WATERLOO
MATH **50**
1967 - 2017

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HOW ARE YOU DEALING WITH PRE-EXAM STRESS?

NOT VERY WELL, I'D GUESS.

Every term must come to an end. (Alternatively: you know why they call it a term? Cause it's gotta terminate!)

Sorry folks, this is the last issue of **mathNEWS** for Fall 2017. It's been a pretty bumpy ride, but now we're finally here.

Here, you ask? Here, with renewed hope for the future existence of **mathNEWS**, even after not receiving funds for three whole terms. (Yes, we are in quite a perilous financial situation at the moment.) Here, knowing that no matter what, **mathNEWS** must continue, and we must unite to make sure it does not fall. After all, if it did, the editors would have to drink the decades-old Orbitz on the shelf of the office, and probably die of some form of poisoning. It would cause a giant PR nightmare for the school, and everyone's degrees would be rendered, if not worthless, worth slightly less than before.

Speaking of PR nightmares, an Imprint article about **mathNEWS** was published just Tuesday night. It's heavily skewed towards **mathNEWS**, and reveals quite a bit more than it really needs to. Just as a disclaimer, the positions represented in the article do not represent the stances of all **mathNEWS** editors. The whole matter was handled a lot more heavy-handedly than I would have personally preferred, and incidents of that nature will hopefully not happen again.

There were also some allegations of **mathNEWS** spending too much money on EOT events, which quizED discusses on p.15 of this issue. In any case, those numbers were from the last year, back when **mathNEWS** was still getting too much funding from Math**SOC** and needed to spend it in order to retain our status as a nonprofit (sorta). After a year of not receiving money, that is no longer the case. We have nothing left.

Luckily, a new MOU is in the works, and it will hopefully make all of **mathNEWS**, Math**SOC** and FEDS happy. So we'll get our money again, and students will get more **mathNEWS**!

Well, that's the **mastHEAD**. I'll miss being a part of **mathNEWS** next term. **mathNEWS** is home to me. And I'll keep thinking about it until I return in Spring 2018.

Signing off,
itorED

The Joker	HAHAHAHAHAHA
YDDT	#Co-opLyfe
Teemo	Supporting net neutrality.
Herbie	Exams? Who's she idk her?
AC	Too many assignments to think about exams tbh
me	I translate it into self loathing and dread toward living.
CylonSympathizer	Rank up in GWENT.
Waldo@<3.LE-GASP.ca	Not shopping BECAUSE THAT'S A GOOD THING!
e	Pretending it doesn't exist by reading Worm.
ITSH	x number of screams into x number of voids.
Soviet Canadian	Collecting and feeding various slimes on a ranch.
Zethar	Taking the time to visit that acquaintance of mine who owns a time machine to take a break from the stress — by going to Ancient Babylon to go troll an Editor who is not here this term. What? Use the time machine to give myself extra time to study for my exams? Doesn't that sound like an abuse of power to you?

ARTICLE OF THE ISSUE

Amazing, Awesome, Magnificent, Glorious, Helpful, Resourceful, Splendid, Spectacular 3rd Year CS Tips wins the article of the issue for having the most adjectives in the title of the article. Come pick up your prize at MC 3030.

Besides such matters, there was a lot of art this issue. I conjecture that the amount of work I have to do scales linearly with the amount of art.…Regardless, this is the last issue of the term, and I think it's a very good one. Full of art, puzzles, poetry, **profQUOTES**, mathematics, ads, announcements, news, and magic, I guarantee that you'll have fun reading **mathNEWS** or your money back.[1]

Thank you, to all of you, for reading **mathNEWS**.

quizED (Zishen Qu),

mathNEWS *editor, Fall 2017*

1. Offer not valid for people that actually paid me money.

mathASKS 135.6

Featuring David Wagner

TheUndecided: What's your favourite prime number?
I guess it has to be 2—all the other primes are odd. My favourite non-prime number is also 2. Since $2 \cdot 3 = (1 + i\sqrt{5})(1 - i\sqrt{5})$ it follows that 2 is irreducible but not prime in the ring $\mathbb{Z}[i\sqrt{5}]$, which is a domain but not a UFD.

T.Z.: Which course would you recommend (not compulsory) from PMATH and C&O?
This is a question that is impossible to answer. It really depends on your interests, background, and goals, and so the answer can't be the same for everyone. All of the fourth-year courses in the whole Faculty are very strong.

Combinatorial-Cat: What is your favourite combinatorial object? Explain?
This has to be a big Moore graph. This is a graph in which every vertex has degree 57, it has girth 5, and every pair of vertices that are not adjacent have exactly one common neighbour. Its most notable feature is that currently nobody knows whether or not it exists.

$K_{3,3}$: Which Graph is your least favourite? Why?
I do not like the graph with no vertices and no edges. It is divisive. Some of my colleagues think it is connected. It is not connected. We fight about this.

Frog: What is your favourite infinite set?
Solely in order to provoke an argument, I will say that I don't believe in infinite sets—they are merely convenient fictions.

LookingForwardToBridges: Do you consider math to be a form of art?
Certainly! (But I would not want to referee a paper by Jackson Pollock.)

249Life: Who is your favourite actor?
Toshiro Mifune.

Zethar: Regale us the tale of "Waggie"?
I know who you are—you're that guy in the cape who asked me to sign a postcard! *[Zethar note: That was Algoweird, from whom I originally heard of the tale.]*

In 1993–94, Waggie was an Active Player of the play-by-email game Agora Nomic. (Wiki it.) Nomic is a game with no purpose, in which the players form a parliamentary system and then change the Rules of the game and the Winning Conditions according to some sort of democratic process.

After a few months, Waggie realized that most Players were taking it way too seriously. He teamed up with Oerjan, Ronald, and a couple other players to form a semi-public cabal devoted to supporting the most ridiculous Proposals that they thought could possibly be passed into Rule.

The peak of this campaign was the Walrus Scam. This consisted of two Proposals, the first of which began something like this: "There are Nomic Entities known as Walruses (or Walri). Every Walrus is either Happy or Sad, but not both. Walruses are not a form of Currency, and can not be bought, sold, or traded. Every Active Player who votes For this Proposal receives exactly one Walrus, which is Happy. Every Active player who does not vote For this Proposal receives exactly one Walrus, which is Sad.". The rule continued to carefully delimit the scope of Nomic Rules as applied to Walri. The second Proposal eliminated Walri after 10^{-28} seconds, replacing Happy Walruses with bonuses, and Sad Walruses with penalties. This provoked some dissent from a player who was a physicist post-doc at CERN, who was one of the Players who took the game way too seriously. His objection was that since 10^{-28} seconds is less time than it takes light to traverse the effective gluonic radius of a quark, that unit of time was immeasurable and hence meaningless. Waggie countered with the sage and timeless observation: "Walruses are not physical objects". A long discussion ensued, touching on virtual walri, spontaneous Walrus decay, the W^+ and W^- vector walrons, the possible existence of one or more neutral walroids, and other advanced topics of Walrus Bogodynamics.

This Walrus Scam was legal but antithetical to the culture and practice of Nomic at the time—but both Proposals passed into Rule by a good margin. A new Official Title of "Scamster" was instated, and Waggie was the first Nomic Player upon whom this infamous moniker was bestowed. He was pleased.

ExamsareHard: How do you feel about being called "Putnam" and what's the reason behind it?
Years ago I set some very challenging final exams, which I guess were a bit traumatizing. I don't mind the nickname "Putnam"…it seems fairly benign.

Toad: What question would you like to inflict on a 239/249 class which you REALLY didn't like?
Hmmm... In 27 years at C&O I have never had a 239/249 class that I didn't like. Maybe: write down a proof of König's Matching Theorem formally in first-order predicate logic. But this would be more appropriate if I really didn't like the grader.

A Math/Teaching Student: Why should we learn C&O? Which is better? C or O?
It is interesting, beautiful, and useful. Neither. Both.

PM-ME-PLANAR-GRAPHS: Why is Zorn's lemma yellow and sour?
A: That profQUOTE was a mis-quote. What is yellow and sour and equivalent to the Axiom of Choice is Zorn's *lemon*.

Hatguy: Hedonism or Nihilism?
Why not both, or neither, or an entangled quantum superposition? And don't forget to throw Gratitude, Altruism, Generousity, and Sociability into the mix.

What does it mean to exist? How does I know?

Because of the mathASKS questions involving infinite sets or Walruses, I decided to write about the nature of existence and knowledge, as regards mathematics. For reasons that will not be explained, I decided to use the symbol I to stand for an arbitrary entity. I will tell you about I, reducing I's arbitrariness. This has the delightful side-effect that I sounds like I is talking Lolcats with a slightly Jamaican accent. I wrote this article.

Rene Descartes famously penned *cogito ergo sum*—I thinks therefore I is. There is a lot in this. If you try a Philosophy minor then you will learn about *epistomology*: the study of the nature of knowledge; *metaphysics*: the study of the nature of existence; and *ontology*: the study of that which actully exists. Descartes' declaration hits all three points. Where does Mathematics belong? What is the number 3?

Descartes's claim is that he has a direct perception of himself, and hence he must exist; if he did not exist then he could not have had that perception. Some people think that this is a proof by contradiction—others admit "direct perception" as being a constructive act, and for them the argument is direct.

I takes as an axiom: If a self-aware I directly percieves a B, then B exists. This is sufficient but not necessary for the existence of B. Internal consistency of B is necessary for the existence of B. Descartes says that I directly perceives I, and therefore I exists. (There are problems with this axiom if I begins to hallucinate.)

Some of you, like I, might remember when you *got* the idea of numbers. In kindergarten, I arranged 24 blocks in a 4×6 rectangle. Then I split it in half and rearranged it to make a 3×8 rectangle. Then I stared at it for ten minutes. Later, the teacher told I's mother that I might be dim-witted. But I was having a direct perception of numbers. What was it that I was directly perceiving?

The Wikipedia page titled "Philosophy of Mathematics" is a good overview of lots of opinions on the nature of existence (metaphysics) of mathematical objects. Most of these opinions are seriously and almost comically flawed. Here is a brief look at the few that I considers most interesting.

Platonism. Plato was a student of Pythagoras, and famously posited the existence of an ethereal non-physical realm in which perfect embodiments of all abstract concepts exist. Our physical universe is just a shadow of this perfect one. I thinks that most mathematicians hew to this ontology from day to day, but if pressed might begin to squirm. Beauty and Justice are abstract concepts, but they are clearly culturally dependent. Do they belong in the Platonic realm, and if so, how? The number 3, though, seems safe. What makes numbers different from other abstract concepts? Some Platonists argue that all that is required for mathematical existence is freedom from internal inconsistency. I thinks this argument is dodgy. It seems reasonable that there could be a small snow-white equid with a single spiral horn protruding from its brow—therefore, unicorns exist. I is not convinced.

Formalism. Swinging as far away as possible from the realist ontology of Plato, in the late 19th century the doctrine of Formalism arose, chief proponents being Hilbert and Russell. For them, mathematics is just a set of rules for manipulating strings of symbols in some well-defined language. Some strings are axioms or postulates, other strings are rules of inference. Then I constructs a whole bunch of more strings of symbols by applying the rules of inference to the axioms. I finds this deeply unsatisfying. I wants to think that I is talking about something, and not just babbling, no matter how coherently. That is, I thinks there is more to the number 3 than just the symbol $0'''$ in Peano Arithmetic.

Intuitionism. Around that time, Brouwer began to espouse Intuitionism. For him, direct experience was the gold standard for existence. Proofs by contradiction are admissible in Intuitionistic logic only under some rather strong restrictions. Mathematical objects exist only if they can be constructed from the axioms and rules of inference in a finite number of steps. The Axiom of Choice is also problematic for Intuitionists.

Constructivism. Constructivism is like Intuitionism, but less brutal. What differentiates Constructivism from other schools is that it takes a closer look at the existential quantifier. For an object x in some domain of discourse, and some predicate $P(x)$, you know that $\forall x : P(x)$ means that all x are such that $P(x)$ is true; also that $\exists x : P(x)$ means that at least one x is such that $P(x)$ is true. I would like to add two more quantifiers. $\Box x : P(x)$ means that there is a constructive proof (given the context) that there exists an x such that $P(x)$ is true. This is meant to correspond with the idea of direct perception. $\Diamond x : P(x)$ means that the existence of an x such that $P(x)$ is true is not logically inconsistent.

The implications $\Box x : P(x) \Rightarrow \exists x : P(x)$, and $\exists x : P(x) \Rightarrow \Diamond x : P(x)$, are clear. The Platonic optimism is that $\Diamond x : P(x) \Rightarrow \exists x : P(x)$. The Formalists view of $\exists$ is so limited that I can't comment without swearing. I doesn't know where the Intuitionists stand.

What about proof by contradiction? Both Platonists or Formalists might state it as:

$$[(\exists x : \neg P(x)) \Rightarrow \exists y : (Q(y) \land \neg Q(y))] \Rightarrow \forall x : P(x).$$

This is not a problem for Constructivists. Or, for a nonconstructive existence proof:

$$[(\forall x : \neg P(x)) \Rightarrow \exists y : (Q(y) \land \neg Q(y))] \Rightarrow \exists x : P(x).$$

Intuitionists reject this principle unless the domain of discourse is finite or effectively searchable in some sense. Platonists accept it, and Formalists are just pushing pencils around. Constructivists don't mind so much, but would rather use the proof schema

$$[(\forall x : \neg P(x)) \Rightarrow \Box y : (Q(y) \land \neg Q(y))] \Rightarrow \exists x : P(x)$$

to count as a "semi-constructive" proof of $\exists x : P(x)$. Really relaxed Constructivists would admit the proof schema

$$[(\forall x : \neg P(x)) \Rightarrow \Box y : (Q(y) \land \neg Q(y))] \Rightarrow \Box x : P(x)$$

but this weakens the notion of constructability.

To conclude, does the number π exist? For a Formalist, one can write down the finite string of symbols

$$\pi = \lim_{N \longrightarrow \infty} \left(6 \sum_{n=1}^{N} \frac{1}{n^2} \right)^{1/2}$$

and another string of symbols asserting that the sequence of partial sums is Cauchy and bounded, with a constructive bound on $N(\varepsilon)$ required to achieve an accuracy of ε. Everyone is happy with this.

What about this number: for each $n \in \mathbb{N}$, choose $b_n \in \{0, 1\}$ arbitrarily, and let $\beta = \sum_{n=1}^{\infty} b_n 2^{-n}$. Does β exist? For a Platonist: heck yeah, we're a big tent party. For an Intuitionist, definitely no. It requires the Axiom of Choice to even pick out a general example of such a number. I has already slagged on Formalists enough. A Contructivist can assert that $\Diamond\beta$ and $\neg\Box\beta$, and remain agnostic about $\exists\beta$, giving a more nuanced answer.

I is a relaxed Constructivist.

24 HOUR BOARD GAMES NIGHT

If you are reading this on Friday, December 1st, then 24 Hour Board games will be TOMORROW !

24-hours board games is a termly event that usually occurs on the last weekend of classes, there will be people playing games in the Math CnD from 12 pm on Saturday to 12 pm on Sunday.

Keeping the tradition from usual board game nights, there will be free drinks and snacks for the whole 24 hour period, as well as dinner at midnight, and breakfast in the morning!

You are welcome to come and go as you please, and play any of the games owned by MathSoc (which is the biggest collection on Campus, counting more than 300 games), including recently acquired games such as Terraforming Mars, 1960: The Making of the President, and Dominion Adventures.

TL;DR: Board games and free food from 12 pm Saturday Dec 2nd to 12 pm Sunday Dec 3rd.

CylonSympathizer

ARTIFICIAL INTELLIGENCE OPTION

A meeting of the Senate Undergraduate Council (SUC) in October went over some changes to the course listings for the 2017/2018 academic year. The one thing that caught my eye was the addition of an option in artificial intelligence, available for BCS and BMath (CS) students, though not for BCS Data Science students. There is also an artificial intelligence option offered for all engineering students, with slightly different requirements. For the math faculty version at least, only 15 students are allowed to enroll per year at the moment.

The option requires students to take 7 courses, at least two of which need to be from the engineering faculty, mostly under the SE, ECE and SYDE course codes. All the engineering courses that can count towards the option will at some point get a list of equivalent math faculty pre-reqs, so that it isn't ridiculously difficult to qualify for the option. All the courses on the list are upper year courses, so current students may still be able to qualify for the option as soon as it is available.

There are some interesting courses on the list. **CS 480: Introduction to Machine Learning** seems to be a new course being added, though there's a course description already available on the Cheriton school site. There are also some grad-level engineering courses that qualify, two 500 level systems courses and a 500 level mechatronics course. For engineering students, there are also two 500 level chemical engineering courses that count towards the option. Everyone's favorite course, CS 452, also counts towards the option, if anyone really wants to try taking that on top of engineering courses.

There's a link to the SUC meeting minutes below. Best of luck on getting in to the option if you decide to go for it, just leave me a spot please.

https://uwaterloo.ca/secretariat/sites/
ca.secretariat/files/uploads/files/suc_agenda_
package_2017-10-17.pdf

You don't deserve to know

DID YOU SMACKTALK MATH ORIENTATION ON REDDIT?

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2018 Federation Orientation Committee
Faculty of Mathematics

INTERESTING PROOFS

In 1777, Georges-Louis Leclerc, Comte de Buffon posed the following question:

> *"Suppose we have a floor made of parallel strips of wood, each the same width, and we drop a needle onto the floor. What is the probability that the needle will lie across a line between two strips?"*

He solved it with some fancy calculus, which was all very nice, but not particularly exciting. However, in 1860, a man named Joseph-Émile Barbier came up with this super slick proof, which is without a doubt the coolest proof I've ever seen:

The trick is that rather than trying to calculate the probability directly, Barbier examined it through the lens of the expected number of lines the needle would cross.

Suppose we define our wooden strips to be 1 unit of distance wide, and we find that dropping a needle of length 1 unit has a probability p of crossing one of the lines. (we will ignore the possibility of the needle being exactly on a line, or having one end each on precisely two lines, since the probability of that is 0).

If we drop one needle x, our expected number of crossings is simply p, the probability that the needle crosses a line. If we drop a second needle y, then by linearity of expectation we find that our expected total number of crossings is $E(x+y)=E(x)+E(y)=2p$. In general, the expected number of crossings when you drop n needles is np.
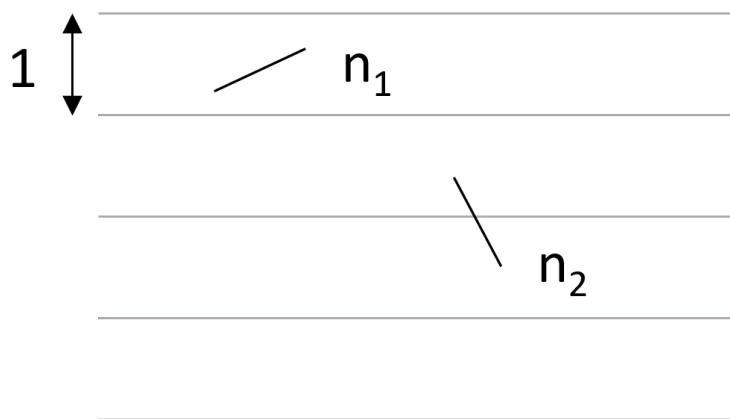

TWO NEEDLES DROPPED ON THE FLOOR.

Similarly, if we drop a needle n and break it into m identical pieces $n_1 \ldots n_m$, we find that each piece must be responsible for the same expected number of crossings: $E(n)=E(n_1)+\ldots+E(n_m)$, so $E(n_i)=\frac{1}{m}p$.

In short, we can drop a needle of any length l we want and the expected number of crossings will be lp. This holds even if we drop some really bizarre needles:
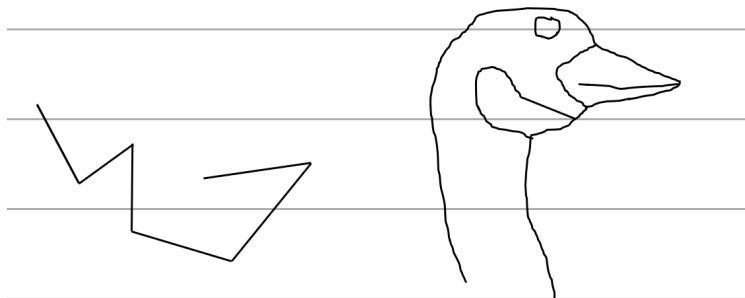
SOME STRANGE NEEDLES INDEED.

Now suppose we take a needle and bend it into a circle of diameter 1. We know that the expected number of crossings must be πp from before. But consider the ways the needle could fall on the floor:
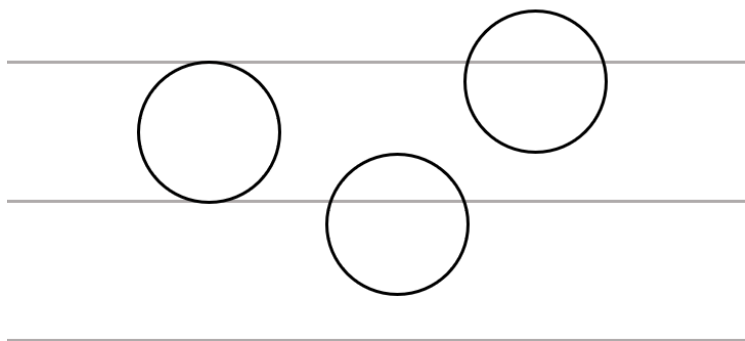
THREE NEEDLES BENT INTO CIRCLES.

It always crosses in exactly two places! So $\pi p=2$ and we find that $p=\frac{2}{\pi}$. Any straight needle we drop on the floor will have probability $p=\frac{2}{\pi}$ of crossing a line. And we didn't do a single bit of calculus!

the proof reader

AMAZING, AWESOME, MAGNIFICENT, GLORIOUS, HELPFUL, RESOURCEFUL, SPLENDID, SPECTACULAR 3RD YEAR CS TIPS

- If you leave things for the night before (which, I mean, who doesn't? Am I right guys?…guys?), spend the night outside and hope for a wicked virus to snag that fresh lookin' doctor's note.
- Sit near the front of the class to avoid sleeping (or sleep and risk having your prof know your face, name, family, home address, and the fact that you are most definitely going to fail the course).
- If notes are posted online, don't go to class—the class is the notes. The notes are the class. You have all the tools you need, especially that lack of motivation.
- Think you might fail a course (*coughs* OS)? No worries! Retake it until the end of time. Keep your detrimental routine intact. Once a Warrior, always a Warrior.
- Forget about that GPA, you've already done enough courses to stay in the safe zone. We all know we're not getting that shiny Google internship anyways. Just be wary of the previous point. (Though I think Rave is still hiring!) :)
- If you really want to Fear Factor yourself, do the worst you possibly can on your assignments and midterms and pray for an otherworldly miracle for your finals. Take a shot for each course you fail. Have fun sweaty :)
- Sit next to the kids that always have questions in class. Odds are you can just get them to ask your question (side note: literally no one talks in class what's with that) and your world will be calm once more. For some convoluted definition of calm.
- Now that finals are approaching, it's the time that everyone starts studying, right? No! Wait until the day of, be a little quirky, brag about how you'll bomb the test—you'll be the most relatable kid on the block.
- You've heard of Cali or Bust, but have you tried just Bust? Not only do you not have to worry about finding that pesky housing, but you don't have to embarrass yourself in every technical interview when they ask you to recreate a BST or something—this way you'll have more time to procrastinate on the schoolwork you never did!

Hope these tips were helpful to some of you, I've been following them religiously and I can say that they've helped me tremendously. At this rate I could just drop out and graduate with half of a degree, a world first!

In all seriousness, I've come this far and so can you. It may all seem really tough right now, and failing a course may seem like the end of the world, but even though we're all different, in the end we are all having a hard time. No one's perfect, our journeys are all different, but we are all smart enough to be here, continuing our higher education. We will all be okay. You've got this.

Good luck on finals!
Herbie

DIGITAL PRIVACY

So way back in 2000, four years before Facebook and seven years before the iPhone, Canada passed the *Personal Information Protection and Electronic Documents Act* which can thankfully be shortened to PIPEDA.

This basically regulates what companies can do when it comes to collecting, sharing, and using personal information. This is pretty important since in the past twenty years or so, some companies have started stalking us like it's their job. Generally, that information isn't abused too badly, but that doesn't change the fact that Google and Facebook know more information about us than most of our parents, and laws like this are our primary protection. If you put a lot of effort into protecting personal information—installing ad blockers, booting up a VPN, burning your laptop after every use—you might manage to avoid getting tracked and analyzed. Although the vast majority of us are unaware of all the details or have just accepted that companies will know most of our dark secrets, meaningful consent to this data collection is often lacking.

When things go wrong as they inevitably do, (looking at Equifax, Sony, and Yahoo as examples) personal information on millions can be compromised. Updating our nearly two-decade-old legislation in this area is rather important. Some suggestions are:

- Higher consent standards
- Greater enforcement powers for the Privacy Commissioner
- Tracking and sanitizing data marked for sale
- Right to be forgotten/creating easy tools to delete personal content.
- Annual security reports for major companies

If you want to weigh in on this issue, the Office of the Privacy Commissioner is taking feedback and submissions up until December 4th. So if for some reason you aren't too busy with exams and assignments, write up something quick for this (not going to include a link, just Google Office of the Privacy Commissioner; it is on the front page).

Pockets

N WAYS TO CRY

We all cry, but here are some techniques that may be useful

- [Silently Cry] — Hold in your face as the tears slowly flow down your cheeks. Bonus points for doing it in class.

- [Toilet Cry] — Find some random stall. start crying. often paired with [Silently Cry]. At least your nose will be so clogged that you can't smell the toilet.

- [Soul Cry] — You're fine, but your soul isn't.

- [Absolute Breakdown] — Fall onto the floor and just bawl your heart out.

- [Joke about Crying] — Use humour as a method to distance yourself from the issue itself.

é

N GAMES TO (NOT) GET ADDICTED TO OVER EXAMS

NOW AVAILABLE ON MANY DEVICES! I'M SURE GOOGLE COULD TELL YOU MORE...

- **AdVenture Capitalist**: like Cookie Clicker, but with digital money instead; you can even conquer other planets with your financial enterprises!
- **Tap Tap Fish Abyssrium**: like Cookie Clicker, but with marine life instead; you can decorate and cultivate your own aquarium in the deep dark ocean abyss with otters, whale sharks and even sea slugs
- **1010!**: like Tetris, but without the pentominoes; just try and get as many full lines across the 10 by 10 grid as you can without getting stuck using the randomly generated puzzle pieces
- **Alphabear**: vaguely like Scrabble, but with cute bears; find words in the grid to collect the bears (they're adorable), you even get to make some hilarious mad libs at the end
- **Slime Rancher**: like Zoo Tycoon (remember THAT game? anyone?) but with much more squishy creatures; catch slime-balls, get their poop gems/plort.....???....profit, it's adorable, exploratory, and awesome
- **Mini Metro**: like Ticket to Ride I guess? (I've never actually played that game, but it's also about trains); build train networks in your favourite metropolitan cities, but don't let them get overcrowded!
- **Neopets**: need I say more?

waldo@<3.LE-GASP.ca

GROUP PROJECTS: AN ANTHOLOGY

forget the refinement

it just has to run

i'll do my best on the assignment

but after 20 hours, i'm done

-marks vs. time

arbitrary line

breaks are totally fine since we aren't

using python; in fact

we could write a whole book like this;

that said it'd be better

if you could follow the style guide; oh ok you're putting all your code on one line; gitlab how do i undo a commit;

-spaghetti

my heart is racing

segfaults, 5 a.m., monday

CS two four six

-a few days from now

AC

ADD ME ON ANIMAL CROSSING KTHXBYE

I think it's safe to assume that the majority of the population here has been plagued by the release of Animal Crossing: Pocket Camp. I'd like to add as many people as possible and start my own Animal Crossing Camp Cult. If anyone is interested, add me:

ID: 1382 4906 372

Let's start a revolution (while failing all of our finals).

Herbie

AWKWARD MOMENTS

Here are some special moments I keep in my memories (unwillingly), also featuring stories from friends (potential future **mathNEWS** writers???)

Cashier: "So will that be Visa or Debit?"
Me: "Yes"
Cashier: "…"
Me: "…"

Professor: "So, do you have any questions?"
Me: *raises hand*
Professor: "Yes?"
Me: "…Yes"

Now we have a special feature from my friend/floormate, ft³⁄m.

> I was walking down Hagey Hall, minding my own business. My mind drifting off as I pass by the sights I've seen a thousand times, barely glancing to the side as I made my way down the stairs. Suddenly, an overwhelming presence. That youthful aura, the ferocious stance, the buff bod that makes all his fellow gym-goers jealous — it could only be the handsome and dashing Professor David Ha who had appeared in front of me. His kind and considerate soul bearing the weight of the heavy metal door, awaiting my departure from the building, his strong, built arms blocking the entire hallway, all just for me. I look into his eyes. I look back towards the hallway.
>
> "Uhh…yeah, my class is that way."
>
> —ft³⁄m

Waiter: "Table for one?"
Me: "No"
I was alone.

We have another feature from my dear roommate, Ⓑolicy 33

> My dreary steps made their way away from the SLC, the MATH 145 midterm having taken its toll on what was left of my sanity. Still, I kept marching on. My head was down, mostly because I was reliving that nightmare with a fellow friend and classmate, my focus on the device in front of me. It did not matter, two months was enough for me to memorise the entire way back.
>
> "Excuse me, sir, SIR."
>
> I looked up. There was an elderly man, wearing an incredibly, incredibly expensive suit. He had his palm raised against me. I looked into his eyes. Five seconds passed. He gestured behind him.
>
> Suits and gowns and dresses and carpets and a strange…mace? A mace.…There was a man, bearing a mace. A macebearer, if you will. An enormous procession gathered around the man, or was it the mace? I looked to my right, spotting a sign with the word "CONVOCATION" printed on top. I looked back to the procession to see them walking straight towards me. Or rather, I was right in the middle of their path.
>
> Shit.
>
> —Ⓑolicy 33

Aquaintance: "Hey é how's it going?"
Me: "hEAeH?"
Aquaintance: "Oh…"

DC Scammer (thought I was international): "So, yes, the children are very hungry so any amount of money will be good"
Me with my mouth full of sushi: "…"
DC Scammer: "Yes so, a donation…"
Me: "…"

I'm sure this will become a (bi)-weekly series.…The DC Scammer thing really did happen, who knew that my anti-social skills would come in so handy. He got tackled and arrested a few hours after talking to me though…was it *that* awkward? (also the featured stories may have been paraphrased by me a little bit)

é

THE CHAIRMAN'S GAME
ALSO COMMONLY KNOWN AS 'MAO'

Rules:

1. Every time a round is won, a new rule is added.
2. These are the only 2 rules I may inform you of.

e

> Note: This is an excerpt of the Charlesworth standard, as presented by ¬perki to an eager group of first-year authors one **mathNEWS** production night once everyone had gotten their pizza. Thus started a glorious tradition of playing The Chairman's Game every production night, which has sadly fallen out of use during the ensuing years. This standard is famous for a number of quirks and incidents, including but not limited to BADGERS, 2s, spontaneous hugging, inter-table warfare, failure to follow the rhythm, a difficulty in naming shovels, and non-dragons not soaring. Descendants of the initial adherents of the Charlesworth standard have carried the torch forward and developed the Revised Charlesworth Standard; this standard is now maintained and stewarded by a fixture of this faculty, the esteemed Standard Bearer. Should you seek to glimpse the standard for yourself, you will need to obtain BLUE Clearance. Please refer to your local representative of Friend Computer for further details.

THEJOKER: THE PRINCE OF BAD PUNS RETURNS

MHAHAHAHAHA TheJoker is back once again! With more bad jokes and puns >:^) I have written for **mathNEWS** once before and I had promised to return at least once! I'm sure most of you are feeling the hell of finals glooming over Waterloo... And that's why it's the perfect time to laugh!!! I mean, why you got to be so serious all the time?? Sometimes you gotta let loose, accept the madness and smile :)

Now here are the bad jokes you have been waiting for ;)

How do you cheer up a hedgehog?…You give it a hedge-hug (hedgehog)

When two octopi really love each other, what do they do?… They cali-marry! (calamari)

What is the difference between an eagle and a fly?…An eagle can fly but a fly can't eagle!

How do mountains catch baseballs?…They use sum-mits! (some mitts)

Why couldn't the broken phone see anymore?…It lost its contacts! (like contact lenses)

How much do old batteries cost?…Nothing! They are free of charge!

How do you know when the Moon has eaten enough?…When it's a full Moon!

TheJoker
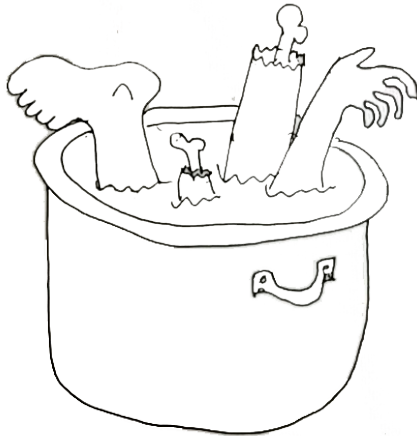
"lim sup"
$n \to \infty$　$k \geq n$

Mathematicians and regular people think of limsup differently.

LAST ISSUE OF THE YEAR.
BY ME

[itorED: article presented in its original form.]

Ho ho ho Merry december

time flies as $T1 = T0(\text{squreroot}(1 - V^2/C^2)) > 0$

since we not moving much, days go by fast as the C will allow it to be. I have done so little yet the rest the word isn't not.

From the general mood of the internet, 2017 is much better years than 2016. There so many good games come out . Starcraft now free to play, Flash won 3 ASL in a row. Major uplifting news!. Internationally, United Staters seem to got used to the notion of having reality TV host as their face of nation toward the world. And the Gen-Z already endorse Richgum vs Jake Paul match up for 2028, best luck to both of them.

Japan, Korea and China gear up for Olympics (as long as Canada not the host country, I have no problem which country burning tax for our entertainment) but I must say, I really believe the current favourite for running the best Olympic is Tokyo 2020. Looking forward to all the gameshow references. Korean 2018 is close second, I hope Psy / Flash be the host and esport as official Olympic event.[me: **lean closer whispers** US NUMBER ONE (America First!), TAIWAN Numba 29, Canada Numba 155…]

For UW the school has being booming with constructions projects. (enjoy your tuition hike internationals!) We have SLC expansion, The health study expansion and new engineer projects. Event AFM have new buildings. For students I don't know too much happen because I speed too much time in posting low quality memes on Facebook.

For **mathNEWS**, this might be one of our last issue if we don't get more money. Pls donate, these piazzas don't buy themselves. (ask the editors for more explanation.)

Le meme generation
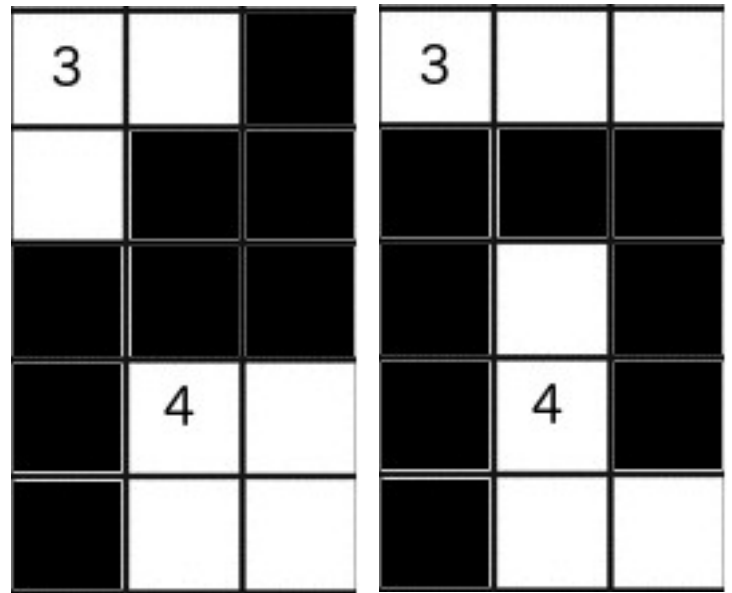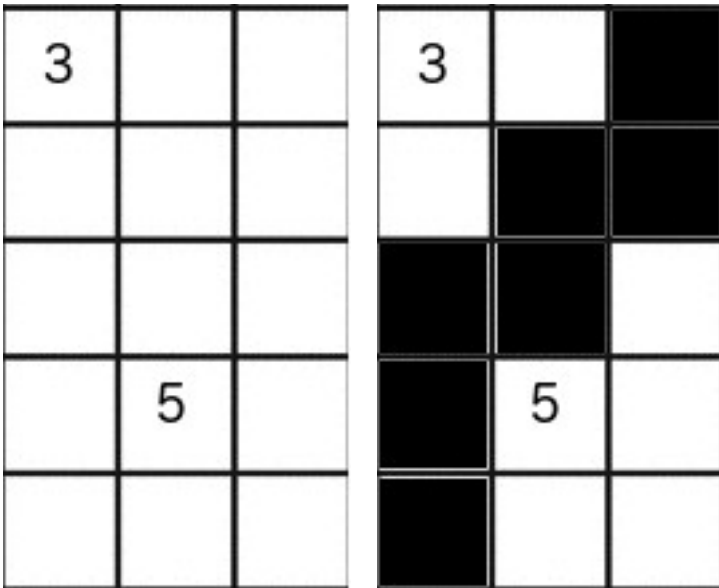
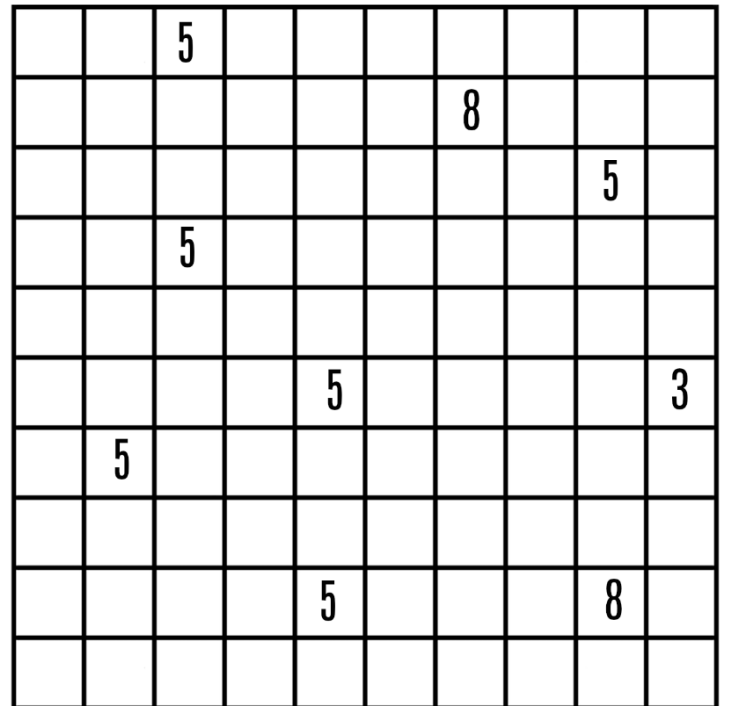# mathGAMES:
SQUARE-FREE
SQUARE-FREE REGIONS

Hello **mathsNEWS** readers and puzzle solvers, I hope you liked my last issue's Z2 Minesweeper puzzle. I received 1 submission from "HA SUCK IT !", which was correct. Sadly there aren't any prizes aside from my personal congrats message.

This issue's game will be Square-free Square-free Regions.

In this puzzle, you will be given a grid with some cells containing numbers. Your goal is to trace a "wall" that separates the grid into regions each containing exactly 1 number, and whose area is equal to that number. An example of a grid is as follows, as well as a potential solution

There are some conditions that need to be satisfied :

- The wall must be connected
- The wall must be in contact with all the edges of the grid.
- No 2 regions may be isomorphic to each other in shape (Rotations and/or mirroring)
- If 2 squares of the wall share a corner, they should share an edge, or are adjacent to a common wall square. (There must not be a 2x2 square where opposite corners are part of the wall and the other 2 aren't)

And since this is my version, Square-free Square-free Regions, we have this extra rule:

- Each region, including the wall, does NOT include a 2x2 square inside IFF its area is square-free. (Reminder: a number is square-free if it not divisible by any square integer other than 1)
- If the wall contains a square, it must contains EXACTLY ONE 2x2 square

The example of the left is correct, the example on the right is false.

Enjoy working on this week's puzzle, see ya next term !

CylonSympathizer
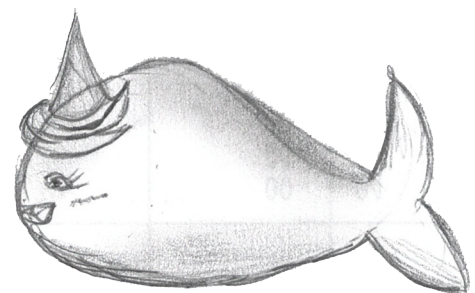
A RE-RE-FAREWELL TO THE PINK TIE STICKER

THE END OF AN ERA CAME IN THE NAME OF ACADEMIC INTEGRITY FOR MATH-APPROVED CALCULATORS (THERE'S NO MORE, FOLKS...SERIOUSLY)

As of February 16, 2017, the Math Undergrad Office has handed out the last of the pink tie stickers to those students who had brought in their calculators for approval. Unfortunately for the students who missed out on this opportunity, there will **_never_** again be a new stock of pink tie stickers to approve one's calculator. That means, if you have a calculator that *can* be approved, you currently have no method to *get* it approved.

WHY IS THIS HAPPENING? WHY NOW?

Back in June of 2015, the Math Faculty announced a major change to the calculator policy: the only calculator that would be permitted would be the TI-30XIIS/B and all permitted calculators (i.e. those that currently sporting a pink tie or its equivalent) currently floating around would be rendered useless beginning in Fall of 2015. The main reason for this change was to streamline the policy, allow for fewer opportunities to violate academic integrity, and make it easier to proctor exams and catch perpetrators. In addition to this, the pink tie sticker was intended to be phased out completely and only models that had an embossed pink tie (or equivalent) would be permitted for use in exams. Many who were caught violating academic integrity in the past had acquired a sticker, placed it on similar looking, yet unapproved calculator models that had higher functionality/power (i.e. programming capabilities, integration functionality, etc.), and made use of said unapproved calculators on exams. While the Faculty places a high priority on academic integrity, it unfortunately neglected to consult students prior to making these policy changes.

The Spring 2015 MathSoc Student Council and the Executives at the time went all the way to the Associate Dean's Office with many students' concerns and fought to have the policy modified. Their efforts at the time gave us the current policy we see today with the Math Faculty permitted not only just the TI-30XIIS/B model, but also the Casio fx-300MS and the SHARP EL-531X/XG/XH models. The agreement at the time however also meant that the pink tie sticker was still poised to be phased out as the three newly approved models would be sold on campus (as well as distributed in the first-year Orientation kits) with an embossed pink tie, or equivalent. Any remaining stickers would be distributed as needed for students who did not have them on their calculators yet, and no more would be acquired as such. The Math Undergrad Office dutifully distributed its remaining back stock of stickers, always with the caveat that they may run out. Almost 5 full terms later, they disappeared .

WHAT DO I DO NOW? I NEED A PINK TIE STICKER!!!!

As it stands right now, if you need a new Math Faculty approved calculator, you are only able to purchase one on campus at MathSoc (MC 3038), Campus Tech (SLC Basement), WriteStuff (SCH), or Media Doc (STC). Depending on the model of calculator desired, students may need to spend as little as $17 to as much as $36 for an embossed version. Of the outlets mentioned, arguably the cheapest one to purchase a Math Faculty approved calculator is MathSoc itself. They sell the **TI-30XIIS for $17**, the **Casio fx-300MS for $20**, and the **SHARP EL-531XG for $23** with all pricing being cash only, with taxes included. The *absolute* cheapest method for acquiring an approved calculator by far, however, is finding a friend who can let you borrow theirs. While MathSoc itself also has pink-tie calculators available for borrowing, it is important to note that they do not currently loan them out for exams.

THAT'S GREAT AND ALL, BUT WHAT'S BEING DONE TO FILL THE GAP FOR STUDENTS WHO HAVE ALREADY SPENT MONEY ON CALCULATORS THAT NEED TO NOW BE EMBOSSED?!

MathSoc Directors, Student Council and the Executive are currently looking into ways to fill the gap to make sure students spend as little money as possible on getting the materials they need. Proposals have included offering a calculator exchange program where students would pay a nominal fee (i.e. under $5) to have their calculator embossed with MathSoc itself so long as it's a more approvable model. That said, it may very well take a few terms to have such a new system in place after consultation with all affected parties. If any of **mathNEWS** readers have further concerns about the demise of the pink tie sticker or suggestions to fill in the gap that was created, feel free to message MathSoc's current Vice President of Academics, at vpa@mathsoc.uwaterloo.ca.

**If you are ever concerned about the calculator requirements for your classes, however, please don't hesitate to contact your instructors for clarification (some are more strict about the policy than others).**

A Mediocre Kitty

CORY DOCTOROW

Dead canary in the coalmine

we just lost the web in the war on general purpose computing

MONDAY
7:00 P.M.

DEC 04

Cory will be signing copies of his books following the talk.
Books will be available for purchase on site from Words Worth Books.

MONDAY, DECEMBER 4 | **7:00 P.M.**

Tickets are free but must be reserved.
For details: uwaterloo.ca/computer-science/events/cory-doctorow

Theatre of the Arts — ML 135, University of Waterloo, 200 University Avenue West

WATERLOO MATH 50 1967–2017

UNIVERSITY OF WATERLOO

PLEASE RECYCLE C014063

prof**QUOTES**

CO 456: GABRIEL GAUTHIER–SHALOM

❝ I'm not inspiring confidence, am I?

❝ Someone's looking at me like I'm being silly. I probably am.

❝ I think this is fewer errors than I normally make, so congratulate me for that. [class applauds] I try. I try.

❝ I'm doing this awkward thing where I keep talking and it keeps getting worse and worse.

❝ I know this makes sense. Just not to me right now.

❝ Don't trust my advice about life. I haven't figured it out. Anyone who says they've figured it out is lying.

❝ You guys aren't allowed to coordinate, but I can coordinate you guys.

❝ My primary goal in life is to make up for my misdoings.

❝ Am I the type of person that wants to punish people?

❝ That sounded really cocky, but I don't care.

❝ Who is it that submits all the prof**QUOTES** by the way?

❝ I'll try not to be late, but you know me.

❝ Are we interested? Is it fun? Are we having a good time?

❝ I'll use the magical word that gets me out of any situation: exercise!

❝ I think I'm reaching close to my symbolic limitation on the black board today.

❝ Four of the teams—uh, a number of teams I don't want to identify [were monkeyfied]

❝ Let's go to the code now—don't judge me, please!

❝ I know I have embarrassing things on my computer—my pony folder for example.

❝ Instead of saying "otherwise, we would have…", we can just say "lest". It's perfect!

❝ I really love words. I'm a Scrabble player.

❝ You can't have things be too nice.

CO 485: ALFRED MENEZES

❝ In fact, it is hard to estimate how inefficient these methods are.

CO 342: MARTIN PEI

❝ The entire course is kind of boring.

CO 351: MARTIN PEI

❝ [student sneezes] You have excess flow.

❝ I was going to scare her, but I'm too afraid to do that.

❝ If it's useful for the assignment, then don't use it.

❝ This is going to be a proof-y lecture today. Hopefully you're OK with that. Well you have to be OK with that. You have no choice.

❝ I wish I could be watching TV right now as well.

❝ Students do disappear. We do care if you disappear. So don't disappear.

❝ This is going to be a little bit disgusting.

❝ That's my theorem. That's not my theorem. That's a theorem.

❝ Ooh, I can't believe this actually works.

❝ It's better than magic, it's Min Cost Flow.

❝ Isn't that exciting? Now you're going to go into open pit mining, right?

❝ So I guess your question is, 'How do you even?'

❝ You just have to be smart.

❝ I have no idea how real life works.

❝ I don't like erasers that sing.

CO 367: HENRY WOLKOWICZ

❝ Go outside and you die. You can't get a complex number.

❝ It's called the department of Combinatorics and Optimization but it really should be called Combinatorics and Minimization.

❝ I call this theorem the 'Hail Mary' theorem because if you're stuck you can call a 'Hail Mary' and use this.

CS 489: YAO-LIANG YU

❝ Some of you may ask why do I make you suffer through this.

❝ I'm very bad with Julia. I couldn't figure out how to get input from the keyboard, so I switched to Matlab.

CS 338: MICHAEL LIU

66 [Shows Mbps on his downloads] Don't ask me what I download. I can't download horror movies because they have copyrights. So, what else can I download?

MUSIC 140: SIMON WOOD

66 I was afraid you were gonna answer 'sex'. I guess it also fits but I've been married 25 years so I don't remember.

CO 330: KAREN YEATS

66 I'm going to be in my office for any questions you have after you do your evaluations. If you come up immediately I'll know you didn't do them!

66 Who wants more time to think about it? No, you're like "I just want the answer!"

MATH 147: LAURENT MARCOUX

66 …I was captured by German pirates who wanted to sell me off into slavery, so I ended up in South America and lived in a farm, a chicken farm. The chickens taught me some algebra. Fortunately I was later sent to Montreal and I studied some analysis with the racoons, and now here I am…. Anyway I have to go see my mother now and I thought this is a good time to leave you with your course evaluations. Yeah I know, tragic life, but take care!

PMATH 930: ROSS WILLARD

66 This was probably the ugliest assignment. But I'm not going to apologise for it: it's just a part of growing up.

66 If you go back to your notes, which I know you are studiously taking…

66 This is an exercise in the book, so I could have just assigned it, as I did in the past, so…you're welcome!

66 I'm trying to be nice here!

66 Ok! I will stop. You are released. Don't forget to turn in your assignments.

66 You have the power to force me to proceed without making any additional assumptions.

66 Perhaps now you are alarmed that this notion of abelianness is crazy.

66 Is universal algebra extremely useful? Pfft, hard to say—probably not.

66 Pick your favorite element, or if you don't have a favorite, pick one at random, and call it 0.

66 I'm not gonna actually do induction 'cause I'm tired of it.

66 Crap. You guys don't know any of this, do you? Daaaaaaamn!

66 Anyways, stuff follows.

PMATH 331: ROBERT ANDRE

66 People will say, 'What do you have in the bag?' You say, 'A bunch of definitions and theorems.' 'Well what do you do with them?' 'I just look at them.'

66 Always carry a Cauchy sequence with you in a pocket.

ARTS 280: OWEN GALLUPE

66 Prof: I feel this is some of the most legible writing I've ever done. It's a good pen.
TA laughs Shut it you…
Prof: She bursts out laughing when I said that this is some of my better writing. Thanks. Gah, I wish there were TA evaluations…

66 Your TA has surprisingly little filter around me. I believe last week she said, 'I hope next semester I get to TA a course I'm actually interested in'…like…I'm right here!

66 Prof: We're going to try to have the assignments marked and grades released sometime next week.
TA: I thought you wanted them graded yesterday!
Prof: Well now they're done aren't they?

Short Attention Span Math Seminars
now at University of Toronto
Details to be announced in Winter 2018

Span {attention} ← this is pretty short

your attention
my attention

arabesque

ICENINE'S GAMING NEWS/OPINIONS OF 2017

This year has been a wild one for the video game industry and people who love video games. I'll be summarizing/giving my opinions (hot takes?) on stuff, I don't claim to be objective, so if you're looking for that, look elsewhere. We'll start with the big three console makers, and then look at a couple of other companies that I've been following.

NINTENDO

The Wii U finally died with its swan song The Legend of Zelda Breath of the Wild coming out on both it and the newly released Nintendo Switch. While there were originally fears about the console, its on pace to outsell the Wii during the same launch period, which is rather impressive for a $300 USD console. I've personally waited on it because after the console, the game and a pro controller, it comes out to something like $550 CAD plus tax, need to wait for either the dollar to improve or a slight price drop. As for other games for it, Pokken Tournament and Mario Kart 8 saw improved re-releases, which from what I've seen on my nephew's Switch, they are good versions. Rather pricey for re-releases though. Fire Emblem Warriors looks to be worse than Hyrule Warriors which is a shame, because they could have had a lot more playstyles, but there are a bunch of clone characters. Super Mario Odyssey looks great, though I am sad that motion controls are still required to get all of the movement options. Finally, the 3DS had Pokemon Ultra Sun/Moon come out, which are marginal improvements on Sun/Moon as far as I can tell. Still far too much handholding, and no option to speed up the lengthly Z-animations. Other titles for the 3DS are Metroid: Samus Returns, the first good Metroid game in a decade, a re-release of the first Mario and Luigi game, Etrian Odyssey V and a new Layton game. Still chugging along, but I think they're working on putting it out to pasture. Besides all of this, Nintendo has been running hard on trying mobile out, with the new Animal Crossing coming out, as well as continuing support for Fire Emblem Heroes and Pokemon GO.

SONY

Horizon Zero Dawn and NieR: Automata blasted out the gate back at the start of the year and from what I've seen both are solid games. I picked up NieR on PC because I don't have a PS4, but it definitely looks good on the PS4. Watching a friend played through Horizon while I was playing Zelda it looked like a good solid open world game, and while it didn't tempt me into buying a PS4, it definitely looked solid. Final Fantasy XV came out and was…weird. I honestly don't know what to think, but then again, I though XIII and its sequels were also weird departures.

MICROSOFT

With almost every game on XBOne also coming out on PC, I honestly can't think of anything interesting to say about them. Microsoft seems to be floundering this generation.

SEGA

Sega of course is far away from their heyday but they're still a solid software developer/publisher. Yakuza 0 looks like it's solid returning to its roots, Sonic Mania was a breath of fresh air, Sonic Forces was another sort of meh entry in the Sonic series. Puyo Puyo Tetris came out in the west for once which I'm happy about, and Bayonetta came out on PC. What I really want to see from Sega going forward through is for them to port the widescreen versions of Sonic 1 and 2 from android to Steam as well as a release of Sonic 3 & Knuckles in the same vein. Also, Puyo Puyo Tetris on Steam. What I'm saying in more PC support please Sega.

PARADOX

Crusader Kings 2 is hopefully finally almost done. I know that people keep buying DLC so they keep making it, but it's getting ridiculous now. Jade Dragon, involving the Emperor of China as an off-screen entity is a bit much. Europa Universalis 4 is also sort of running out of steam, with Cradle of Civilization not really properly fixing the bad changes to Ming introduced in Mandate of Heaven. Hearts of Iron 4 got two expansions focusing on British Dominions and China, but I haven't really gotten a chance to try them out yet. It definitely seems like the Year of China for Paradox though. In Stellaris, Utopia and Synthetic Dawn came out and generally have been fun, but the next update is what is looking really good, a complete combat and colonization overhaul that will radically change how the game plays. Still, I am somewhat disappointed that Paradox hasn't really released any new games this year, I'm hoping for either Victoria 3 or EU: Rome 2 next year.

HOMEBREW

SNES Classic and NES Classic are super easy to hack, so is the Wii U, I now have hundreds of games to play through as well as my Steam library help I'm drowning in choice.

LOOT BOXES

They suck, and these companies suck: EA, Ubisoft, Konami. Jim Sterling was right.

Peace,
IceNine

THE mathNEWS EOT COSTS

Some concerns were brought up to me about the **mathNEWS** costs line by Gurpreet Saini, the Feds Societies Accountant. The spending was written verbatim as follows:

Postage $54.11

Layout/production night costs $4,067.62
– for food (sometimes 1-2 student dinners, sometimes 1-6 pizzas, drinks and snacks)

EOT Event $3,353.10 –
movie & dinner - 20 students

Printing costs $26,178.78

The first, and most obvious point to make here is that these are costs for a fiscal year. I don't believe the Layout/production costs are too high, as there are approximately 20 of these events in each fiscal year. The only event that **mathNEWS** has, other than those working on issues, is the EOT.

As for the EOT, there are three of these events, as the term ends three times a year. The comments on the fiscal lines are false, as I have the records of the events for 2016 excepting the Winter 2016 EOT. For the Spring 2016 EOT and the Fall 2016 EOT, we did not go to the movies. While the number of students is approximately correct for the Spring 2016 EOT, which, if my memory is correct, was attended by 22 students for dinner, it is highly suspect for the busier terms of Winter and Fall. Also of note is that reservations were made for 36 people for the Fall 2016 EOT, which is a far cry from 20.

Lastly, and of course the **mathNEWS** writers are aware of this, is the requirements for attending a **mathNEWS** EOT. I may be incorrect on this claim, but I don't believe any other club has requirements on being allowed to go to their EOT (Other than being in the club). However, you need to have contributed to an issue in the current volume to be eligible to come to the **mathNEWS** EOT.

Thus ends my explanation of the budgets. But what about the actual expenses? Are they still really high per person? Well, of course they are. You have to actually do something in order to get into this EOT.

Here are the actuals for the Fall 2016 EOT:

$687.04   The Ultimate Escape Inc (Booked for 32 people, split into 2 bookings of 16 each)

$610.00   Huether Hotel (Dinner)

$1297.04   Total

If you still think it's too little or too much, you should write something for us next term, and attend the EOT yourself.

quizED (Zishen Qu),
**mathNEWS** *Editor, Fall 2017*

WHY THERE'S NO CS CHART

I tried. It actually won't fit into a **mathNEWS**-sized page and still be readable. There are a few problems:

1. 13 courses have CS 350 as a prereq. There's nowhere to put them all.
2. CS 240, 241 and 246 each also lead to a whole bunch of courses, so all of those would have to be arranged in a reasonable way as well.
3. A bunch of 3rd and 4th year CS courses require a number of early courses, like MATH 239, MATH 136, and STAT 230. The lines connecting those have to go from the top of the chart way down to the bottom, and they all cross over each other and everything else, creating a tangled mess
4. A bunch of the aforementioned upper-year courses have 3 prereqs, connecting them to another upper-year course, one of CS 240, 241, 246, or 350, and another upper-year course, making problems 1-3 much worse
5. I figure the CS people can figure it out themselves. They learn a bunch of ways to find paths through graphs, so this should be easy for them, right?

Long story short, there are 3 main categories of CS courses — those that require CS 350, required CS courses, and "other". Trying to find more underlying structure is beyond me. The best advice I can give to CS students is "take 240, 241, 246, and 350 as soon as possible." The best advice I can give to whoever's in charge of CS courses is to take another look at the prereqs for each course, and see if the whole thing can't be streamlined a little bit. Prereqs can help give students an idea of the landscape of the field and determine which areas they are particularly interested in, but the situation is currently pretty opaque.

Octopodes
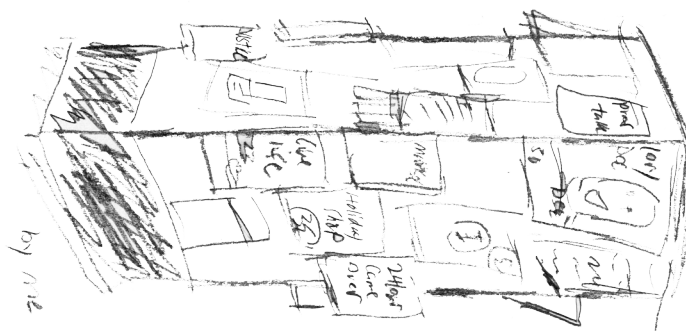
gridWORD

ACROSS

1. Song that Kills Me Softly
8. *Informer* artist
9. U2 has one
11. Expresses
13. Pin or clasp
15. Tibetan priest
16. IDE interface
19. Like most American beers
20. "Freedom fighters" in Belfast
21. Comes before carte or king
22. Dictionary command, at U(W)
24. Common alternative protein source
25. Dr. Seuss' environmentalist?
27. Kind of fund, or kind of game
29. Only seeing half of things
30. An Italian's capital
31. Second word in many fairy tales
32. A second look
37. Indian mystic
38. *Love Letter* singer
40. DNA's companion molecule
42. Street that breeds Nightmares?
43. Motor homes, for example
44. Abu Dhabi's surroundings
46. Sugar used in beer
48. Eagle's home
50. What you pay to play
51. Pleasure boats
53. Yoghurt makers
55. Dodge car or fluorescing gas
56. A Manxman or a Scot
57. Song to hide behind the Wall?

DOWN

1. Enthusiastic Muppet musician
2. Lisa's other name
3. A ram's mate
4. Site of a famous wedding
5. Each
6. Graven image
7. Self-centered individual
8. Fight for practise
10. On the outside (prefix)
11. Song for the Armed Forces to invade by?
12. Arabian greeting
13. Coffin stands
14. Song about the Dan of Steel getting old?
17. The art of stuffing
18. Catchall Jeopardy category
21. "___ we not men?"
23. Impaired driving charge
26. Belle Scarlett
28. Rapids, as those at Ste. Marie
33. Barely make ends meet
34. Heaps
35. Seen the light?
36. Chess programs, maybe?
37. Spider's mandible
39. A way to go beneath
41. Indian bread
45. Bikini, for example
47. You, formally
49. A bird or a theft
50. Neurotically meticulous
52. Country music TV
54. How old one is
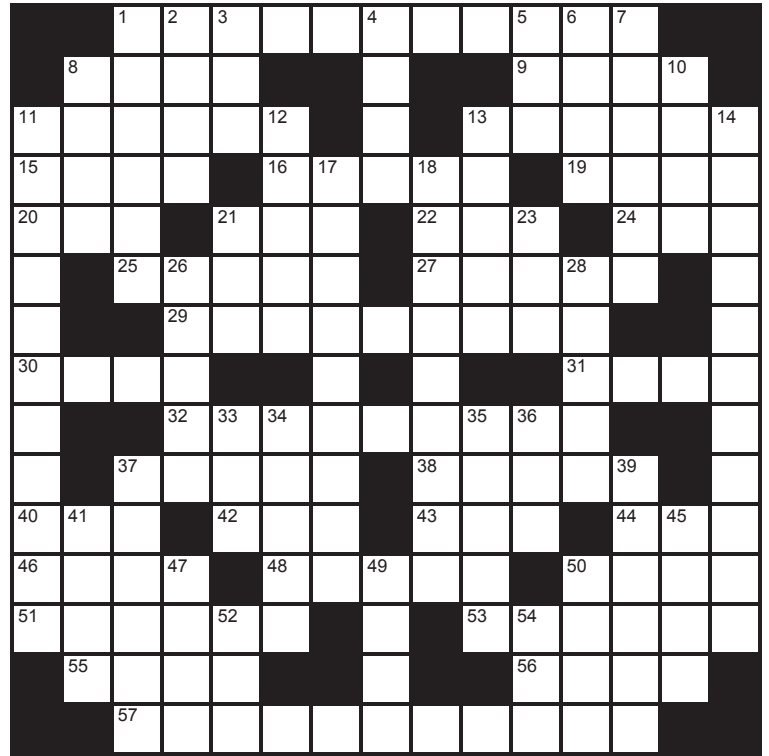
gridCOMMENT

Hello and good morning to the last issue of the term, where hopefully everyone has come out of the frying pan of midterms and is entering the fiery embrace of final projects and examinations. Given that I have received more submissions than usual, either that my grid was easier than usual, people had some more spare time, or people are learning how my grids work. Personally, I think it's a linear combination of the three.

Here are the contenders for the prize for last issue's grid, and the **gridQUESTION** from the previous issue was "What is sly, purple, and occasionally smells of brimstone?"

- Andrew submitted a grid with two incorrect letters and answered "My shoes?"
- Jmaes [sic] submitted a grid with one incorrect letter and answered "Dragon from the Shrek movies. Purple(ish), lives over a volcano, and managed to convince a donkey to marry her."
- *e*, Kelly submitted a correct grid with the answer "The Dragon from Shrek"
- athamizh and bvenkite submitted a correct answer with the answer "FOX GRAPES"
- clew3 submitted a correct answer and answered "Feridun, if Feridun was sly, purple, and sometimes smelt of brimstone"

- PMC Dream Team & Simon Y. Huang submitted a correct gird and answered "Spyro?? (The Dragon)"

I would like to commend the PMC Dream Team & Simon Y. Huang for managing to name the thing I was think about when I made the **gridQUESTION**. However, the tiebreaker rule is my *favourite* answer to the **gridQUESTION**, and in this case, I prefer clew3's answer: it touches upon the deep philosophical question of how an object's qualities define the object itself, and for that I think it is worthy of a prize. Please come and badger the **mathNEWS** editors at your convenience.

As is custom when signing off for the term, I present a blast from the long history of **mathNEWS**, since I am unable to give people a prize for the last issue owing to the fact that there isn't a next issue to publish the winner in for the term. This issue's **gridWORD elseWHEN** is from volume 85, issue 2, originally published February 2nd, 2001, courtesy of the **gridMASTER** of the time, Matt in the Hat.

Signing off for Fall 2017,
Zethar

gridWORD
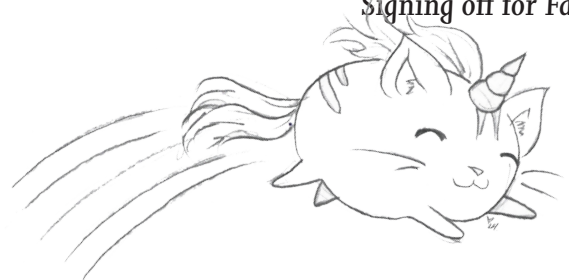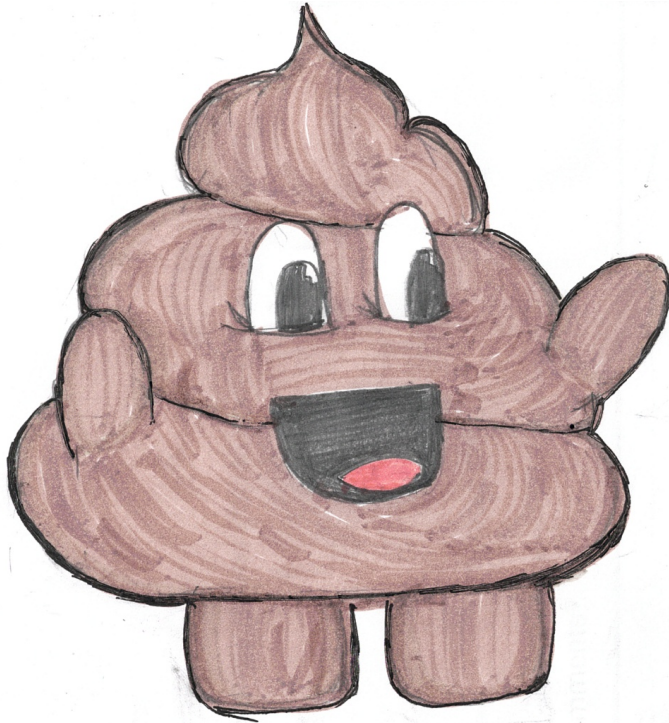
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R	E	A	L	E	S	T	A	T	E	A	G	E	N	T
C	A	L	A	I	S		M	A	R	C		S	E	E
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THIS WEEK'S
gridSOLUTION:

lookAHEAD

SUN DEC 3	MON DEC 4	TUE DEC 5	WED DEC 6	THU DEC 7	FRI DEC 8	SAT DEC 9
24 Hour Board Games Night Ends	Lectures end	Pre-examination study day	Pre-examination study day	On-campus examinations begin	Online course examination days	Online course examination days

SUN DEC 10	MON DEC 11	TUE DEC 12	WED DEC 13	THU DEC 14	FRI DEC 15	SAT DEC 16
	The mysterious missing mathNEWS Production Night!				The case of the missing mathNEWS issue	

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