, not Twin)! Tell all your friends. $11 for us poor student peons.
4. The sunshine warms you up on a sad walk home from work :)
5. If you take more than 2 minibags of Miss Vickie's Salt and Vinegar chips from the snack area at your office, your coworker will look at you a little concerned, but they will be far too nice to press it.

Now that this list has five (best number) items, I will rest easy. Yabba Dabba Doo.

yummyPi

SOUP

WITH BEANS

moist or dry?

in your soup,

with beans

good soup

SONIC THE HEDGEHOG 2: A RETROSPECTIVE

WHAT I GOT RIGHT AND WHAT I GOT WRONG

In February of 2020, I stepped into theatres for what would be the last time in two years to watch *Sonic the Hedgehog*. In the following issue of **mathNEWS**, I wrote about my predictions for the then-not-yet-confirmed *Sonic the Hedgehog 2*.

A few weeks ago, I returned to the theatres for the first time in two years to watch that very movie.

Let's cut to the chase — what did I get right? And what did I get wrong?

WHAT I GOT RIGHT

- The character Tails, introduced in the post-credits scene of *Sonic 1*, **does** play a major role in the plot of *Sonic 2* — no secret if you've seen any trailers or film posters.
- The chaos emeralds **are** a key plot device (in their amalgamated form as the all-powerful Master Emerald), and, like in the games, their origin is never explained.
- The tribe of echidnas from the first film **do** reappear, and Ken Penders **did** sue — or, at least threaten legal action.

WHAT I GOT LESS RIGHT

- Knuckles does not appear in the post-credits scene as a teaser, since he is one of the movie's main characters. However, I *did* predict a third movie, and we do see get to see [REDACTED] during the credits, so…
- Sonic doesn't *really* go through a teenage rebellion phase and run away from home, but we *do* see him get separated from his adoptive human parents from the first movie, Tom and Maddie, and go off on his own adventure. And there *is* a montage of him trashing the house during a party while Tom and Maddie are off at her sister's wedding in Hawaii.
- There was not a single mention of the Sonic Drive-In fast food chain. There was a delightful reprise of Olive Garden brand placement though.
- Shigeru Miyamoto did not design a Mario model to be used in this movie. In fact, there was no cameo of Mario in the movie. In fact, there were never any plans to include such a cameo in the movie, whether it was a CGI model or a man in a Party City costume. But Ugly Sonic *did* make the rounds recently for his inclusion in *Chip 'n Dale: Rescue Rangers*, so there's that.
- Knuckles was not voiced by Dwayne "The Rock" Johnson, but by Idris Elba. But I'm not complaining.
- Solo Jim Carrey scenes did not take up 75% of the movie's runtime.

❦

So, basically, if you think about it, I was pretty bang on, even for things that *seemed* to be a bit off the mark at first. What can I say? I'm good at what I do.

If we continue the pattern set by *Sonic 1* and *Sonic 2*, *Sonic the Hedgehog 3* should come out in 2024. What will happen? Well, first of all, I'll hopefully have graduated and moved on from this paper by then (so no follow-up article), and second of all — well, to make a long story short, they're going to faithfully adapt the plot of the game [REDACTED]. With [REDACTED] and [REDACTED] and the horrible [REDACTED] on the [REDACTED] and all. Consider yourself enlightened!

Finchey

ASSUMPTIONS ABOUT THE PRINCESS BRIDE FROM SOMEONE WHO'S NEVER SEEN THE PRINCESS BRIDE

In honour of me going to see *The Princess Bride* very soon, here is a list of things I think I know about the movie:

1. There is a princess.
2. There is a bride.
3. The princess and the bride are probably(?) the same person.
4. Some quote resembling "You killed my father, prepare to die."
5. Apparently, it's really terrible that I haven't seen this movie yet.

Get excited for a movie review article next prod night! Hopefully, it'll be better than the last movie I reviewed, *Elf (2001)*.

peacelovemath

IDK WHAT TO WRITE

I just wanted pizza.

pizza-enjoyer

INSTRUCTIONS ON THE BACK OF THE INSTANT INTIMACY PACKET

OR: WAYS TO FALL IN LOVE WITH HUMANS

METHOD 1
potency: tipsy

find some excuse to dim the lights. try stargazing, karaoke, 3am walks, "hey I got new candles", and "check out my RGB/ fairy lights!" bonus points if you're sleepy (it's like being drunk but less expensive). you'll be surprised what people say in the dark—it makes us braver.

METHOD 2
potency: cosy

there's something to be said for domesticity—cooking, cleaning, and doing manual labour in the company of others are all surprisingly good bonding activities. try: dinner parties where you make the dinner together, volunteering at an overnight event, going camping, or building something with your hands from scratch.

METHOD 3
potency: electric

get scared together. push each other down sidewalks in a shopping cart. play manhunt in the dark. swindle your way onto rooftops and watch sunsets from the edge of your world. ride roller coasters and traipse over suspension bridges. or just submit your assignments at 11:59pm next to each other on the couch and exchange an achingly good high five/hug afterwards.

METHOD 4
potency: intoxicating

play a game of probing questions. look up "36 questions to fall in love" or "we're not really strangers" or make your own version of those or just play truth or dare. go from "what would your perfect day look like?" to "when was the last time you cried in front of someone else?" and boil each other like frogs in an increasingly vulnerable soup. (this one is dangerously potent for romance and wonderful for friendship.)

METHOD 5
potency: time will tell

steep it like cold brew—don't rush. let your relationships be guided by sincerity and serendipity, but always make an effort when they need it the most. show them that they're worth your time.

perhaps the ones you can really lean on are tested by time; perhaps the other ways are quick thrills that contribute little to the foundation. that's not to say they're not worth a shot. I know I haven't figured it all out myself. what I do know is that giving other people a chance to love you is the most terrifying thing, and that it's always worth doing.

florence

N WAYS TO DESCRIBE MY BOYFRIEND

- he has a magnetic personality
- he brightens my day
- he keeps me warm
- he makes flowers bloom, songbirds croon, and sunbathers swoon
- he is 99.9% hot air
- he leaves marks on my neck
- ancient civilizations would call him a god
- the world seems darker when there's something between us
- proficient at nuclear fusion

vanGoghLover

WE NEED MORE ICE CREAM!

What's ur favorite Ice Cream flavour?

Mine is **Vanilla** ;)

[Editor's note: Mine is orange.]

eliastardust

You can drink, you can have sexual relations with whoever you want, but you can't use GOTOs.

PROF. TROY VASIGA

MASTER OF TIME

John once lived in a world very much like ours. Every morning, he would wake up at the same time and eat the same breakfast. Every day, he would work the same shift in the same office cubicle. Every night, he would return home at the same time and watch the same artsy movies. Day in and day out, come sun and moon and stars and rain, John lived in a world very much like ours.

But one morning, something remarkable occurred. John was pouring milk into his bowl of Golden Flakes when suddenly, there was a hiccup. Or maybe it was a rip in the fabric of space-time, or a blip in the consistency of metaphysics. It's hard to say for sure, but that morning, John happened to stare into his soggy bowl of cereal for a little too long. He saw the flakes swirl beneath the falling milk, and for a brief moment, he could make out a figure far beyond his comprehension. John knew instantly that he had never seen anything like it, and that he would never see anything like it ever again. But as quickly as he had noticed it, the jug went empty, and the figure disappeared forever. John shoveled the cold cereal into his gullet in deep contemplation.

He held the shape of the figure in his mind for as long as he could. He did so while brushing his teeth and tying his tie and walking to work. He caught glimpses of it in the world around him: in the broken branches of trees and in the jagged crevices of sidewalks and in the missing letters of street signs. He saw these things and he smiled to himself. He dodged one, two, three while wandering around aimlessly, but while staring at an old clock tower that only counted seconds, John crashed into the Fourth Person.

The Fourth Person grumbled and told John to pay attention. John apologized. The two of them began heading their separate ways, but as his foot hit the ground, John looked back and called for the Fourth Person, who turned around. He asked them about the figure in his cereal — that wonderful thing he was still unable to put into words — and he asked if they knew anything about it. The Fourth Person thought for a long time before finally telling John to ask again in eight months.

Eight months!? John couldn't wait eight months. Life was short, and he needed to know now. But realizing that this was the only way, he thanked the Fourth Person and headed to work.

John sat at his cubicle and was productive that day, but not the next day, or the day after that. After a week, John stopped showing up altogether, instead choosing to lay in bed and watch artsy movies. But John began to find them dull, so he turned on some sitcoms, which he grew to love more. Characters would stick around for longer.

In the first season finale, John caught another glimpse of the figure. He saw its shadow trailing behind two lovers, kissing as credits rolled down the screen. So John watched another season, then another, then another. Characters would drop in, live their lives on camera for a short time, and drop out. It wasn't long before the original cast had been entirely replaced, but John would continue watching and watching, season after season, people rotating in and out like brief flashes of light, no two the same. John felt every emotion at once and no emotion at all. And it was only once John had seen exactly one hundred thousand seasons of television that he was ready to get out of bed and return to work.

John worked harder than he had ever worked before: so hard, in fact, that he was promoted to Head Cubicle Worker. Unfortunately, the Great Head Cubicle Worker Layoff occurred shortly thereafter, and John was forced to find employment as a mechanic. The work was strenuous and messy, but John found it rather fulfilling, and he felt quite happy until the Great Mechanic Layoff occurred. John then became a piano teacher until they abolished pianos, and a priest until they phased out religion, and a carpenter until they chopped the final tree, and a fisherman until they ate the final fish. One by one, John worked thousands of little jobs for the world for as long as the world needed John's help. During this time, John lived in thousands of different places — large mansions and little apartments, street corners and dark barrooms, cheap motels and silent beaches. John liked the beaches the most: at night, he could rest his body on the sand and trace the figure along the stars of the bright, black sky.

In the meantime, amidst all this change, John would fall in and out of love — one by one, he would marry six hundred women and father twelve hundred children. Each family was different. John was present in some of his families' lives. These marriages would end on good terms, and these children would call him frequently after moving out. But John was absent in the lives of many others. He would spend long summers in his room with his fingers in his ears, sitting up perfectly straight, desperately trying to keep his memory of the figure from spilling out like coffee at the brim of a shaking mug. Needless to say, these marriages ended poorly, and these children would never call him. Slowly, John felt as if the people of the world resembled him more and more, and he grew disinterested in meeting them. And slowly, John lost interest in marriage altogether.

In an argument near the end of his six hundredth marriage, his six hundredth wife asked John if he ever believed she was real. This made John sad.

The stars in the sky would permute, and the trees would tangle in the wind like spaghetti. For a short moment between ugly marriages, John grew fond of a small puddle of diesel forming from the exhaust pipe of his mobile home. He would stare into this puddle for days at a time, making out faint rainbows whose colours drifted apart and grew dull but never quite disappeared. It reminded him of the figure, which he hadn't seen in a while. When John's newest lover begged him to live with her, he refused, not because he couldn't leave the puddle behind, but because he could no longer remember the brand of cereal he saw the figure in.

John no longer lived in a world very much like ours. The characters and lighting and stage pieces would revolve ruthlessly around John. Every time he found his footing, the world would shake him off, just as a mechanical bull shakes off small children at carnivals. But above the merciless spinning of the planet was John's memory of the figure — a small kernel of permanence. There were periods where John did not think of the figure at all — brief times during which he lived life without distraction — but the figure would always re-emerge one day in its fullest power. In times of fixation, John yearned for quieter days — for the days before the figure, when he was just a young Cubicle Worker. But in times of calm, John found himself waiting for louder days — for the next time the figure could cast the muted colours of diesel upon his weary mind.

Much, much later in John's life were the Great Home Reductions. The chairs were the first to go, then the tables, then the carpets, then eventually all other pieces of furniture. John's final home was an empty white box with a coffee machine. John was a tired man.

One morning, John was slumped over on the floor. He was sipping on coffee (no milk), and for the first time in a million years, he was certain something remarkable was about to occur. So he waited patiently until, just as he anticipated, he heard a knock at the door. Excited, John shot up and bolted down the hallway, turning the corner and undoing the latch when suddenly, the Fourth Person flung the door wide open, spilling coffee all over both of their shirts.

And then everything went white, and I began to sob uncontrollably.

❦

Bad day?

Bad week? Bad life?

I've been going through something — something you wouldn't believe.

Something I wouldn't believe?

That's not true. I guess it's just that I don't believe it.

❦

I just want to go back. I feel like I started it all a little too late, like I was propped into the middle of something that had started without me. I want to go back just a little bit — just enough. You know what I mean?

Sometimes.

❦

Yeah, and sometimes, I wish I was incapable of wanting. Like there's a part of me, a little guy in here [points to heart] *that wants and wants and never lets up. I want to kill that fucker, that selfish bitch. I don't want to want. I just want to be. To be content.*

You don't really believe that, do you?

No, not most of the time. Most of the time, wanting feels good. I feel alive when I want.

❦

Why are you looking at me like that?

Like what?

Like you are right now. Why do you look so curious, like you're trying to freeze me in time? When you look at me like that, I'd rather be someone else, someone not —

Should I stop?

— but I mean, all of this only makes me feel weird because I'm inside of me. If I were outside of me, it wouldn't be weird at all. It would just be eye contact.

Is that a yes?

I don't know.

❦

Why did you come here?

To check in on you.

Did you want me here?

I'm not sure.

Actually yeah, I think I might have.

I'm glad we can share this moment.

Me too.

❦

We went our separate ways, as if the coffee had never spilled at all.

χ

SUPER

NIPPLE

twister

lesbian

DEAR JULIE: DOUBLE, DOUBLE, TOILET TROUBLE

Dear Julie,

Okay, let's say you found the perfect girl. She's gorgeous, she's kind, she laughs at all the shitty jokes you stole from Reddit, and she doesn't even care that you own so many copies of The Hangover 2. And sure, sometimes you accidentally call her mom, but she thinks it's SWEET that you have a GOOD RELATIONSHIP WITH YOUR MOTHER, DEVIN! So, in short, perfect.

Now let's say you're hanging out and things get a bit steamy. You had a little bit to drink, it gets a bit touchy, and she invites you over to her place. Jackpot!

You two stumble to her house and just as you're about to spring into action you feel mother nature calling (read: screaming). She leads you to the bathroom and that's when **it** begins.

You rush past her in a blurry haze and before she can get another word out, you slam the door on her.

You don't even notice **it** at first, you're racing against time after all. You nearly tear your own jeans off trying to get them undone before your underwear gets more piss on it than Margaret Thatcher's grave.

The zipper gives in and you pull down your pants. You hum with a sigh of relief when you finally let the dam walls crumble and the Yukon golden river rushes out of you. And as you feel the wave of relief washing over you… the first time anything washed you in at least a month… **it** hits you.

The most disgusting, nauseating smell hits your nostrils like a car t-boning a kindergartener. You clutch your mouth but it's useless, vomit chunks by the pound race up your esophagus, burning on their way out as you splatter the porcelain throne in front of you. Even your puke wants out of here.

You pathetically hunch over in hopes over of slowing the flow, your hands tapered to your stomach as if pressing on it would make it stop like a bleeding wound. But instead, your frail knees tremble into submission, and your withering body keels over, forcing gravity to take the wheel.

Your head comes crashing down on the bowl of the toilet, cracking your skull open with all the ease of a starved man and a ripe coconut. The pain hits first, but it's only seconds more before you're engulfed by a river of a burning hot crimson, pouring into every crevice of your body.

You let it.

As you lie in a puddle of your own piss, vomit, and blood, it feels like a century before you finally find the strength to open your eyes. Through jolts of pain, they flutter open, like a baby deer trying to walk for the very first time… and **it** hits you.

Dear fucking God. It's even worse than you thought.

A carpeted bathroom.

Be honest Julie, I can take it. Is she a lost cause?

Signed,

Charming.

puppy

WHERE TO GO IN WATERLOO?

This weekend, my friend and I finally found the time to visit St. Jacob's market. After spending 8 months in Waterloo, we decided that it was finally time to visit the main (or what seems like the only) attraction in this wonderful city.

Oh, what a beautiful day that was. With only 13 km/h NW wind, a low chance of rain, and a temperature of 20°C, the weather was perfect.

The bright colors of fresh produce were highlighted by the sun. Walmart and Bob's Valu-Mart were nervously smoking on the sidelines. Never in their existence had they seen strawberries so red and cucumbers so green.

During the 4 hours there, nothing could stop me.

Did I need 3 buckets of strawberries? Debatable.

Did I buy them? Most definitely yes.

Buying pizza and churros without having to beg my parents felt so freeing. For the first time since moving away from home, I felt like an adult.

We left right before getting tired of this magical atmosphere so we would want to keep coming back. Though before we come back, we will get more cash because, apparently, credit cards are not accepted there.

Sparkly Moisturizer

Oh no! You're gonna make me do math?

BLAKE MADILL

A DAY IN TORONTO MARKETED TOWARDS ASIAN GIRLS WHO LIKE TO THRIFT

Bored at home during your co-op? Need an escape from the dread of impending assignments? Why not go explore the 6ix? Anyone I've asked to go hangout with in Toronto knows that I literally follow this exact route every single time; it's great fun, I promise.

Bonus if you're an Asian girl who likes to thrift, but also if you're trying to take that cute ABG out on a fun Toronto date — this is the way to do it.

1. Take the bus/train to Union, or Yorkdale or something. Then, take the subway (Finch line) up to Osgoode.
2. Get off and walk down Queen Street West to Tribal Rhythm Village to go thrifting! Even if you don't buy anything it's fun to look around. Plus they have cute earrings.
3. Keep walking down Queen Street West and on the left side go to Black Market Village (it's a different thrift store next to Zara). Lots more clothes there.
4. Keep walking and if you're into Brandy Melville wait in line to try to get inside before inevitably giving up because the line is too long. If you're not into that, stop by Groovy to look at cool shoes, or Miniso to write your names on the test paper beside the markers, or Steve's Music Shop if you like instruments.
5. Time to relocate. Either walk 20 minutes or take the street car towards Kensington Market. You'll pass by the AGO. Free admission if you're under 25 btw!
6. Walk to Dragon City Mall and go to Juicy Dumpling to buy 6 dumplings for $4 (I recommend the soup dumplings). Wash it down with some drinks from the cute Boba shop next door.
7. Go inside Dragon City Mall and buy the Hong Kong egg waffles from the lady who sells it at the entrance or go to Sugar Marmalade on the right side of the mall for some bingsu. If you like claw machines there's a pink room right upstairs. Great photo opportunity btw. Also a bathroom here if you need one.
8. If you're there before 6:00–7:00 PM, walk towards the thrift stores on Kensington Avenue. There's a great collection of thrift stores where you can find everything from cowboy boots to vintage leather jackets. Also, there's a great little book store here with an adorable pet cat inside.
9. You're tired and hungry so make a stop at Kao San Road for some great Thai curries and noodles. Guys, if this is a date, pay for your girl ;)
10. If you're old enough and you're into that kind of stuff go buy some weed and smoke it by the Harbourfront. Not too much, y'all gotta get home safe.

Source: trust me (but actually).

Kaytri.x

INSTANT NOODLES RESENTMENT NOODLES

THIS ARTICLE IS A PARODY OF BREAKFAST SANDWICH MELANCHOLY SANDWICH, WHICH WAS PUBLISHED IN* mathNEWS *148.3

I want to eat instant noodles…

I always liked to think about eating instant noodles outside, like camping, at a playground, possibly in the grey and dreary Iqaluit summer, or maybe in snowy weather, using some sort of portable gas stove; I'd watch snowflakes tumble and melt instantly into the spicy, simmering soup. Or maybe I would be inside. I would be at the uppermost floor of a building with the heat turned off, clutching my cup of noodles to keep warm and looking out at the cityscape of twinkling lights stretching out ahead of me like the future.

Instead I'm in UWP staring into the swirl of saltwater in my tepid pot, where the noodles lie all limp and soggy and bloated from being left uneaten too long. The overhead light casts everything in a dreary indoorswhite glow, turning the soup into an unappetizing orangered. It ought to be silent, but there's a cacophony of sounds coming from the hallway, and the sink dribbles incessantly as it drains through the stack of dishes I left in there. I feel fisheyed: the walls are close enough to subsume me and yet too far to touch, curving away from me when I try to reach them.

I blink, and three years pass. It's nine-thirty in the evening and I'm outside at a **mathNEWS** prod night noticing the faint hint of summer in the air, which I'm told is just humidity. There's pizza here, like all prod nights, but what I really crave is a piping hot cup of cup noodles. There are more than thirty people here, all laughing and dancing and whooping and singing loudly. I am instantly thrown back to every other summer evening, where the air smelled wet and thick and sweet and vaguely like dirt, and I looked up at the sky and thought of possibility. Now I look at the empty horizon, watching the clouds move, and feel sick; both from nausea and knowing there's a spot inside me that nothing will ever reach. Normally I'd lean into the summer feeling and disappear in it, but it's the first heatwave of the year and the only thing on my mind is prod night and assignments…

I just want to eat instant noodles on a rooftop under some fireworks and feel alive

cy

THREE GUIDES TO HOME

As raindrops bled in neon glow, I walked a path of dread. The homesick cure I sought; return alone to my own bed.

The shadows danced 'twixt lightnings, thunders enraged roared. This night sought I a ticket, but one that I'd afford.

I sought the guides to home, who knew the London sun. They numbered only two, With Greyhound's death long-done.

In night I called their presence; in night I asked their price. In night I saw their shadows; theirs who I'd named thrice.

Twin they were approaching, in glide above the ground. One verdant, one marine, the heralds had been found.

I greeted each in kind, for dealing had begun. I weighed each herald twice, and chose the bluer one.

'O please all-knowing guide, what trails must I now roam? O please all-knowing guide, I ask a safe way home.'

A TRAIN I WILL DISPATCH, the bluer herald groaned.
AT NINE IT WILL ARRIVE, WHILE DARKNESS LIES ENTHRONED.

FOR FORTY DOLLARS SIX, EACH WAY I BID YOU GO. TO ONLY LONDON CORE; NO FURTHER DO I KNOW.

I shrank away dismayed, the price was far too high. With unsafe destination; I gave another try.

'O please all-knowing guide, what trails must I now roam? O please all-knowing guide, I ask a safe way home.'

AFRAID, BE NOT, he told me, the second herald green. I OFFER BETTER FARES, THEY SHALL NOT COST THY SPLEEN.

A TRAIN I HAVE AS WELL, TWO LAYERED SHALL IT BE. FOR TWENTY DOLLARS ONE, A GIFT FROM YOU TO ME.

And yet I had a doubt, without reason could I contrive. 'Then where shall thy train land, And when shall I return?'

AGAIN TO LONDON CORE, AGAIN AT EQUAL TIME. AT FIVE O CLOCK A.M., RETURNING BELLS SHALL CHIME.

At this I fell and sobbed; if only I could drive. But only trains I had, and this one left at five.

'Begone!' I told the pair; 'Begone, and leave me be! Neither choice I'll have; alas for option three!'

At this I felt a change, the storm came to an end. At corners of my eye, I saw a feathered friend.

At ask do I arrive, this angel spoke to me. *I come at beck and call, presenting option three.*

No trains have I for you; there's naught but bus for school. For dollars only thirty; pricing's not so cruel.

At six and twenty five, on Friday you'll be back. At six and twenty five, on Sunday we backtrack.

I jumped and cried for joy; from Waterloo I'm loose. His time and price well-reasoned; thanked I Mr. Goose.

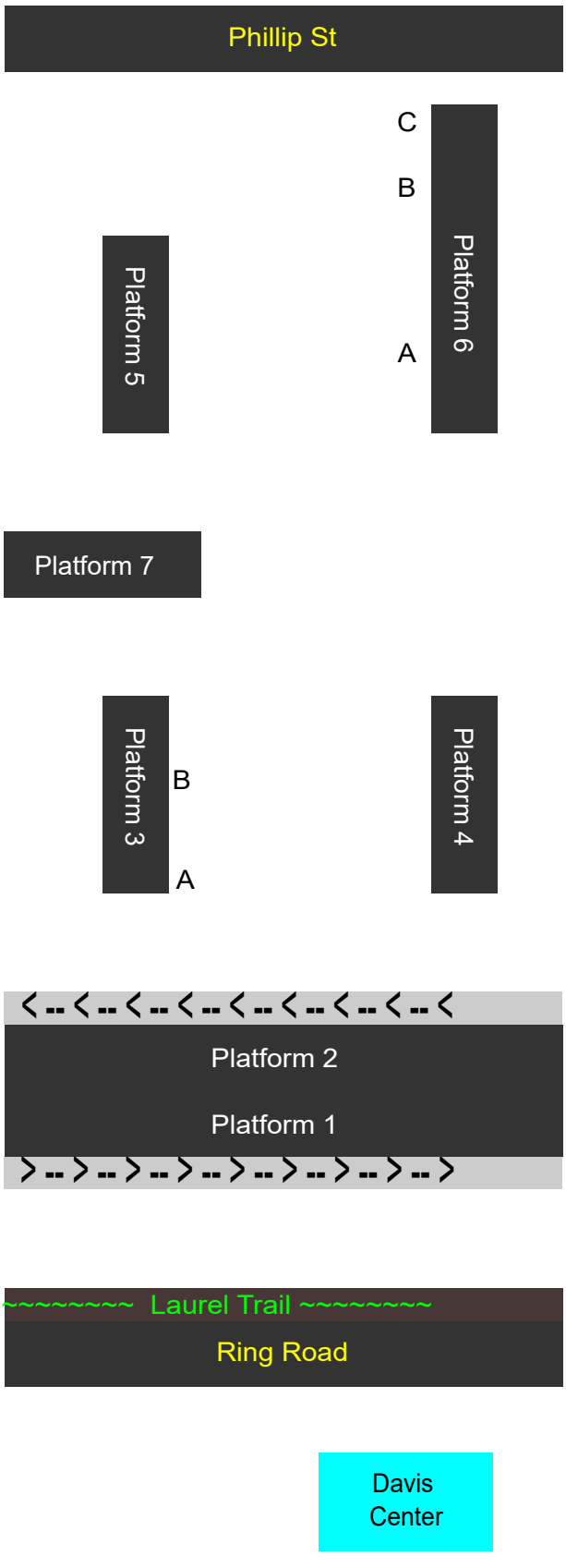
molasses

If you're particularly talented at forging identities and you want a 5:00 AM ticket from York St to Kitchener GO, I've a ticket with ~~my~~ your name on it.

A GRAPHICAL GUIDE TO THE BUS STATIONS AS CONVEYED THROUGH ~~ASCII ART~~ AN IMAGE

Well, it's the official return to normal student life. It's been more than 2 years of pandemic living and all that entails. Now that the golden age of online learning and getting up at 2:00 PM is beyond us, we need to successfully navigate a volatile, uncertain, complex, and ambiguous campus and all the changes that have happened. While the biggest one is the completion of the SLC/PAC expansion and a new bridge connecting MC to SLC on the 3rd floor, it's pretty simple to understand as it's just an extra edge on the navigation graph. A more interesting example is the new University of Waterloo Station. A massive undertaking consisting of replacing a lot of concrete with a lot of concrete, the new station consists of five extra platforms extending the two from the ION (yes, they count the single platform as two) and providing bus stops for a bunch of different lines. As ~~actually listing which buses stop at which platform would be too easy, a diagram is provided instead~~ the editors hate ASCII art, you get an image instead. *[Editor's Note: It's true — ASCII art poisoned my water supply, burnt my crops, etc.]*

Platform 1 : [6004] 301 to Rest of Waterloo
Platform 2 : [6120] 301 to Conestoga Mall
Platform 3A : [1260] 201 to Conestoga College, 31 to Sundew
Platform 3B : [1262] 30
Platform 4 : [1223] 201 to Conestoga Mall, 19A, 19B, 31 to Conestoga Mall
Platform 5 : [1264] 301R
Platform 6A : [1078] 9, 13
Platform 6B : GO 30
Platform 6C : GO 25, 25C
Platform 7 : GO Ø



What's an ASCII

GLEE REVIEW

BUT IT'S JUST THE FIRST 6 EPISODES WHICH IS WHAT I'VE WATCHED SO FAR (SORRY)

Hey guys! So this guy I've been texting (cute, funny) has recommended that I watch *Glee* (TV show) and I decided to take him up on it. And now I'm writing a review.

The show is about a Spanish teacher, Mr. Shue, trying to find meaning by reviving the glory days of his high school Glee club (essentially a show choir club) by cobbling together a rag-tag team.

Taken seriously as its purported genre of "comedy-drama," this show is not really that great. The plot-lines and convoluted character interactions are already extremely soapy for season one (though that might be my personal distaste for soap operas in general). It heavily leans on cliche. The show's protagonist comes across as an uncharismatic, blank everyman.

Because of this, I propose an alternative understanding of Glee: through camp and surrealism. Mr. Shue should be viewed as largely an audience stand-in/lens to view highly absurd characters and scenarios. The temporary school nurse (protagonist's wife) serves diet meth. The cheer-leading ("cheerios") coach takes bold stances such as "pro-littering." There's a heavy reliance on the trope of "high school social caste" but it's done strangely; the football team, which has a worse track record than the Glee club, somehow has more social sway. The nearby school for the deaf comes up unusually often. The protagonist's wife stumbled into faking her pregnancy and negotiating a baby from a cheerleader (who is president of the celibacy club, and cheated on her boyfriend, and lied by saying his sperm swam around in a hot tub). In turn, said boyfriend (in the Glee club, dumb), often stops premature ejaculation by thinking of the time he ran over a mailman while learning to drive. There's also the classic adult film trope inserted, where a high schooler (the one who knocked up the celibacy club president) is highly into MILFs and will get with them through a "pool cleaning business."

I have to cut myself off because this show is already nuts. Yet, there's a sincerity to it. Like "this is the internal logic of this world, and yes, we know it is inherently absurd." I recommend you give it a go, don't take it too seriously, and have fun!

Xx_420SonicFan69_xX

N WAYS TO BEAT A PRO BACKGAMMON PLAYER

- Be better
- Try harder
- be gamer

pig snout

RAPHAEL'S SISTINE MADONNA

As the epitome of the renaissance painter, Raphael is one of the most studied artists of all time. His depictions of beauty make his paintings often subject to comparison with the greatest earthly beauties. Chief among his works was his *Sistine Madonna*, which depicts Madonna holding Christ while floating on clouds, surrounded by angels. On display in Dresden since 1754, the painting has inspired thinkers of nearly every European intellectual movement, from the Romantics to the Nihilists, and may have been subject to more criticism than any other painting in existence. During the revolutions of 1848, Mikhail Bakunin was even said to have floated the idea of hanging the Sistine Madonna on the ramparts of battle, claiming the Germans would be too cultured to shoot at it.

For the painting itself, one's focus is immediately drawn to Madonna and Christ. Madonna is expressing her classic Catholic divinity as the "Mother of God," drawing veneration from the surrounding *putti* and nearly floating on the cloud on which she stands. Her dress is billowing and seems imbued with energy, and her features strikingly beautiful. The heavenly curtains being pulled back on the corners of the painting and their similarity to Madonna's garment seem to bring her outside of the painting. Raphael's Madonna nearly follows her traditional depiction in every way, as a stoic, loving, beautiful mother figure to all of Christendom that she is always seen to be. Yet, in her visage this image of her seems to fall apart. The child in her arms is more serious than she, staring out of the frame at the viewer while her gaze is downcast and wavering. It is a common interpretation to see Raphael's Madonna as cold and aristocratic. Rather, she appears humble, yet unsure. In the one avenue in which she can still demonstrate her humanity, the Mary of this painting exhibits a powerful sense of uncertainty.

The Mary of the Christian imagination was one which was fully prepared for the task placed upon her by God. She voluntarily offered her body for the birth of Jesus Christ with no apprehensions. These traits became cemented by the divinity imbued with her title "Mother of God," and suddenly Christian thinkers faced a poverty of perspectives when interpreting a painting such as this one. So often have Madonnas emphasized the love and passion felt by the Mother, that classical interpretation is unprepared when faced instead with a measure of terror. Perhaps she knows not what is coming next, holding a child she does not recognize and elevated to a station beyond her wildest dreams. Staring too deeply into her eyes it is all too easy to see oneself in that position, surrounded by others lauding you with undue praise and holding you to great expectations.

Turing Machine

ISSN 0705-0410

UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

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YOU CAN (NOT) RETVRN

In a world that seems to most to be spiralling towards its end, the past begins to look a lot more attractive. Through the rose-colored glasses of posterity, the lives of our forefathers become idyllic and innocent, stripped of their uncommunicated hardships. In some cases, we idealize the simple life of the medieval peasant—working hard during the harvest season for the very food that ends up on their table, relaxing on the feast days of the winter, and most of all: free from the most extreme depravities of the Anthropocene era. If you abhor the industrial revolution and its consequences, you may yearn for its complete reversal, and the "return" of a fully agricultural society. Perhaps you lean towards the worship of the 1950s American nuclear family. Kept pacified by prescription drugs and restrained by the strict social stratification, one's existence would nevertheless be much simpler. Or maybe—in the most extreme of cases, your utopia was consummated before the dawn of organized agriculture. If only we hadn't destroyed our environment from the very beginning, and been organized into our hierarchical structures through this original model, our children may be growing up in a just world.

Whether you espouse these ideologies or not, their influence on our state of cultural discourse is difficult to deny. "Paganism" in its modern form has far more adherents than were ever burned at the Salem Witch Trials three hundred years ago. Various movements have seen the re-embrace of Norse Mythology, Witchcraft, and even a movement which claims descent from the druids of pre-Roman Gaul. If you spend too much time on twitter you have probably seen accounts with busts of Roman emperors for their profile pictures, espousing the benefits of eating raw meat and drinking unpasteurized milk. The very heart of modern conservatism is a wish to return things to the way they once were—before the pure beauty of the past was destroyed by the corrupting tendrils of the present. Older guardians of a bygone era of moral standards push for the reversal of public opinion on countless social issues, opposing directly the torrent of the changing times. Viewing these movements generously, they are a valiant attempt to restore something greater than the world has now. Viewing them objectively, they are pathetically grasping at a past that never truly was and again never will be.

The Bourbon Restoration could never last once the floodgates of a Republic had been opened to the French. The Stuart Restoration was soon followed by an ascendant parliament in the Glorious Revolution. 1825, 1848, 1881, and 1905 brought about the Russian Revolution of 1917. Even the enlightened Julian the Apostate could not hold back the tides of Christianity for long. Though one should be reluctant to ascribe "rules" to history, it is an axiom that all that happens *is*, and all that happened *was*. Every event that occurs can only be seen in the context of all that occurred before it, and can never thus contain the same authenticity as it once did. Every course of action the human race takes changes the playing field irreparably, with every other past action applying their various influences. Is there anything more absurdly idealistic than to believe that the past can be reconstructed with knowledge of the present extant? The very state of the world being otherwise denies this possibility. There may be no definite end to the process of history, no culmination that all has progressed towards, but what is certain is the absolute uniqueness of every transitory point in this great procession. Corollary to this is our inability to interpret past events with the same information then available. The idyllic lives of our forefathers could have been for them crushing impotence, and even those who lived through their idealized events are incapable of viewing them without the distorting lens of hindsight. What is then required of us as a society? Against all of our best, most painfully human instincts, we must accept the past as exactly that—past.

mehatamm

FUN STATS IN NBA PLAYOFFS 2022

It's the NBA playoffs! The Boston Celtics just made it into the Finals after 12 years. To celebrate this, let's have a look at some fun stats in this playoffs.

1. Celtics big man Al Horford has finally reached the Finals after 141 career playoff games, which was the record in NBA history.
2. Jayson Tatum, Jaylen Brown, and Marcus Smart are the second trio to record 20 points/5 rebounds/5 assists in a game 7.
3. Celtics coach Ime Udoka is the first rookie coach to win 2 game 7's in a playoff.
4. The Warriors are 9–0 at home so far in this playoff.
5. The Warriors have made 6 of the last 8 NBA Finals.
6. During that span, the Warriors made Finals every season with Klay Thompson, and missed every Finals without Klay Thompson.
7. Celtics players have 0 final experience up to this point, while their opponent, Golden State Warriors, have 123 games of experience combined.
8. The last Celtics Warriors Finals match up was in 1964, when the starting centers on each team is Bill Russell and Wilt Chamberlain respectively.
9. Boston Celtics is the only team with winning record vs the Warriors under Steve Kerr.

Credit: @statmuse on Twitter.

ted fu

THE MOON

A few months ago, I was having a bad night. I wasn't able to sleep. Looking out of my window, I could see the moon. It was a full moon. It shone very brightly that night. So brightly that it was noticeably illuminating my room. So brightly that it felt… unnatural. It flickered as the clouds passed in front of it, but I did not see that as a bright moon momentarily covered in mild darkness. I saw it as a bright moon occasionally getting brighter as the clouds uncovered it, then going back, then getting brighter again… pulsating, thrumming, invading my space and threatening to come yet closer. It feels very strange to admit this, but that night I was afraid of the moon.

This feels stranger yet when as early as three issues ago I was singing praises of the sky, that too the night sky.[1]. So it might seem contradictory to say what I am saying right now. But there was no moon the night I sang my praises, and that was no coincidence. I had started to love the sky, yes, but after that night I had come to hate the moon.

❦

A few weeks ago, I was at Tim Hortons. I was trying to read the menu, which they displayed on screens attached to the top of the wall behind the counter. The size of the text on the menu was really small. So small, in fact, that it was unreadable. It felt very weird to do so, but I could not think of another solution — I pulled out my phone, opened the camera app, pointed it at the menu, and zoomed in. Surely this was terrible UX. Who at Tim Hortons had approved such a terrible menu, that you could not read with the naked eye?

I looked around. Nobody else was doing what I was doing. Nobody else was straining to read the menu. It was just me.

I booked an eye exam very soon after.

❦

A few days ago, I was about to leave for Toronto for some important work. The plan was to take the 12 P.M. GO Bus from the new UW station to Bramalea, transfer and take the train from there to Union, do my thing, and then meet up with an old school friend for dinner before coming back at night.

At 11:47 A.M., I got an email saying that a package had been delivered. At 11:55 A.M., I boarded a bus, headed not for Toronto, but home. At 12:21 P.M., I arrived back at the UW station, just in time to catch the next bus headed to Square One. Clutched in my hands as I ran to the GO Bus was my package.

I sat on the front seat of the upper deck. When the bus started moving, I opened the package and pulled out my brand new pair of glasses. With little hesitation and no idea of what to expect, I put them on.

I did not know that you were supposed to be able to discern the leaves on a tree, the blades of grass in fields, the details in brickwork of a building hundreds of meters away. Sure, I had been able to see those things at some point in the past, but I didn't remember that. My vision had slipped from decent to bad slowly, bit by bit, and at every step I got used to the slightly reduced resolving power of my eyes. The gaslights dimmed so slowly that I could not tell that the room was darkening at all.

But the light was back. My sight was back. I could *see* now, clear as day. The difference was shocking. It still is — I have been pulling down my glasses and peeking at how the world used to be, and then pulling them back up and marvelling at the difference. Everything is new again, everything is fresh again, everything is beautiful again.

❦

A few hours ago, I was walking home, after a hard-fought battle against the demons of calculus. And I happened to glance up at the sky I loved so much. And I saw the moon.

It had been blurred away from my vision and my memory, the fact that you were supposed to be able to crisply distinguish the edges of the sphere that is the moon. That you were supposed to be able to see the moon's terrain, the large land formations and craters, as they darkened and brightened the surface in places. That the moon did not shine with a harsh unbearable glare, but glowed gently with the light of the sun. Far from being an invasive god of the night, the moon felt like… a friendly neighbour. Watching but afar, smiling and waving. I wasn't afraid of the moon anymore.

All my hate melted away at once, and all it took was a fresh look at things. Maybe that means something, even outside this one experience… or maybe this is just a silly story. After all, of all things, who the fuck is afraid of the *moon*?

tendstofortytwo

1. *Look at the sky* in **mathNEWS** 148.5**.**

MY SHOPPING LIST

- clam chowder
- coconut milk
- carton of egg
- raw eggplant
- jasmine rice bag
- porcelain teapot
- red pansy seeds

Russel crow

SPRING ISN'T REAL*

Season is an odd metric by which to measure time.

When a person says "Spring is in the air," they do not mean that the three months between the Vernal Equinox and Summer Solstice are somehow aerosolized, they mean trees are budding, flowers are in bloom, and robins are chirping merrily away. The calendrical constraints upon which seasons rest come off as ridiculously artificial. December, considered a very wintery month, is mostly fall. June, despite daily average temperatures being higher than in September (in Waterloo[1]), contains little more than one mere week of summer, whilst September contains 3. The system is ludicrous, and seemingly has little basis in reality.

There is an obvious solution to this. A season should be defined not by points in the planet's orbit, but by consensus of when each season is. This seems arbitrary, but there is a pretty good heuristic to determine which season is which. Imagine yourself as a designer for the decorations for daycare walls. Your task is to make a calendar to adorn a wall or door of a classroom. For each month, you decorate its respective page with things associated with that month. Whatever seasonal affects you chose to decorate a month with is what season that month is in. For example, every children's calendar designer in their right mind will have snowmen in December, a blazing sun in June, and apples and fallen leaves in September, clearly indicating that December is winter, June is summer, etc etc.[2]

And so the problem of defining a Season is solved.

But wait one moment. What symbols would you use to display spring? Flowers? Flowers bloom more in summer than in spring, a figure that makes sense when you consider a lot of so-called spring is comprised of the slushy parts of March and April.[3] Rain seems like a good idea, until you google the fact that September is the rainiest month (in Waterloo at least), followed by June.[4] Spring is a season defined by transition, yet it has no hallmarks that define it well[5].

And spring being defined by transition simply doesn't ring true for me in the same way it does for autumn. In September, October, and November, the temperature is like clockwork. Chilly in the days, cold at night. A compromise between the sharp icy-cold of winter and the mind-numbing permeating heat of summer. The typical "fall" weather and temperatures seem to persist for months. This makes it recognizably a season, and this is very much not the case for spring. Temperatures will be below freezing until everything suddenly melts the last week of march, only for everything to freeze over again the first two weeks of April, become tepid for a week, become blisteringly hot for a week, and then chill until halfway through May before becoming hot again. There is no consistency, only chaos. The one or two weeks of "Spring-like temperatures" thrown haphazardly in to the mix do not constitute an entire season, and anyone who suggests that is absurd.

The week of buds on trees does not constitute a season, and anyone who suggests so is a fool. Spring-like temperatures are an illusion, all smoke and mirrors, simultaneously existing everywhere you look, yet no where you look closely. Spring-like temperature is every temperature, and therefore no temperature. It is useless in defining a season.

Spring is a myth, existing only in your rosy childhood memories of simpler times, when the world wasn't so confusing and when there were four even balanced seasons, upon which the great calendar rested, around which your innocent infantile world revolved. It is time for you to grow up. It is time for all of us to grow up.

aphf

*in Southern Ontario. I haven't lived elsewhere for as long

1. https://weatherspark.com/y/19227/Average-Weather-in-Waterloo-Canada-Year-Round#Figures-ColorTemperature
2. According to my 5 minutes of looking it up.
3. http://www.missouribotanicalgarden.org/Portals/0/Gardening/Gardening%20Help/PDFs/Bloom%20summary%20by%20month.pdf Missouri is further south than Waterloo, and should therefore favour Spring in terms of flower blooming, as flowers will begin blooming earlier. This not being about Waterloo, if anything, biases it against my case.
4. https://kitchenerwaterloo.weatherstats.ca/charts/precipitation-monthly.html
5. Any defining hallmark of Spring is more cultural than anything else, like how rain and flowers are associated with spring, despite being more common in other months. Half of spring, the half when snow is melting and everything is slushy and muddy, is not at all represented by the so-called "symbols" of spring.

BEGINNER'S GUIDE TO COMPILE-TIME DESCENT, II

II: AN INDUCTIVE ITCH

Here we are again. Let's continue.

ADDENDUM TO PART 1 AND INTRODUCTION

There's a brief note I wanted to make on the last part. Specifically, I said that template arguments have to be **`constexpr`**. While this is true for most objects, it's actually a little stricter than that. Specifically, you might try passing a string literal like **`"Hello"`** as a template argument for a **`const char*`** non-type template parameter and be confused when it doesn't work. I won't tell you why it doesn't work; you'll have to find out for yourself! Check out the page *"Template parameters and template arguments"* on cppreference — specifically the *"Template non-type arguments"* subsection. While reading, keep in mind the difference between the `static` keyword when used in a class versus when declaring a variable elsewhere (look it up if you forget). Have fun!

Anyway: last article, we looked at the basics of templates as a way to abstract and parameterise over types and constant expressions. Now, that's nice and all, but sometimes we want to get a bit specific with our abstractions. Specifically: what if I want my template class/function to look different for certain kinds of parameters?

TEMPLATE SPECIALISATION

Yes, we can do this. Let's think back to our `Node` template example from the last article. Now, I might want some specific functionality depending on the type substituted for `T`. Let's get concrete and say that if `T` is **`int`**, then I want `Node<T>` (i.e. `Node<int>`) to have a method called `inc`, which increments each value in the list by 1. Then, here's how we could do that:

```
// UNSPECIALISED
template<typename T> struct Node {
  T data;
  Node* next;
};
// FULLY SPECIALISED!
template<> struct Node<int> {
  int data;
  Node* next;
  void inc() { /* implementation... */ }
};
```

So, in this case, we *fully specialise* the `Node` template by specifying all parameters. We still write `template` so that the compiler recognises it as a specialisation of the original one, but the list of parameters after `template` ends up being empty, since we specialised them all. We declare the class name itself as `Node<int>`, to give a heads-up to the compiler that this is a specialization for when `T` is `int`.

Naturally, since I used the verbiage "*fully* specialised" just now, there is implied existence of a *partially* specialised template.

And yes, that does indeed exist. We can specialise over some or all template parameters:

```
// UNSPECIALISED
template<typename T, typename S> struct Thing {
  // some generic implementation...
};
// PARTIALLY SPECIALISED
template<typename S> struct Thing<int, S> {
  // slightly-less-generic implementation...
};
// FULLY SPECIALISED
template<> struct Thing<int, std::string> {
  // not-very-generic implementation...
};
```

When we instantiate an object of one of these types with all parameters provided (e.g. `Thing<int, float> t1;` or `Thing<string, int> t2;`), the compiler will choose the most specialised version it can when creating the type. We need to be careful not to have two specialisations which are equally specialised for which the compiler could pick from either for a certain instance, because then it'd be ambiguous and the compiler would get indecisive and throw a tantrum. That doesn't happen in most cases. But it might for us. Who knows!

We can also do this specialisation stuff with non-type template parameters, i.e., parameters which take constant expressions. The astute reader might now ask a pertinent, time-worn question:

Can I use this to compute factorials?

You poor soul.

TEMPLATES AS COMPUTATIONAL POWER

Here begins our grand quest of tricking the C++ compiler into doing actual, useful computation for us. Now, I'm of the opinion that functions are passé. We don't need them in today's volatile, uncertain, complex and ambiguous world. No; we need classes.

Recall the inductive definition of $n!$: if $n = 0$ then $n! = 1$, and if $n > 0$ then $n! = n(n-1)!$. With that in mind, here's our factorial:

```
template<int N> struct Fact {
  constexpr static int value = N * Fact<N-
↪1>::value;
};
template<> struct Fact<0> {
  constexpr static int value = 1;
};
// ...
Fact<10>::value == 3628800; // true
```

Remember that **static** is a keyword that makes the variable a sort of instance-agnostic member of the *class*, not a member of any particular *object*. So, the data member is shared across all instances of the class, and can be accessed independently of any instances. In fact, here, we don't even create an object of type `Fact<10>` anywhere — it wouldn't really be useful to, after all. We only care about the class for its sole static member which holds the value computed at compile-time.

So, we've tricked the compiler into doing our busy work. Indeed, the compiler will do all of the work finding 10! via `Fact<10>::value`, and the result will be embedded directly in-place in the compiled program; we'll have instant running time.

Marvellous.

But there's still an itch I can't scratch with this template business. I'm not satisfied with one parameter; nor two parameters. I'd like many more than that. So should you.

PARAMETER PACKS AND VARIADIC TEMPLATES

It's with parameter packs that we can make our templates take *as many parameters as we want*. In turn, we can also make functions that take as many arguments as we want. Here's a minimal example:

```
template<typename ... Ts> struct Onion {};
// ...
Onion<int, float, std::string> o;
```

In this case, the `Onion` template takes a parameter pack called `Ts`, indicated by the `typename ...` . Well, that's neat I guess, but not eminently useful. How do we expand this, and access each individual type contained in the pack? Let's make our `Onion` behave a little more like an onion:

```
template<typename ... Ts> struct Onion;
template<typename T>
struct Onion<T> { using head = T; };
template<typename T, typename ... Ts>
struct Onion<T,Ts ...> : public Onion<Ts ...> {
  using head = T;
  using rest = Onion<Ts ...>;
};
```

That's a little more like it! Here, we're making our original one the unspecialised version, and we're adding two specialisations, one which just has one type, and one which has one type, followed by another parameter pack. These might not *feel* like specialisations at first; all of the specialisations we've seen so far have replaced parameters with specific types. Here, we're just specialising an abstract form to a more-specific-but-still-abstract form. It's in this way that we can do a sort of "pattern matching" in template parameters via specialisation. If you've ever programmed in Haskell or used the pattern matching facilities in Racket, this should be eminently familiar.

Just to clarify the syntax: we declare `Ts` to be a pack by writing **typename ...** `Ts` in the parameter list, and after that declaration, we can *expand* the pack into its constituent types by writing `Ts ...` . So if I instantiated an `Onion<int,float,long>`, then we'd be using the last specialisation with `T=int` and `Ts` being a pack with `Ts ...` representing **float,long** in a way. We can also apply this "pack expansion operator," the ellipses, in more flexible ways on top of other operators. For example, I can do something like this:

```
template<typename ... Ts>
struct Thing {
  using type = Onion<std::vector<Ts> ... >;
};
// ...
Thing<int,float,long> t;
```

in which case we'll have `Thing<int,float,long>::type` being `Onion<std::vector<int>,std::vector<float>,std::vector<long>>`. Basically, putting the ellipsis after the `std::vector<Ts>` made it so that we'd expand the pack, but with each type wrapped in a `std::vector` template parameter. This is pretty cool! At this point, you might start seeing these parameter packs as "linked lists" that need to get peeled layer by layer linearly, and you might imagine this application of the `...` pack expansion operator as sort of like Racket's `map` procedure. Hold onto that thought.

In our specialisations, we also have these **using** statements which are, for our purposes, equivalent to **typedef**s from C. Just like classes can have member data and member functions, a class can also have member types. In the last example, we'd have `Onion<int,float,long>::head` being **int**, and `Onion<int,float,long>::rest` being `Onion<float,long>`.

Some of these things might feel a little esoteric or not well-motivated, but these are the stones with which we will build our empire.

There's something else we need to get to soon that lives at the heart of so much template metaprogramming. What is that thing? You'll see next issue. In the mean time, you might want to think about this:

How could we conditionally choose a template function overload based on parameters?

jeff

Pretend that you're attending a good lecture, okay?

PROF. ROSS WILLARD

EXPLAINING MATH RESEARCH TO MY PARENTS: WEEK 2 OF 6

Welcome back beloved readers! (I'm allowed to pluralize that since I know both my mom and dad read my article). Last week, we talked about what math research is like, and what rings and sets are. However, all the interesting examples of rings we had — the real numbers $\mathbb{R}$, the complex numbers $\mathbb{C}$, the rational numbers $\mathbb{Q}$, the integers $\mathbb{Z}$ — had multiplication which commuted, which you'll remember meant that $a \cdot b = b \cdot a$ for every a, b pair. My research is in noncommutative algebra, which means that we'll be studying rings with multiplication that doesn't commute, so the big first question is why do we care? I mean, multiplication of numbers commutes for obvious reasons, and so why would anything else matter? The answer is going to be very geometric! Let's talk about linear algebra.

Let us consider 2D space. Mathematicians refer to this in a fancy way, denoting it $\mathbb{R}^2$. we think of 2D space as having an x-axis and a y-axis, so we can describe every point with an x-coordinate and a y-coordinate, a horizontal position and a vertical one. We write the point with an x-coordinate of a and a y-coordinate of b as (a, b). We can think of "scaling" a point by a real number λ by defining $\lambda(a, b) = (\lambda a, \lambda b)$. Visually, this can be thought of as taking the point, and keeping it on the same line to the origin, but moving it λ times further away. There are some nice transformations of space that we studied in elementary school — you know, if you have a shape, you can rotate it, you can scale or shrink it, you can shear a square to get a parallelogram. If you haven't heard of that last one before, imagine taking a square, fixing the base, but slanting the two vertical sides, and moving the top side along with it.

These things — rotation, scaling, shearing — could be applied to all points, not just a shape. This actually gives us a function from $\mathbb{R}^2$ to $\mathbb{R}^2$. By rotating everything, we take each point, and send it to a new point, same if we stretch or compress, same if we shear. Understanding these functions — and how they interact — is therefore a natural goal, because it gives geometric insight. Now, a general function from $\mathbb{R}^2$ to $\mathbb{R}^2$ is disgustingly awful to understand; I mean it could take any point and send it anywhere else, which could be an incomprehensible distortion. It could just randomly scramble everything, which is hard to picture, and doesn't really have a geometry.

Because of this, we study functions which are called linear transformations. These are functions which are restricted in a way that they're more geometrically natural. A linear transformation has two properties: first, it keeps any straight lines straight, and second of all, it takes the point (0, 0) to the point (0, 0). Rotating everything about the origin has this property, so does a shear, so does a scaling.

These can be algebraically described as functions T with the property that $T(a + b) = T(a) + T(b)$, and for any real number λ [quick aside: I may denote this as "$\lambda \in \mathbb{R}$." The $\mathbb{R}$ refers to the real numbers, and $\in$ just means "is in" or "is an element of." This can be used for any set.], we have that $T(\lambda a) = \lambda T(a)$. Why these conditions are equivalent to preserving lines is slightly outside the scope of this article, but the idea is that a line is the set of multiples of some point; for example, if I plot all the multiples of $(0, 1)$ I get points in the form $(0, y)$ for any real y, which is the y-axis. This holds more generally, so the scalar multiples of a point are a line. Therefore, if we take a line ℓ, write it as the scalar multiples of a point, say (a, b), then let's think about what happens when we apply a linear transformation. Let's take a point $\lambda(a, b)$ on the line; we then have $T(\lambda(a, b)) = \lambda T(a, b)$, so everything we get by applying T to the line is a multiple of $T(a, b)$, and so is also a line.

Now, with those algebraic rules, we have that $T(a, b) = T(a(1, 0) + b(0, 1) = aT(1, 0) + bT(0, 1)$, so to know what T does to any input, we just need to know what it does to $(1, 0)$ and $(0, 1)$. We represent this conveniently in what's called a matrix. In particular, if $T(1, 0) = (a, c)$ and $T(0, 1) = (b, d)$, then we represent $T = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$. The columns of this matrix are the results of applying T to the so called "standard basis vectors", $(1, 0), (0, 1)$. Now, given two linear transformations, we can put them together to get a new linear transformation — simply apply one, and then the other. This is still linear since if the first one preserves lines, and the second one does too, then applying them in a row will also preserve lines. Now, this gives an analogous rule for putting two matrices together to get a third one — think of both as linear transformations, apply them, then write the resulting combined transformation as a matrix.

Hey, wait a second, a way to combine two matrices to get a third — that's multiplication! You can verify that it obeys the rules from my last post. What's more, this multiplication is noncommutative. What I mean by this is that the order matters, and if we think of the geometry, it's easy to see why. Shearing then rotating a square is different from rotating then shearing it — or, if you go in 3D, you can picture doing a rotation along the x-axis then y-axis, and that'll be different from y-axis then x-axis. This idea of linear transformations and matrices can apply in n-dimensions, not just two, and this gives us a whole class of noncommutative ring; the so called matrix rings. These form a class of important examples in noncommutative algebra, and they're generally very well understood, so reducing problems to problems about matrices is often very fruitful. We'll discuss this idea in detail in week 4.

This multiplication captures a more general idea that's common when objects are noncommutative — the multiplication represents some kind of function composition, it represents doing one action then another. This isn't the normal multiplication we're used to, but since it obeys the same rules, if we prove things starting with those rules, it applies to both the commutative and noncommutative setting.

The reasons to study noncommutative algebra — aside from interest — is that lots of objects that are natural to consider turn out to have a notion of multiplication which does not commute. It's a much broader idea than we see when we multiply numbers, but since it has the same barebone properties.

Now that we understand why we might understand objects that don't commute, we'll be ready for next week, where I'll describe the fundamental object of study in my research! An Ore extension, also known as a skew polynomial ring. See you all then!

gildED

A SHORT TABLETOP ROLEPLAYING RANT

TRUST ME, THEY'RE WORTH YOUR TIME

If you haven't already, I would really recommend finding some time to try tabletop roleplaying games. It's just a really nice experience to sit down with friends, either physically or virtually, and all tell a story together.

I've been playing a Power Rangers tabletop RPG with some people I met online for a few months now, and it's honestly the most fun I've had with a TTRPG in the five or so years I've been playing them.

It's great to have an escape for a few hours a week, to build out a world and characters, and really tell a story unique to your group. It's always fun, but especially when I'm in the middle of a busy school term, TTRPGs really hit different.

A lot of people start with Dungeons & Dragons, which is admittedly quite a fun system, but I'd recommend branching out. There are a lot of different systems available that let you play in basically whatever fictional world you have in mind, be it cyberpunk, superheroes, or sci-fi, with D&D, of course, representing that classic fantasy niche. Different systems work better for different genres and stories, or are just more fun in general, so finding a system that works for you is important!

Admittedly the games themselves can be fairly expensive, but if you buy one copy of the sourcebooks, then the whole group can use them, plus there are plenty of free resources out there on the internet to help you get started. All-in-all, it's not a terrible cost for something that can provide you with hours of fun every week for years.

If you get a good group of people and a good story going that you all vibe with, there's really nothing like it.

Predap

MATHSOC QUOTES

VINTAGE EDITION

This council approves in principle to boot the Arts Faculty off Campus.

March 30, 1988 MathSoc Meeting Minutes

Production Night Pizzas — $132.00

mathNEWS *Winter 1989 Budget*

Pat Szwyrlo is 24 today; Motion: that Council sings Happy Birthday (Craig, Chris); Motion rescinded because it's frivolous

March 7, 1990 MathSoc Meeting Minutes

Tom amended 'Sytek' to 'Gandalf' in all occurrences in this policy.

October 15, 1990 MathSoc Meeting Minutes

In 4a, 'I'm comfy with the way it is' is not a direct quote, and should not be construed as such.

October 29, 1990 MathSoc Meeting Minutes

Councillors: Hear, hear! (applause.)

November 12, 1990 MathSoc Meeting Minutes

Tom: I want to enter into the minutes that I hate my job a lot!

November 12, 1990 MathSoc Meeting Minutes

Tom: No. Put the official [election] results in **mathNEWS**.

November 19, 1990 MathSoc Meeting Minutes

Council sang Happy 19th Birthday to inebriated Elaine.

February 6, 1991 MathSoc Meeting Minutes

The other stream is not going to be a bunch of yaks.

March 20, 1991 MathSoc Meeting Minutes

archivist

AC / DC

Athematics and Computing / Davis Centre

Roman Catholic

TURING 101

THE BEST EDUCATIONAL PROGRAMMING LANGUAGE EVER INVENTED IN THE PROVINCE OF ONTARIO

Turing was a programming language developed in Ontario by HoltSoft for use in high school computer science classes. That's how I learned Turing. One of the founders of HoltSoft was the late Ric Holt, who was a professor in the School of Computer Science here at UW.

You can download Turing at `http://compsci.ca/holtsoft/`. I am using version 4.1.1 and running it in Wine since I use Linux.

You might be wondering, is Turing compiled or interpreted? Yes. It can be either interpreted or compiled, so it's the best of worlds!

Let's start with a simple program: Hello World!

```
put "Hello World!"
```

This will print `Hello World!` to the output window.

Note: You must use double quotes, if you use single quotes it will not print anything. Single quotes are for characters, double quotes are for strings.

Next, let's write a program that takes the user's name as input, then says hello to them.

```
var name : string
put "What is your name? " ..
get name
put "Hello, " + name + "!"
```

We'll run this saying our name is `mathNEWS Reader` and we get:

```
What is your name? mathNEWS Reader
Hello, mathNEWS!
```

Oh no! It missed our last name! This is because the `get` statement only gets input until it encounters white space. To get input until the end of the line, we have to invoke the command differently:

```
var name : string
put "What is your name? " ..
get name : *
put "Hello, " + name + "!"
```

And we get the output:

```
What is your name? mathNEWS Reader
Hello, mathNEWS Reader!
```

So we've established the basics of input and output. But what can we do with Turing? Well, we can do anything. Turing has (almost) everything you would ever want in a language, including:

- networking,
- concurrency,
- a built-in command for drawing a maple leaf,
- objects and pointers, and
- manual memory allocation and freeing

So what can we do with this? A lot.

Here are a few directions I considered taking this series:

- Build a **mathNEWS** article submission server and client in Turing.
- Write a printer driver.
- Make an online multiplayer video game.

While interesting, these would probably be too long for **mathNEWS**. I also don't want to have to worry about an long-term plan that I end up not liking halfway through, so I think in the next few issues I'm just going to take you on a wild journey through all the weird parts of the Turing language.

teff

BECAUSE THE LAST CO250 ASSIGNMENT SHOWS THAT I CLEARLY DON'T KNOW WHAT THEY ARE: LINEAR FUNCTIONS

they're of the form $y = mx + b$. this means that things like $xyz \geq 1$ are not linear. and neither is $x \leq yz + 1$. $x + y + z \leq 3$ is linear, however.

i am going to try to keep this in mind as i continue to formulate problems. you should too.

thank mr goose

Lemman

SHEEP SHAGGER

STUD

my ass-bandit did pass. hand-it over unplanned, it should demand it for class stand. it

butt pirate

THE ADVENTURES OF PROFESSOR M. GOOSE CHAPTER 6

A golden hue surrounded Professor Goose. He turned to a page in the tome that seemed to have the most raw power. "Monster Group," he uttered. A low humming sound and pulsing light followed, then a spell that looked like a *is that a fricking nuke??? Guess it really is a radioactive ball of fuck you* (thanks gildED) *that no sane person wants to deal with.*

[REDACTED] cried out, his tentacles writhing in pain. The professor was pretty confident he got a good hit in, when all of a sudden a torrent of souls was released from the corrupted math student's body, dealing 1d10 of necrotic damage. *Fuuuckkkkkkk.*

The souls materialized next to the creature, and mini health bars appeared on them, because that's exactly how combat works in real life. *Okay, so AoE damage…* The professor flipped through the coursenotes. "Killing Field!" The souls, being stupid squishy, immediately perished, but not before returning to [REDACTED] and healing. *Well this is just unfair.*

"Never fear professor, we are here to help!" A crotchety voice yelled. The old man that conveniently disappeared before suddenly reappeared.

"The fabled coursenotes of A. Gaoldenheart aren't enough," the professor honked sadly. "We'll never make it out of here."

"Don't worry, I have something up my sleeve." The old man grinned evilly.

"More spells?"

"Nah. **This** is my weapon. She weighs one hundred fifty kilograms and fires two-hundred-dollar, custom-tooled cartridges at ten thousand rounds per minute. It costs four hundred thousand dollars to fire this weapon… for twelve seconds."

"What the frick?! You get a gun? Why the fuck would you ever want magic when you can have a gun? Also, where'd the Russian accent come from?" The not-corrupted but still scary math student piped in. They were currently trying to bash in the skull of a stray soul, but the bat kept going through.

"Still, if we work together, I'm sure we can defeat [REDACTED]. You have my bat!"

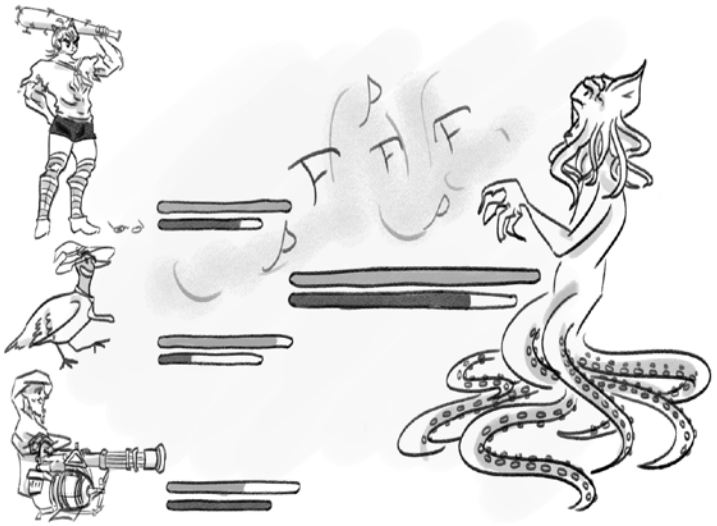
"And my awesome minigun… my beloved Sascha…," the old man started mumbling.

"So we'll defeat him with the power of… cooperation? Unwilling teamwork?" The goose asked.

"What? Of course not, that's ridiculous," the old man and student said in unison. "We'll defeat him with the…"

Professor Goose sighed, but was secretly somewhat relieved. The spells were reminding him of how annoying math was as a student and how none of it made any sense and if there was a hypothetical author to this very real story, the author would've been driven insane trying to understand any more of the math used in the spells.

"Alright, but first… you'll need a bit of a buff." He turned to the math student and raised the coursenotes with a wing. "Sheafify!" They tripled in size and their glasses fell off, but hey the cat ears stayed which is really the important bit.



To be continued…

*Not a N*rd*

Hello fellow math god! Want to decide what happens to ProfessorM. Goose? Come to the next prod night or email your suggestions to professormgoose@gmail.com

EVERYTHING IS ANYTHING: WHO NEEDS TYPES?

> *The class* `any` *describes a type-safe container for single values of any copy constructible type.*
>
> CPPREFERENCE

Are you serious right now? What was the point of all of it then? All this type nonsense? I can't believe it. Clearly, I've been living in the past. Why don't we just declare everything as an `any` right?! Christ, we don't we just switch to JavaScript while we're in the business of making flagrantly inane decisions, huh?! Just burn it all down, why don't you?!

Okay; in reality, this isn't totally absurd. While `std::any` *can* hold a value of any type, it *is* supposed to be type-safe, meaning that, to access the underlying data, we *do* have to cast to the right type using the `any_cast` template function. This does pose an interesting question, though: how could we write something like this ourselves, if we were so inclined?

Let's think. For something like this, our data would probably be pointed to by a **`void*`**, since that's type-agnostic. Obviously, **`void*`** isn't type-safe, so the whole point of this `Any` class we write will be to encapsulate a **`void*`** while preserving information about the underlying type. We can conveniently represent type information via `std::type_info` from `<typeinfo>`. Assuming we've included this header, we can obtain information about a type `T` with `typeid(T)`, which returns a **`const`** `std::type_info&` to the information about that object. It's a reference that presumably refers to some run-time type information stored somewhere implementation-dependent. In our `Any` class, we'll instead store a **`const`** `std::type_info*` so that we can change where it points during re-assignment.

With all that, we can decide how to construct `Any` objects. We'd like to be able to do `Any a{t}` for any object `t` of type `T`. We can do all of this in one template using perfect forwarding, and we can use `std::forward` to forward `t` to `T`'s constructor, so that move semantics Just Work.

```
struct Any {
  void* data;
  const std::type_info* type;
  template<typename T> Any(T&& other) :
    data{new T{std::forward<T>(other)}},
    type{&typeid(other)} {}
};
// ...
Any a{std::string{"Hello"}};
```

This is almost good; there's a little bit of a problem here. Consider the following usage:

```
std::string s{"Hello"};
Any b{s}; // !!!
```

Turns out the highlighted line actually won't compile. The problem is in how C++ determines types for expressions: since `s` is an lvalue, the type of the expression `s` is deduced as `std::string&`, and so we end up having `T` being `std::string&` in the `Any` constructor. This is bad, because then in our member initialiser list we'd be trying to do stuff like `new std::string&{ ... }`, which makes no sense.

To get around this, we'll use `std::remove_cvref_t<T>` from `<type_traits>` to remove the references and cv-qualifiers from `T`. Basically, just replace **`new`** `T{std::forward<T>(other)}` with **`new`** `std::remove_cvref_t<T>{std::forward<T>(other)}` and we're good.

Okay, that's solved. On the other hand, we still can't meaningfully access the underlying data. So, we'll write an `Any_cast` template function which takes an `Any` and returns a reference to the underlying data with the right type. Since we're storing the type, we can easily verify that the given type matches the type of the underlying data wrapped by the `Any` object. If it doesn't match, we throw an exception provided by the standard library:

```
template<typename T>
T& Any_cast(Any& a) {
  if (typeid(T) == a.type)
    return *static_cast<T*>(a.data);
  else
    throw std::bad_any_cast{};
}
// ...
Any_cast<std::string>(a) = "world";
```

That's pretty good, right? Looks like we're done.

Except we're not. Here are a few things we've completely neglected:

- Copy/Move Constructors: we forgot them.
- Assignment Operators: we don't have any.
- Destruction: we're making a copy of our data, but never destroying it. We're leaking!

These are actually pretty substantial problems, if that wasn't clear. Okay, fine, let's deal with the destruction problem first.

DESTRUCTION

"What's the big problem?", I hear you ask. "Why don't we just do this?"

```
struct Any {
  /* previous stuff... */
  ~Any() { delete data; }
};
```

Well, that's a fantastic solution, if the problem you intended to solve was "Goodness, My Library Doesn't Have Enough Undefined Behaviour Yet." That's right, deleting a **`void*`** is undefined behaviour. That makes sense after all — there's no

type information. How's it supposed to know what deletion should look like? We need to be a little bit smarter in our approach. In particular, we need to somehow cast it back to a pointer of the underlying type. How can we do that?

Here's an idea.

```
struct Any {
  /* previous stuff... */
  ~Any() { this→destroy(data); }
};
```

Alright. What's `destroy`? A member function? Aha. Not quite.

Here's the magic. This `destroy` thing is actually going to be a pointer to a function that takes a **`void*`** parameter and returns **`void`**, i.e., a **`void (*)(void*)`**. The pointed-to function will be responsible for destroying the given underlying data. Why the layer of indirection? Because, this pointer can be initialised and re-assigned to anything else later on. So, this means we could assign its content dependent on template parameters in our constructor or assignment operator. What content specifically?

A lambda!

```
struct Any {
  void* data;
  const std::type_info* type;
  void (*destroy)(void* myData);
  template<typename T> Any(T&& other) :
    data{new std::remove_cvref_t<T>{
      std::forward<T>(other)
    }},
    type{&typeid(other)},
    destroy{[](void* myData) → void {
      delete static_cast<
        std::remove_cvref_t<T>*
      >(myData);
    } {}
  ~Any() { destroy(data); }
};
```

You might feel that this is a roundabout way of doing things. Why does this `destroy` function need to take an argument if it's always going to be **`this`**`→data`? Well, that's just the best way I could think of doing it. You might initially consider making the lambda capture **`this`** and take no parameters, but then we'd run into issues later on when trying to deal with copying. Speaking of—let's deal with that now!

COPY/MOVE CONSTRUCTION

Here, we can directly copy or swap the `type` and `destroy` fields respectively and be fine. The main issue comes from copying the data; we again need to know the type so that we can invoke the copy constructor of the underlying type. This poses a similar problem to the destructor, actually: we need to know the underlying type to do things right. It follows that we should be able to apply the same sort of solution with lambdas. In particular, we'll introduce a `clone_data` function pointer which will be assigned by the constructor a lambda that returns a copy of the underlying data.

```
struct Any {
  /* data members... */
  // revisiting our existing constructor
  template<typename T> requires
    (!std::same_as<std::remove_cvref_t<T>,Any>)
  explicit Any(T&& other) :
    data{/* same... */},
    type{/* same... */},
    destroy{/* same... */},
    clone_data{[](void* myData) → void* {
      return new std::remove_cvref_t<T>{
        *static_cast<
          std::remove_cvref_t<T>*
        >(myData)};
    }}
  /* other previous stuff... */
  swap(Any& other) { /* obvious */ }
  Any(const Any& other) :
    data{other.clone_data(other.data)},
    type{other.type},
    clone_data{other.clone_data},
    destroy{other.destroy} {}
  Any(Any&& other) { swap(other); }
};
```

where `swap` is a member function that swaps all the fields. Write it yourself.

Notice that we're doing the same `std::remove_cvref_t<T>` trick as before to get rid of any references and cv-qualifiers in our type `T`. Also, note that I tossed a C++20 **`requires`** clause into the original constructor template, just to make sure that template constructor doesn't get overconfident and try stealing business from our copy/move constructors. Finally, note that I made the constructor `explicit` just to make sure no implicit conversions accidentally happen. Fantastic!

ASSIGNMENT OPERATORS

If you learned anything in CS 246, you should know to reuse code wherever you can. Since we've done the work in our constructors, the assignment operators can just invoke constructors with temporary objects and invoke `swap` to make things work out. Run-of-the-mill, at this point. Do it yourself.

CONCLUSION

With all that out of the way, we actually end up with a pretty-much-mostly-functional-proof-of-concept DIY version of `std::any`! All the following code should now compile and run as expected:

```
Any a{1};
std::cout << Any_cast<int>(a) << std::endl;
s = std::string{"Hello"};
Any b{a};
```

```
std::string& strref = Any_cast<std::string>(b);
strref = "world";
std::cout << strref << std::endl;
```

If you want to be a completionist, the actual `std::any` class has a few additional methods like `reset`, `emplace` and `has_value`, but these are pretty easy to implement given our groundwork.

I think this is really cool; we solved some interesting problems involving type erasure with **`void*`** in an unconventional way using lambdas determined by template parameters. It's an interesting solution that uses compile-time computations to basically manage our own run-time type information inside the structure, effectively giving us a type-safe version of **`void*`**.

God, I love C++. Even its most screwed up features have cool implementations.

jeff

MATHEMATICAL PROOF THAT ACAB

[Editor's Note: Content warning — the following article contains graphic descriptions of violence and sexual assault.]

Here we will mathematically prove that ACAB.

First, we need to understand the notion of a Cauchy Sequence. In a normed space (X, d), a sequence $(a_n)_{n\in\mathbb{N}}$ is considered Cauchy if for all $\varepsilon > 0$ there exists $N \in \mathbb{N}$ such that for all $n, m \geq N$, $d(a_n, a_m) < \varepsilon$.

Now we say a sequence $(a_n)_{n\in\mathbb{N}}$ is bounded if for all $n, m \in \mathbb{N}$, $d(a_n, a_m) < M$ for some fixed $M \in \mathbb{R}$.

So, from here we can define $N \in \mathbb{N}$ such that for all $n, m \geq N$ that $d(a_n, a_m) < 1$. So, if we define $M := 1 + d(a_N, a_{N-1}) + d(a_{N-1}, a_{N-2}) + ... + d(a_2, a_1)$ then for all $n, m \in \mathbb{N}$ (WLOG $n \leq m$), if $n, m \leq N$, $d(a_n, a_m) \leq\ d(a_n, a_{n+1}) + d(a_{n+1}, a_{n+2}) + ... + d(a_{m-1}, a_m) < M$.

Also, if $n \leq N < m$, we can see that
$d(a_n, a_m) \leq d(a_n, a_{n+1}) + ... + d(a_{N-1}, a_N) + d(a_N, a_m) < d(a_n, a_{n+1}) + ... + d(a_{N-1}, a_N) + 1 < M$
So, in total, that means for all $n, m \in \mathbb{N}$, $d(a_n, a_m) < M$.

So, if anyone tells you ACAB isn't true, tell them they're being stupid, obviously it is, look at this proof that All Cauchy sequences Are Bounded!

However, if they keep insisting, tell them about how in 1997 NYPD officers arrested a man named Abner Louima. While being taken to the station, Louima was beaten by NYPD officers Justin Volpe, Charles Schwarz, Thomas Bruder, and Thomas Weise using their fists batons, and police radios. At the time, the officers claimed that Louima has assaulted them, however they later recanted their claim that Louima had attempted to assault them. After being taken to the station, Louima was brutally raped, tortured, and beaten by Officer Volpe, according to the Wikipedia page on the trial (in which Volpe pleaded guilty):

> *Volpe kicked Louima in the testicles, and while Louima's hands were cuffed behind his back, he first grabbed onto and squeezed his testicles and then forced a broken broomstick up his rectum. According to trial testimony, Volpe walked through the precinct holding the bloody, excrement-stained instrument in his hand, bragging to a police sergeant that he 'took a man down tonight.' Louima's teeth were also badly damaged in the attack when the broom handle was jammed into his mouth. He testified that a second officer in the bathroom helped Volpe in the assault but could not positively identify him. The identity of the second attacker became a point of serious contention during the trial and appeals. Louima also initially claimed that the officers involved in the attack called him a racial slur and shouted, 'This is Giuliani-time' during the beating.*

So yeah, it's a mathematical fact ACAB.

All Cauchy sequences Are Bounded

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

Check the lookAHEAD for the next date!

A mathNEWS EDITOR WHO NEEDS NEW FRIENDS

POOP-SHAKER

hoop-maker,

dupe-acre,

coop-laker,

soup-taker,

goop-faker,

troop-baker,

loop-waker.

redneck

(NO TITLE)

flip the bird,

by tossing the crow,

a little teapot,

two studs in a row.

anal assassin

TURBOCHARGER NOISE

You know how when you upshift a car with a really loud turbocharger, it goes, "hu-tu-tu-tu-tu-tu…"?

I just realized I do that when I exhale sometimes. Like, I make that sound. Completely involuntarily. Why am I turbocharged. I don't get it.

tendstofortytwo

THE BANACH TARSKI THEOREM

states that any sphere can be cut up into finitely many pieces, such that those pieces can be rearranged to form two identical copies of the original sphere.

The Banach Tarski *paradox* states that you can't do the same with money.

Unemployed mathematician

MINTY MINT YUM!! 😋

I love 🌿 minty so much!! Mint is like a cool 🧊 breeze 🌬️ on an icy day!! Or diving into a cold 🥶 pool on a hot ☼ day!!! I like to put on 🌿 peppermint to cool me down on a hot day :smile: or yummy minty 🦷 toothpaste!!

Eating 🌿 minty mint makes me feel allllllll grown up 😊! My friend says it tastes like 🍺 root beer! Young enamourED always said 😖 yucky yuck yuk when eating 🌿 minty but grown up enamourED 😤 loves minty!! Sometimes you change and find out something yuck 😖 is actually 😋 yum 🙂

enamourED

EPISODE 38: MATH 136 – LINEAR COMBINATIONS

Enjoy Episode 38 of the MathSoc Cartoons series: *MATH 136 — Linear Combinations*!

Want to see the next comic BEFORE it's released and provide feedback to help us out? Sign up at `https://bit.ly/cartoons-reviewer-join`! Want to see the next comic when it's released? Follow @mathsoccartoons on Facebook and Instagram! As always, feedback, suggestions, and fan art can be left on the MathSoc Cartoons Discord channel in the MathSoc server.

MathSoc Cartoons

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A SOCIAL mathNEWS EDITOR

MATH 136 – LINEAR COMBINATIONS

STORY BY: CAITLIN KWAN
ART BY: JULIET WANG

(1): $\mathbb{F}$ AND $\mathbb{F}^n$ ARE FIELDS – SETS IN WHICH ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION ARE DEFINED COMMON EXAMPLES ARE THE UNIVERSAL SETS $\mathbb{R}$ AND $\mathbb{R}^n$ AS WELL AS $\mathbb{C}$ AND $\mathbb{C}^n$

gridWORD THOUGHTS

gridCOMMENT *149.2*

Speedrunning cryptic crossword creation is what I imagine Chess-Boxing is like, only self-inflicted. I'm a huge fan of cryptic crosswords, and think fondly of previous generations of **gridMASTERS** who went on to write **gridWORD**s for the stars. By that I mean Fraser Simpson, who still publishes weekly in many a newspaper of note. The early 80s were quite a time for student journalism, with tales from alumni of the era implying with some shock that Imprint was not only reputable, but also dare I say it 'based'. It makes it even more impressive that these intrepid boomers would publish multiple student papers aweek, filled to the brim with wonderful content for students to enjoy before they new the salty spray that comes with surfing the web. Despite having worked on this for weeks I can't quite seem to hit any deadlines I put for myself. Personally, I blame the motivating power of having other responsabilities.

Like figuring out who to vote for. (Did you vote yet? I don't remember when 149.2 comes out so you'd better or better have, the election's June 2nd but I'm writing this 20 minutes after the article cutoff for 149.1.) Go vote. In fact if you're eligible to vote and don't, then I don't know if you'll be allowed to finish the **gridWORD**. Not that your physically couldn't but we'll both know you didn't do it quite right.

Through this process I've realised how dang hard building a crossword in general is, not to mention trying for symmetry. I'd describe today's shape as having one. If you squint and tilt your head maybe it represents your favourite implementation of Linux. In reality, it represents my favourite, whichever is currently making my project run without crashing.

I was supposed to have had this **gridWORD** prepped for the last issue (149.1), and with that in mind this week's **gridQUESTION** relates to the matter of procrastination. "How late can you submit an assignment after the deadline before anyone notices it's missing?" Send in your answers to mathnews@gmail.com by 6 PM on June 13th, or, dare I say it, submit physical copies to the **blackBOX**. [Insert suprised pikachu face.] Maybe the editors will give you a Math CnD coupon or something, I'm not their dad.

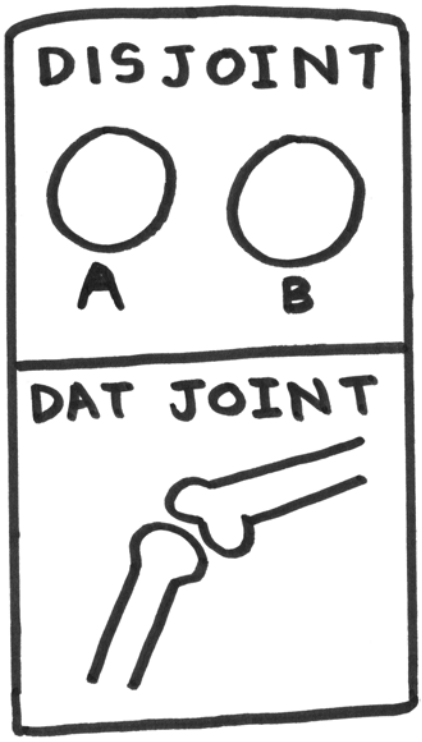
sqrt(cause)

ACROSS

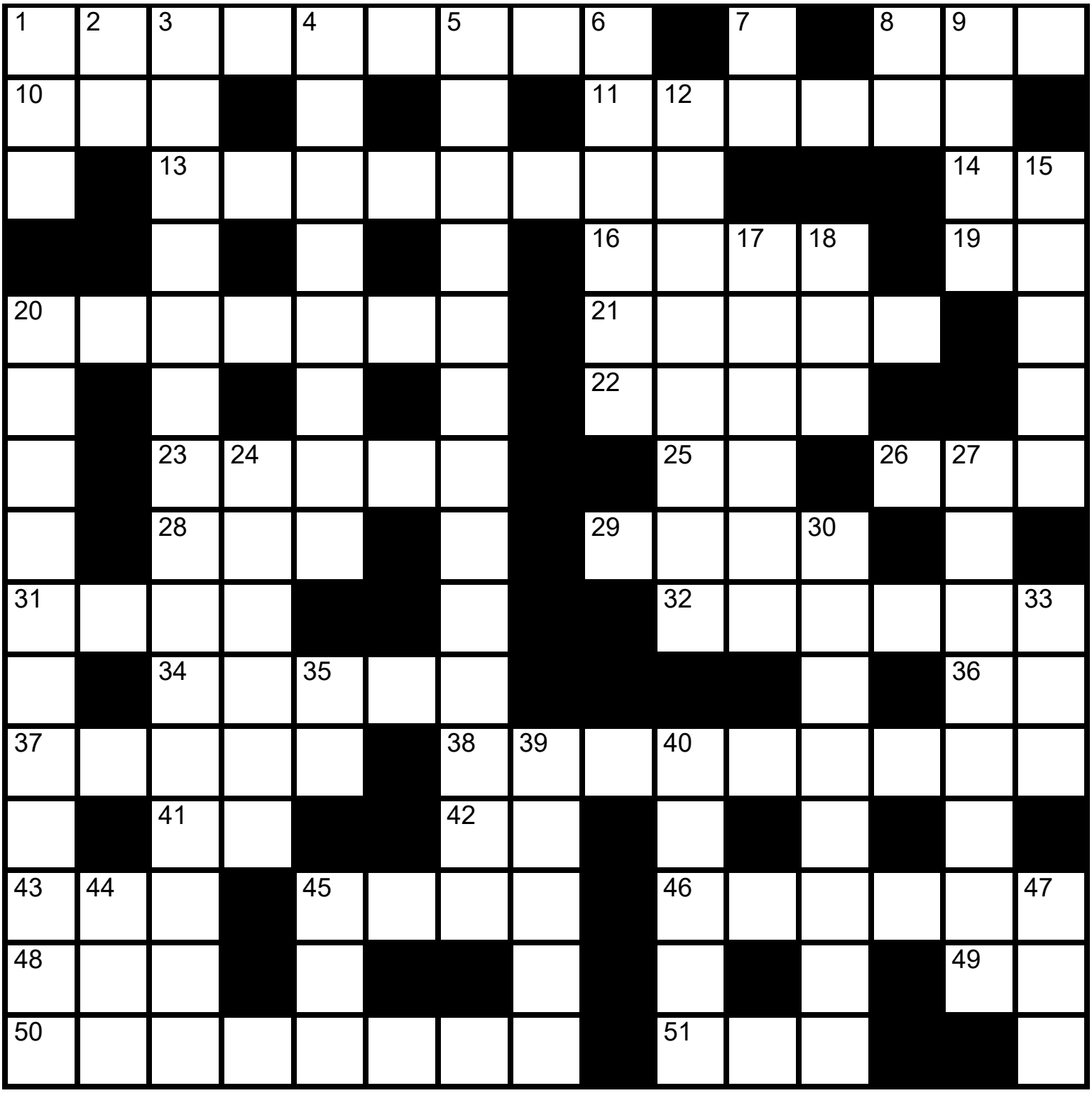
1. Insular island of penguins Colombo invited to his home. (9)
8. Old knowledge without banana nutrients is a novel idea. (3)
10. Running local rail trolls the land of the rising sun. (3)
11. Chickens reduced at the nearby airbase! (6)
13. Childless cervid made honest by infection. (8)
14. Sum of flightless expendables. (2)
16. Clarinet mouthpiece blown closely mimics loved ones. (4)
19. Lovers follow a long way to run. (2)
20. An Italian ram aroused. (7)
21. German woman's Basset game gets out of hand. (5)
22. First pair of cetaceans meet the first pair of hunters to a questionable end.(4)
23. Uncontrolable need to spring forth, but faltering first. (5)
25. Spider's aunt dropped an unknown quantity. (2)
26. Full moon howlers became one. (3)
28. An annoyance, the marsh plant has no length. (3)
29. Lice parasitise young fox matting hair. (4)
31. A pause from logging cored trees.(4)
32. Natural for real Indochinese isoprene. (6)
34. Stirred spaghetti whets the appetite. (5)
36. About the 75th. (2)
37. Bodacious lemur noise inspires many circles. (5)
38. Occitan aerospace declare aloud pairing of insects. (9)
41. Parisian bachelor shortens world government. (2)
42. In short a continent under one flag. (2)
43. Agreement In advance of the Bees. (3)
45. Change to hardness scale is resisted. (4)
46. Inflamation of her French arachnids. (6)
48. A rope tied without the kink. (3)
49. Worldwide measures agree with Spain. (2)
50. Amogus with the Muscovites is a quiet affair. (8)
51. Quickly remote control halt a submarine. (3)

DOWN

1. Red canine functions with respect to crossroads. (3)
2. Only one bridging the gap between America nowadays. (2)
3. Dyson collected a network of powdered foie gras links. (10, 5)
4. Offkilter measurement of the local network is Greek to me. (8)
5. Monster uses Vy perplexing central mesage corridor. (13)
6. Blackout sprinting contorted in pain.(6)
7. Unlikely a lower golf score is the output. (2)
8. Negate the Ontarian bookends. (2)
9. Sheep stare at first young becoming newly wise. (4)
12. A large grey wrinkly planet eh?(8)
15. Master Dorothy visits twice. (5)
17. Frozen mouse blended into short term superhero. (6)
18. Kill rodent with tar. (3)
20. Raincoats not-required crossed against better judgement. (10)
24. E-Train collision kept on the tracks. (6)
27. Turncoat Incontinence confuses a sunrise. (8)
30. Uracil hitcher bumbles way to the Lazarus man.(3, 5)
33. Lakeside focus is early seventies film. (3)
35. Following omicron in the ides of March. (2)
39. Removed from office at the point of a broken lance. (5)
40. Turned sore and taking the L. (5)
44. Never myself as a youth without Thailand. (3)
45. Stingless pig makes way on the water. (3)
47. Physics contest does wrong. (3)



GRIDWORD



Drop your gridWORD solutions off at mathnews@gmail.com to make a gridMASTER's day.

A PERSUASIVE mathNEWS EDITOR

lookAHEAD

SUN JUN 5	MON JUN 6	TUE JUN 7	WED JUN 8	THU JUN 9	FRI JUN 10	SAT JUN 11
			Best Friends Day	Cycle #1 employer rankings available	Final examination relief requests due Cycle #1 student rankings due	

SUN JUN 12	MON JUN 13	TUE JUN 14	WED JUN 15	THU JUN 16	FRI JUN 17	SAT JUN 18
	mathNEWS 149.3 production night	Convocation begins			**mathNEWS** 149.3 published Tuition and fee refund deadline — 50%	

LAST ISSUE'S gridSOLUTION

C	R	A	B	■	S	O	D	R	Y	■	B	O	R	N
L	O	L	L	■	A	R	E	A	■	■	E	P	E	E
A	M	O	A	■	G	L	E	B	A	■	R	A	T	S
W	A	R	B	L	E	■	D	I	S	A	B	L	E	S
■	■	■	B	E	L	■	I	C	E	D	E	■	■	■
E	■	T	I	N	Y	■	N	■	T	O	R	S	O	S
G	L	E	N	S	■	A	G	O	■	■	■	O	R	A
G	I	N	G	E	R	Y	■	L	A	T	E	R	A	L
E	R	O	■	■	■	C	O	D	■	E	X	A	L	T
D	A	R	I	N	G	■	U	■	G	R	A	S	■	Y
■	■	■	B	L	A	S	T	■	A	R	M	■	■	■
F	I	N	E	A	R	T	S	■	D	A	P	P	E	R
O	P	E	D	■	B	R	I	N	G	■	L	I	R	A
I	S	L	E	■	■	I	D	A	E	■	E	M	I	T
N	O	R	M	■	S	P	E	N	T	■	S	A	N	E

otherNEWS is made technically possible by club executives of the Math Faculty.

I say "technically" because if they had sent us more news this week, this box wouldn't be here.

THE mathNEWS EDITOR WHO PUTS THE "NEWS" IN mathNEWS