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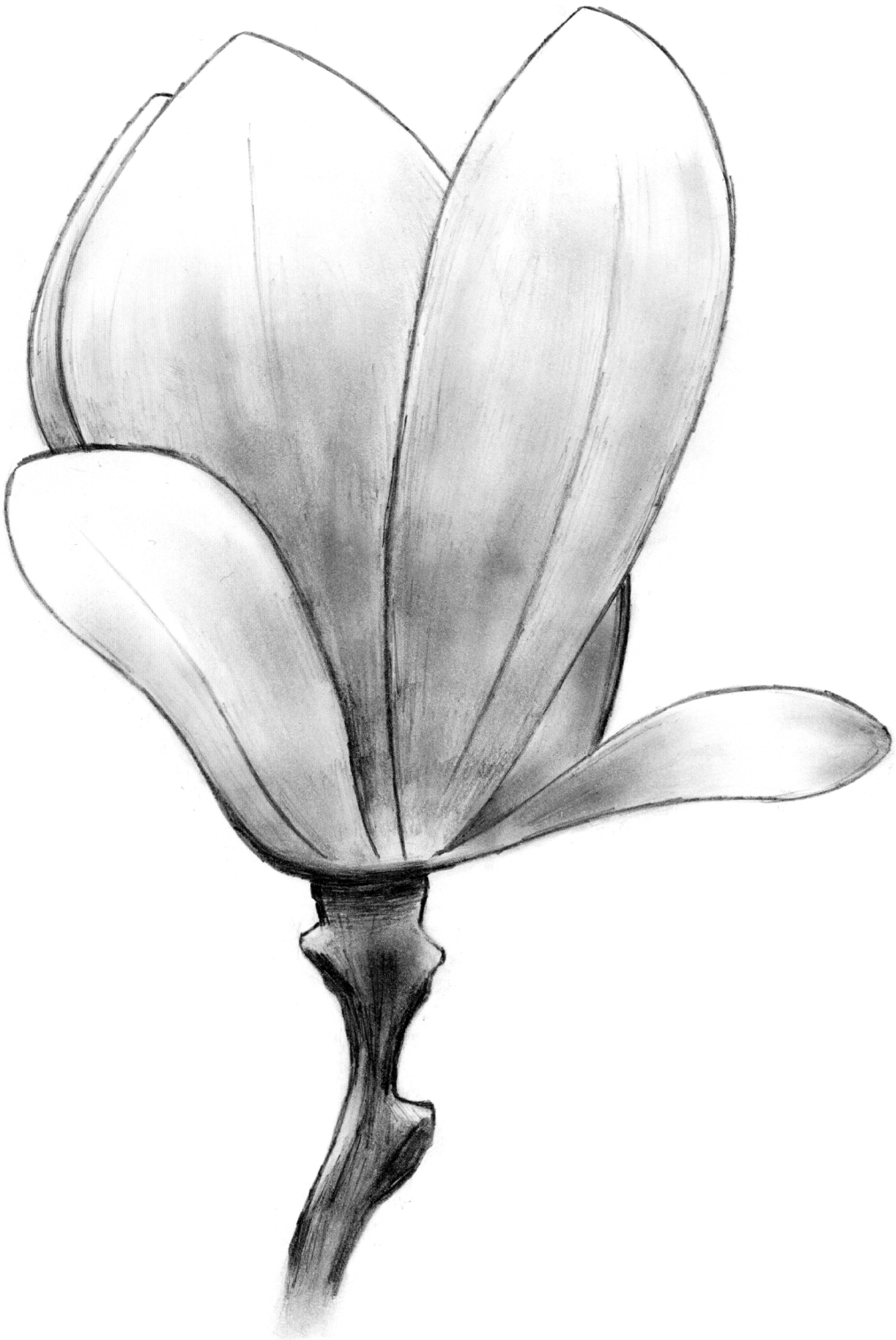



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# mastHEAD

## "WHAT WILL ALWAYS BE RELEVANT?"

*NOT ME. I'M RETIRING.*

This is weird.

Like, really weird. I didn't think this could actually happen.

But sure enough, this term has been my last at Waterloo, and naturally, that means that this issue of **mathNEWS** will most likely be my last as an editor of Waterloo's Bastion of Erudite Thought.

It's so surreal; in the past seven years I've been at this school, I've missed only a handful of Production Nights[1]. I've made so many friends through **mathNEWS** — hell, I've found *roommates* through **mathNEWS**. And what am I gonna do for free pizza now? It's not like biweekly pizza parties happen back at my parents' place — it's usually just *other* free food.

I seriously didn't think I'd see this day come.

But enough of what seems to be the beginnings of a serious existential crisis — this week's issue has a *ton* of great stuff in it to close out the term. We've got a great guide to keeping your breakfast safe, the history of zero, a pinch of **midiNEWS**[2], and Zethar makes good on a ridiculous challenge he accepted a year ago[3].

Oh, and I hope you like surprises: this week's **haltingPROBLEM** is truly my greatest work yet. I mean, given that only two out of the five I've been totally responsible for so far were (to my knowledge) any good at all, that's not a high bar to clear, but hey, effort counts for something, right?

So yeah. That wraps it up for the term, and I guess for my stint as a **mathNEWS** editor too. Goodbye, everyone, good luck on your exams (and everything else), and goodbye **mathNEWS**.

Thanks for a fun ride. 😎👍

*George Lambrou*
~~Editor, mathNEWS~~

1. During the terms I've been on campus, anyways.
2. My tenure as editor has taught me a lot about so-called "internet memes", and honestly, I think **midiNEWS** has the potential to be a great one.
3. I've been afraid of this day for a long time…

| | |
|---|---|
| SIGSEGV | Existential dread. |
| Theodore Bear | Keanu Reeves. |
| me | Jake Paul. |
| JoJo | Britney Spears. |
| BMONEY | Pineapple Pizza. |
| C_mon | Our Lord and Saviour Nicholas Cage. |
| The Eurobeat-'Em-Up | **midiNEWS**. |
| Zethar | Akkadian. |
| ITSH | Today's news. |
| extrovertED | The power of God and Anime. |
| swinldED | My PhD in analog circuits. |
| George Lambrou | School credit, and **mathNEWS**. |

## ARTICLE OF THE ISSUE

This week's article of the issue goes to…

[does a finger drumroll on the desk]

Zethar's untitled Cuneiform article! He learned a whole other language to write it, so… yeah. Come get your prize, Zethar!

You know where we live.

*George Lambrou*
~~Editor Whose Fingers Now Hurt, mathNEWS~~

## A SPECIAL TRIBUTE

This week, **mathNEWS** features a heartfelt goodbye to a fellow student who passed away recently, written by his sister.

Our condolences go out to his family. He'll be sorely missed by both his family, and by the community of the Mathematics Faculty.

*George Lambrou*
~~Editor, mathNEWS~~

## So long, and thanks for all the pizza.

GEORGE LAMBROU, mathNEWS EDITOR FOR WINTER 2018
ALONG WITH ANGELA LE, ANUJ OPAL, ZISHEN QU

# mathASKS 136.6

*FEATURING PROF. ALI MASHTIZADEH*

**ZETHAR: WHAT'S AN INTERESTING PIECE OF MATH OR RESEARCH THAT YOU COULD SHARE?**

It's hard to pick a single one but several of my favorites are from Xerox PARC during its peak in the early 80s. It's surprising how often I read one of their papers and what they built still seems better than what we have today. As someone who works in operating systems I'd have to pick "Pilot: An Operating System for a Personal Computer" and the Mesa programming language it was written in.

**MELISSA: HOW DO I COME UP WITH GOOD PASSWORDS?**

I use KeyPass to generate and store my passwords. It's somewhat counterproductive that many services bound the length of passwords and require special characters. Choosing four random words contains sufficient entropy and is easier to memorize.

**CHEESEBALL PAINTSTAIN: ARE THERE ANY NEW COURSES YOU'D LIKE TO CREATE AT UW?**

For undergraduates and graduates alike I'd like to create a course looking at computer systems with a historical perspective. I'd cover a lot of great systems research and the hardware that went along with it. We would explore how it influenced the development of future hardware and software system. Some of the modern ideas seen in computers today are actually rooted in systems as old as fifty years ago.

If I could add a course to the early curriculum I'd teach the basics of using UNIX systems to incoming students. Virtually everyone in industry ends up working on a Linux or UNIX derived operating system and thus it's critical to have a good understanding of these systems. I'm surprised how many students depend on graphical interfaces to get their work done.

**THE EUROBEAT-'EM-UP: WHAT'S THE SCARIEST THING ABOUT COMPUTERS, COMING FROM YOUR PERSPECTIVE AS A (FORMER) SECURITY RESEARCHER?**

Unnecessary complexity! Linux and Windows both have tended to build unnecessarily complex solutions to things that don't really make our lives better and increase the surface area for potential security vulnerabilities. This is reflected in all the recent choices including systemd, logd, etc. that replaces what used to be simple shell scripts. Kernel changes including kdbus/bus1 that add complexity to the operating system.

The original vision with UNIX was to build simple interfaces that could be composed to build anything you want. This is visible in the way system calls can be combined to accomplish complex tasks and command line tools can be piped together through the shell.

**VICE MITT: TEA OR COFFEE?**

I consume both in large quantities. Recently, I've had a preference for natural process coffees where I can taste the berry notes. Ethiopian coffees from Gelana Abaya with their strong Strawberry notes have become my favorite so far.

**_BORED_: WHAT'S YOUR FAVORITE OPERATING SYSTEM AND WHY IS IT WINDOWS ME?**

Did anyone even run Windows ME? I use Free**BSD** on basically all my machines for research and daily use. A couple of my machines dual boot Windows or OS X.

**SWINDLED: WHAT ARE YOUR THOUGHTS ON THE MODERN POPULARITY OF DOCKER (AND CONTAINERS IN GENERAL) AS AN ALTERNATIVE TO VMS?**

Hypervisors provide tons of functionality around managing VMs and physical hosts that containers (e.g. Docker) are still trying to replicate. The main reason to use containers is to reduce the memory and CPU overhead associated with virtual machines. In the end, I think we will lose most of the container functionality and run applications. This can already be seen in systems like Amazon Lambda that provide the ability to run single functions. Operating systems and hardware needs to evolve to provide stronger performance and security isolation.

**GEORGE LAMBROU: DO YOU KNOW OF ANY FLAWS IN LINUX'S IMPLEMENTATIONS OF VIRTUAL MEMORY, FORK() OR EXECV() THAT I COULD USE TO GET SCHOOL CREDIT?**

School credit? Wouldn't you rather sell that on the black market to the highest bidder?

[~~Editor's~~ George's Note: is it too much to ask for both?]

# DANIEL, 1995-2018

My little brother passed away earlier this month. He was 22. His name was Daniel, but I always called him Dude Boy because I heard my Grade 11 economics teacher call another student by that moniker in class and I thought it was hilarious. The nickname stuck, and to me, he was always Dude Boy.

He was born in November '95, at 6:18PM. It snowed on the way to the hospital. Unlike me, he had the good sense to be born head first. It was a good start for his life. He was the brightest, most considerate person I ever knew.

In elementary school he joined a local programming group, and in high school, he medalled multiple times in international programming competitions. Later on, he became a co-leader of the school programming group. He was a patient, thorough teacher and helped many younger students in the group to develop their skills. He emphasized understanding why a bit of code worked before using it.

My brother's work and achievements with the high school programming group allowed him to come to the University of Waterloo on a big scholarship. My mom and I joked that he might try to take the fabled "trains course" or do a minor in combinatorics and optimization, but by his last term, he was taking all bird courses. He deserved a bit of a break after completing all his computer science degree requirements with flying colours.

My brother was also an athlete. My dad said that my brother was like a hamster when he rode circles around the running track at a nearby high school, feet pumping furiously on a single-speed kiddie bike. In elementary school and high school, he became an accomplished long-distance runner in city track and field competitions. We were so proud of him. Sometimes we called him a "good job boy." And we always told our friends and family about how brilliant we thought he was. I think I boasted about his accomplishments more than he did.

Dude Boy was the most gentle, considerate individual, but with a spicy slapstick sense of humour. He probably got that sense of humour from watching the movies Hot Fuzz and Kung Fu Hustle frequently during his formative years. For my birthday, he sent me a picture of my cat edited so that she was wearing a party hat, surrounded by confetti, and blowing a party horn. When anybody did anything gross at home, he would pantomime wearing a hazmat mask with his left hand, and spraying invisible disinfectant with his right hand—with sound effects.

As a child, he obsessed with Thomas the Tank Engine, Bionicles, and (very briefly!) Theodore Tugboat. At some point he developed a fondness for euchre in all its variants. Later on, he grew to enjoy video games, board games, and comic books. Late at night, I'd sometimes hear him shouting about in-game strategy with his mates, interspersed with PG-13 swears like "What the—" and "Screw this! Screw this!"—thoughtfully censored for my parents' benefit. On Thursdays nights after one of his bird courses at the university, he would go and play board games with his friends. At home, his bookshelf was stuffed with comics—Asterix, Garfield, Tintin, and Saga among the titles. But his favourite books might have been the Harry Potter series. He dressed up as Harry Potter for Halloween once—my mum hand-knitted a red and yellow striped scarf, and he already had the spiky hair and the glasses for the look. Sometimes, when the two of us were kids, we would re-enact our favourite scenes from the books with our stuffed animals, all playing the part of Hogwarts students. Our favourite scenes to reenact were the bits from the fifth book, where we would invent pranks that we might play on Professor Umbridge—usually involving fireworks and dungbombs.

But outside of these adventures, my brother didn't have a lawbreaking bone in his body. One Christmas, my mom made a tray of chocolate Christmas trees—an upside-down ice cream cone, covered in melted chocolate, and rolled in sprinkles. We went downstairs one morning to find that one Christmas tree had the pointy top missing. My brother had eaten the top half of a chocolate Christmas tree but left the bottom half in the tray. If he had eaten the whole chocolate tree nobody would have noticed one missing. But my brother had experienced a sudden attack of conscience halfway through his midnight snack and put it back, letting himself get caught. That's the type of dude my brother was. He was a good guy.

After finishing his classes this year and graduating, he was supposed to go to California to accept a position at Facebook, where he had completed multiple co-op terms previously. He said he might get his G2 license in Ontario over the summer, and I joked that he'd be driving circles around the local Drivetest centre for weeks since the parking spaces there were very awkward to get into. I told him that I hoped that Facebook would let him get away from Eagleland after he'd progressed a bit in his career, and that he should visit home frequently in the meantime.

There are so many things about my brother that I will miss. His favourite color was blue. His haircut was always a number one buzz cut all around, so he looked a bit like a fuzzy bowling ball. But he only got a haircut when he came home from university, so by the time we saw him, he had a spiky 'fro. His hair was sharp; when my mum cut it she said it lodged in her fingers like little black splinters. Mosquitos rarely bit him, and my dad joked it was something in his sweat that we should bottle up and sell on eBay. When we went to the Chinese butcher for meats he ate the BBQ pork almost exclusively. Sometimes, he liked to pour the sauce from the bottom of the container into is rice and mix it around by stabbing it vigorously with his chopsticks. His favourite fruits were basic ones, like apples, oranges, bananas, and pears. He liked to be neat: his room at home was always tidy, and everything stored in its proper place. He talked really fast when he was excited and he had a brilliant smile. I wish I could see him smile again.

He was the very best of all of us. None of us expected that he would die so young. I was supposed to have many more decades teasing Dude Boy about his haircut and his posture. Now we will have to grow old while he stays 22 in our memory forever. His family and friends love him and miss him very much. I'm certain not a day will go by where I won't think about him.

> *If ever there is tomorrow when we're not together…there is something you must always remember. You are braver than you believe, stronger than you seem and smarter than you think. But the most important thing is, even if we're apart…I'll always be with you.*
>
> WINNIE THE POOH

*Nancy Hui*
*UW Engineering, Class of 2015*

# DETERMINING AN ALGORITHMIC APPROACH TO SECURING YOUR BREAKFAST FOOD


### ABSTRACT

This research paper outlines methods to secure your hashbrowns using an augmented version of a reputable computer science hashing algorithm to ensure your breakfast remains private and secure from other diners.


### INTRODUCTION

Breakfast is often referred to as the most important meal of the day, as it is loaded with protein, salt, and fats to maximize your energy at the beginning of the day. Consequently, it is a valuable asset and only a breakfast meal meant to be shared, such as a breakfast party platter, should be shared with others.

Computer science researchers have devised a method known as "hashing" to protect data from attackers. Using hashing algorithms, your breakfast hashbrowns can theoretically be rehashed so others cannot observe your breakfast.

### METHODS

The data used for this research paper consists primarily of the tuberosum Group Phureja DM1-3 Genome Annotation v3.4 mapped to the pseudomolecule sequences, provided in plaintext by Michigan State University. In order to uniquely identify the hash as your own, the plaintext as ASCII is multiplied by the weight of your hash in milligrams and each ASCII value is then added by the sum of a unique ID of the diner. The SHA256 hash algorithm is then applied to the genome, producing a

rehashed hashbrown genome. The following python code was used to rehash the hashbrowns:

```
import hashlib

def hash(browns, id, mass):
  sha_obj = hashlib.sha256()
  genome = " ".join([chr(int(ord(c) * mass + id)) for c in
open(browns, 'r').split(" ")])
  sha_obj.update(genome)
  return sha_obj.digest()

rehashed = hash("PGSC_DM_V403_genes.gff", 100, 12)
```

Results

While the input genome is too large to publish in a singluar edition of Math**NEWS**, the hashed hashbrown is a very small string.

```
±X(ô{ð·Üá€\vºâ€)[N6ÖÉç³_ª
```

### DISCUSSION

Having hashing and encryption methods applied to a hashbrown ensures the security of your breakfast food, protecting it from snoopers and malicious actors. Additionally, it decreases the size of the genome, as the original was 70mb and the hash output is a mere 32 bytes of unicode.

### CONCLUSION

More diners should offer encryption and hashing of hashbrowns to ensure security and safety of customer orders.

*Vice Mitt*

# profTHOUGHTS 136.6

Considering my experience in industry and academia, I want to share my thoughts on why research and completing an M.S. or Ph.D. is important to having a great career.

As the industry progresses, the reasons to embark on a Ph.D. have changed over time. A decade ago you would want a Ph.D. to go to an industry lab and work on cutting edge problems but today, very few of these industry labs still exist. You can, however, work on cutting edge computer science challenges at many companies and startups. That said, there are a few reasons to go graduate school that have remained true.

First, the quality of the job you are offered depends on your education and experience. During my four years at VMware, I interviewed about one hundred applicants for a few positions. Applicants with research experience are always offered far more interesting projects to start with. More importantly, they are granted far more freedom to choose what they want to work on. For example, when you interview with Google you typically don't know what you are going to work on. For Ph.D. students with relevant research, they get to pick the group they will be joining. Ph.D. students will have their potential manager take them to lunch to convince them why they should join rather than the other way around.

Companies won't trust you to ship production software without experience. They also won't give you challenging and interesting problems to solve without being convinced you can handle it. Graduate school is a great place to grow and demonstrate your abilities to solve challenging problems through research and building working systems whether you build open source prototypes or upstream your improvements to existing systems. As Waterloo graduates, most of you have done many co-ops and have a lot of experience that will help you excel during your graduate studies.

Second, surveys that show a small average salary gap between undergraduate and Ph.D. graduates are misleading. Students who do relevant research and demonstrate the ability to build software or solve relevant problems do get paid more. Not to mention, Waterloo undergraduates are not average by any measure. I've seen many Ph.D. students offered over three times the average salary of undergraduate students. Graduate students have received great jobs and salaries simply because they did research on something a particular company cared about.

**Being a mathematician requires imagination.**

PROF. BARBARA CSIMA

Third, job security is underappreciated because of its cyclical nature. I joined VMware just before the housing bubble collapsed and like previous bubbles, companies stopped hiring and laid off many employees. The senior engineers and/or researchers (most of which had Ph.D.s) were exempted from many hiring freezes and continued to move freely between employers. There's no shortage of demand for the best in their respective fields. Graduate school is the most reliable way to become an expert in a field.

Lastly, potential students should remember that graduate school is very different from their undergraduate program. Being a great researcher doesn't have a lot to do with your ability to take exams. Many of my friends who enjoyed research and graduate school did not enjoy taking classes in undergrad. It's a lot more like a job where you will explore and build solutions to real problems. In many fields, including computer science, you get paid to do your research.

**GRADUATE CAREER ADVICE:**

I want to leave off with some advice regarding graduate school and this may be somewhat more focused toward the systems areas of research. Your goal throughout graduate school should be to learn how to solve and pick your own research projects. This is daunting and you will usually begin by starting with projects suggested by your adviser until you become independent enough to ask your own questions and find your own answers.

In the systems area, the ability to produce working prototypes and/or make improvements to existing open source software really goes a long way to ensuring you maximize what you get out of graduate school. If you can point to something you built that people use, it is pretty hard to argue with. A lot of the graduate students who get great jobs have made an impact during their graduate studies.

Waterloo students who have completed many co-ops throughout their undergraduate career will be well prepared for building real software in graduate school. You can focus on developing your research skills and build working demos. Your work experience, will be above that of the average graduate student, will help you accelerate your graduate career.

In my experience, I've focused on building systems that I want to use (e.g., Ori File System) and building practical solutions to problems I've faced as a systems developer (e.g., CCFI and Castor). I built software that I've open sourced and have had both individuals and companies use. This has given me a broad perspective on how to build better systems and how to help developers while keeping me grounded in practical problems. The end result is that I've had adoption by both open source and industry. For example, my CCFI project influenced ARM to add new support to the upcoming ARM v8.3 specification with a feature called pointer encryption that defends against certain types of exploits.

Any student who is capable of going to graduate school, should. It is the best for your long term career and opens up

opportunities that you only get through research. Graduate school can be a fast path to work on hard problems and with cutting edge technology that nobody in industry will trust you with. In graduate school you can have a direct and immediate impact on industry. Finally, as Waterloo students having worked at numerous companies by the time you graduate I think you are exceptionally prepared to stand out as graduate students as well. Use your knowledge and experience to work on challenging and relevant problems.

*Prof. Ali Mashtizadeh*

# FUN FACTS!

[Editor's note: the empty bullet point is intentional]

- Uranium Oxide has been used as a dye since about B.C.E. 79
- Ramen was once considered a luxury item because buying fresh noodles was cheaper than buying instant ones
- MongoDB is the best.
- help
- Orange as a colour got its name from Dr. Frederick Orange, the first to recreate it in a laboratory environment
- Microsoft celebrates anniversaries with M&M's
- h e l p
- Guardians of the Galaxy was the first Marvel movie to
- Aaaaaaa
- *VHS static*
- The worst form of comedy is surrealist comedy
- The second-worst form of comedy is self-deprecating
- this is not a joke please help
- We are all trying
- Slowly but surely
- I long for the sweet release of the sweet release of the sweet release of the sweet release of the sweet release of the sweet release of
- Pizza Nova sells pizza with extra carbon in the crust
- Milk isn't as good for you as you think it is
- Rabbits don't like carrots that much. They actually prefer grapes
- Beware the Orange. He betrays.
- H E B E TRA Y S
- HE BETRAYS
- Our corporate overlords are generous
- Soft communism is a viable aesthetic
- Florida's largest export is alligators
- Dan Wolczuk can dance if he wants to; he can leave your friends behind. 'Cause if your friends don't da
-

*Anon*

# profQUOTES 136.6

### CS 343: PETER BUHR

❝ In court, you pull out your CS 343 notes

❝ I wouldn't have spent 10 years in jail if I did that in the first place!

❝ This is the worst way to die: starvation, dehydration, stuck at a 4-way stop sign

❝ If you remember a long time ago, on a planet far, far away… a couple months ago

❝ That's the zen. And if you can't find the zen, you have to buy another chair

❝ At 3 a.m., the dry cleaners sneak into your house with the clothes they cleaned and stuff them in the bag

❝ My knowledge of hardware can fit in a thimble along with a blue whale

### CS 360: RICHARD TREFLER

❝ Easy, right? It's a research question. I'll give you the weekend.

### HIST 216: IAN MILLIGAN

❝ CERN is near Geneva, which is… kind of a boring city… yeah…

❝ British guys always come up with great names.

❝ I know too much about this because this is my life.

❝ We shall end it off there and you shall be free to explore the darkness outside.

### MATH 146: MATT KENNEDY

❝ A matrix A is upper-triangular if A is upper triangular.

❝ By popular demand, the deadline for the current assignment has been extended to Monday.
[The students applaud.]
Coincidentally, you should by now received an email about teaching evaluations.

❝ Let's do a proof by example.

❝ Next time you see the word 'ideal', think of me.

### STAT 341: REZA RAMEZAN

❝ Please, don't put that quote in **mathNEWS**.

# ME AND MY BIG MOUTH

### *A FOREWORD TO ZETHAR'S MAGNUM OPUS*

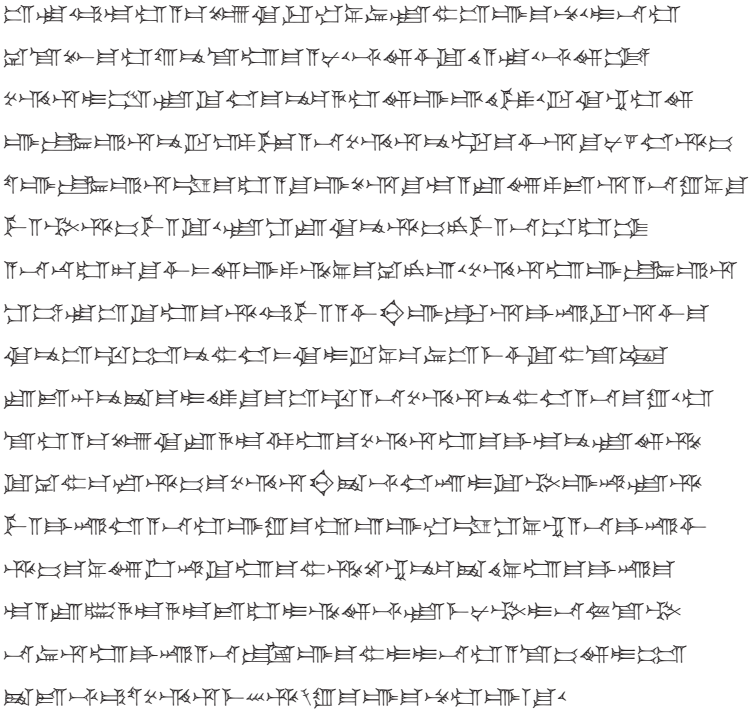
As some of you may remember, **mathNEWS** underwent a huge overhaul in issue 133.4. While introducing the new format that issue, I wrote that "we can now print articles in [a bunch of contemporary languages] and even *Cuneiform*."

It was a **joke**. I was **joking**. I mean, I tried to make it possible, because I thought Zethar was joking too, but I never thought he would actually ***do it***.

At least, not while I was still an editor.

But, lo and behold, it's my last issue, and Zethar has delivered. Written entirely in Cuneiform, I would like to present Zethar's response to my challenge, which you will find below. **There is no English version**, and he won't tell me what any of this text means either, only that we get two illustrations to help. Enjoy!

*George Lambrou*
~~Editor-Astounded, mathNEWS~~



# FORTNITE REVIEW

So Fortnite has become insanely popular in the past few months. I told myself I wouldn't play but I fell for it. I played it with an open mind even though there is a lot of hate surrounding the game. The main concept surrounds picking up equipment, and material then battle other players when you encounter them. There is a circle you need to stay inside and it shrinks according to time and number of players remaining. Eventually the circle gets small enough that everyone is extremely close to each other and forced to battle. If someone is outside of the circle they will slowly die a painful death. So this makes the game somewhat rapid paced since you need to keep moving along with the circle shrinking. There's different colours of weapons that correspond to the damage. Orange is the highest, blank being the lowest. I quickly learned that having a full squad of four people you know was key to success. There are way too many little kids and people too high for their own good.

My friends first tried the Tilter Towers location strategy but we learned that everyone else goes there too. The location has many buildings so there are many drops available there. Now I understand why people were saying Ezra Street was Tilted Towers on St.Paddy's. The most successful location I've had so far is Motel, it's not labeled on the map and its relatively small. But the real key to success is getting the RPG. Every time I survived until the end, I was destroyed by someone with an RPG.

I always forget to build structures while fighting since I haven't played another game where you can build walls and stairs while battling. The real problem with this game is all cringe cartoony features added to appeal to the younger audience. I thought Overwatch was really cartoony then I saw Fortnite... There are plenty of dances with horrible music to go along with it. There isn't really any gore other than we're shooting other people. The in game voice chat works pretty well but isn't fun when little kids flame you for being a noob.

I believe I sorta have an advantage over most players since I have a GTX 1070 I can run max settings on everything. This allows me to view distance way further than the kids playing with their toasters. Therefore I can snipe them before they can see me if I am far away. Recently there was a celebrity Fortnite game that featured Drake, Ninja, Travis Scott, and Kim Dotcom. This caused a huge momentum of memes, including the Drizzy bush. In the game there is a bush you can wear as camouflage but it isn't really effective. Our boy Drake decided to use this anyways. This also broke the record for the most viewed stream of all time, and was huge for Discord since Ninja instructed Drake to install Discord instead of use his trashy phone.

See you on Fortnite

BMONEY

# CIPHER

## *A HISTORY OF THE MOST ELUSIVE OF NUMBERS*

Nada, zip, cipher. How do you explain nothing? The use of the number zero is embedded in our society — from finances to science and math as well as culture — to such an extent it is difficult to imagine everyday living, or the things we would have to give up without it. Most of us take it for granted, hardly giving the notion of zero a thought. The story of zero traces its ebb and flow through thousands of years and countless cultures.

In past civilizations, traditionally, counting came to be used to settle accounts for trading in livestock and other agrarian implements. For such purposes many cultures utilized their symbols, often appropriating them from their written language — alphabet or otherwise — for writing numbers. These numbers tended to be additive, that is they were written as if tallying scores. Much like a prison inmate tallies the number of days spent in the slammer on the wall of the cell by adding marks to existing marks.

The Roman numeral system is such an additive system. The numerals I, II, and III can be seen almost as pictograms in their representation of counts. Furthermore the numeral X can only mean ten and its meaning is independent of its position in the number.

Yet among the Sumerians over four thousand years ago, a number system was first adopted that was positional in nature. That is, the value of a symbol depends on its position within the number. A 9 within the number 930, signifying the number 900, means something quite different than within the number 390, where it signifies the number 90.

Incidentally the position number system has historically also been invented independently within the Mayan civilization around seventeen hundred years ago for one of their calendars, for the purposes of astronomical calculations. The Long Count calendar ended its previous cycle on December 21, 2012 when, according to some, the world was projected to end. Mayan civilization itself ceased around eleven hundred years ago.

Over the centuries the Sumerian positional system was passed down to the Babylonians and It was the latter that first utilized a symbol for zero as a placeholder, meaning empty. This was helpful when transcribing a number like 903. The Babylonians initially left a space between numerals but this can result in errors, too large of a chasm can imply 9003 instead. The use of base ten digits to explain Babylonian numbers is for ease of presentation, as they did not utilize such numerals.

As useful as having an explicit representation for zero as a placeholder is, the Babylonians still did not think of zero as a proper number in its own right, signifying nothing. Such an invention would have to wait until a few centuries later when Hindu mathematicians in India invented the concept of zero as a number proper fifteen hundred years ago. Zero now became as real as the number 42, or 2000. It is difficult to overestimate the magnitude of this achievement as we live in a world where such a concept is entrenched and taken for granted.

Incidentally the ancient Greek mathematicians did not even have a positional number system — let alone a concept such as zero — and yet still made momentous discoveries in the field. This is a testament to the brilliance of the mathematicians of antiquity such as Pythagoras and Euclid, but also because many of the mathematical contributions made in classical Greece were geometric in nature, therefore an advanced number system was not needed to aid in such formulations and proofs.

Islamic civilization brought the concept of zero from the Hindus through trade twelve hundred years ago and along with the base ten positional number system refined them into the numerals and shapes we are familiar with today. It was only through commanding such an advanced mastery of numbers that new discoveries in algebra were made by Al-Khwarizmi. The concept of zero as a number also spread east to Chinese thinkers around this time.

It was around eight hundred years ago that the concept of zero along with the rest of the Hindu-Arabic numerals were imported into Europe by Leonardo of Pisa, better known as Fibonacci. As a merchant Leonardo traveled around the Mediterranean and lived in north Africa for a spell. He was introduced to the more advanced positional number system and henceforth spread their knowledge throughout Europe. It was a slow process though within three hundred years the new number system displaced Roman numerals.

The rapid advances in the mathematics and sciences henceforth would not have been possible utilizing an archaic number system. It would be difficult to imagine landing on the Moon whilst still using Roman numerals as the basis for our calculations.

Now we know that nothing is indeed quite something!

*MK Ultra*

# midiNEWS: OUTPUTS!

I heard your voices loud and clear, and created beautiful music for all to hear. Hosted on Google Drive, the art is near, for avante-garde style we all hold dear.

https://drive.google.com/file/d/1Io8j6_SoAF7MEqfHrBjx0Dms47HLrNNz/view?usp=sharing

*Vice Mitt*

# THE TRUE NATURE OF THE CANADA GOOSE

The Canada Goose is, as any Waterloo student can attest, a truly formidable creature. It's fangs glint in the sun, their edges rivaling those of razors. The Goose's eyes glow at night, reflecting not only light, but the auras of those they encounter. They create offspring with no regard for whether the young can be raised well or even survive. The Goose's wings are the picture of strength, their bodies the very incarnation of aerodynamics as they hurl through the air. Their talons are sharper than any blade known to man, and they have a sense of smell unmatched in the animal kingdom. The fearsome cry of the Goose shatters windows and curdles the blood of any living thing unfortunate enough to hear it. The Goose's neck is said to break bones and even rend cement from steel. The only thing more fearsome than a Goose's sexual appetite is its thirst for blood. The Goose is truly an apex predator.

Yet, to what does the Goose owe the source of its fearsome might? The answer lies in a deal with a demon, long long ago. Far before the genesis of human history, the Goose was walking a very lengthy journey. It walked, for at that time it had not wing nor fang nor any of its now distinguishing features. No, at that time the Goose was a much humbler creature. As it walked, the Goose encountered bandits who beat it up and robbed it, leaving it for dead on the side of the road. The Goose cried out to the heavens, begging whatever gods may be for mercy, whether in the form of restored life or swift death. Two beings answered the Goose. The first was dressed in white[1], the second in a sort of orange[2]. The first bowed before the Goose in respect and said unto it,

"I will give you what you seek and ask nothing from you. I will aid your passing from this world to the next, and give you peace."

The Goose considered this and turned to the spectre in orange. The second remained standing and said unto the Goose,

"I will give you what you seek, though I ask one small thing of you. I will restore your life and give you the tools to defend yourself. In exchange, I want your soul now. Never shall you pass into the next world, for I will have you already."

Again, the Goose thought. It coughed and saw blood. It ached from its beating and remembered the mean names the bandits had called it. "Pathetic," they said, "helpless." They even made fun of its short neck. That was the last straw for the Goose.

"Give me the tools to take my revenge," it pleaded.

And that was how it ended. Right then and there, after revealing himself to be a demon, the orange-clothed one bestowed upon the Goose the monstrous qualities we know it for today. The Goose, without hesitation gave up its soul to be a heartrending abomination.

*Jojo*

1. "Off-white" in the original translation, but it's more dramatic this way.
2. Scholars argue that this was most likely "red" in older, less scrupulous versions of this text, but the most agreed-upon version says "orange."

# PROGRAMMING LANGUAGE SPINOFFS THAT SHOULDN'T EXIST BUT SHOULD

Every once in a while I see a programming language that really deserves a spinoff language based on it that shouldn't exist, but I want it to anyways. With no further ado, I present my ever-growing list of wordplay-based language names

### THE UNCOMMON LISP

Based on the List programming paradigm, this language would be so uncommonly used that it does not exist on StackOverflow, and only in use on no more than four programming projects.

### NURSE RACKET

Like Racket, but is given a few bit permissions less than Dr. Racket due to a lower pay grade and less responsibilities.

### LATTE

The same as Java but uses a custom import org.coffee.shop.steamed.milk; import statement at the top of every program. Needs to be run on a multi-thousand chrome plated, countertop machine.

### LEWDA

Uses similar structure and practice as Lua, but primitive datatypes are all profanity.

### VISUALADVANCED

Visual Basics brother that was not born from the aftermath of Chernobyl.

*Vice Mitt*

# INVESTIGATIVE JOURNALISM: REPORTING FROM THE FRONT LINES OF THE MEME WORLD WAR

Ladies and gentlemen, this is an emergency broadcast from Theodore Bear. I had another article planned for today, but I'm afraid some recent developments have taken me across the world, where I am now reporting from the front lines of the Meme World War.

What started as another skirmish between the constantly warring factions of the r/PrequelMemes and r/SequelMemes has escalated into something that has engulfed entire communities into a full-blown war. According to primary sources, the incident that has launched this bloody conflict was something small, like a little incident in the Balkans that launched one of the bloodiest conflicts of the twentieth century. It was a little event, you may have heard of it, a little thing called The October Crisis. It resulted in the deaths of over 37 million people. The primary sources say that relationship between r/PrequelMemes and r/SequelMemes soured, but have not elaborated much more about the reasons why. One likely theory, which I have managed to uncover on my own, is that it was the aggressive behaviour of the PrequelMemers that resulted in the spark that ignited this conflict. The constant brigades of rogue PrequelMemers, whose existence is suggested by a recent stickied post on r/PrequelMemes asking for users to abstain from brigading their rivals, likely caused the uneasy truce between the two factions to deteriorate.

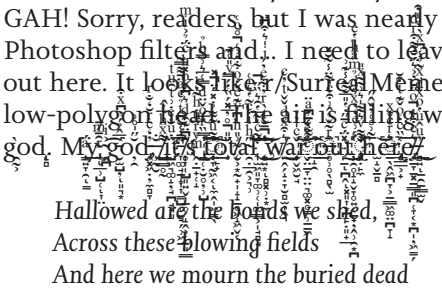
As of now, there has been no formal declaration of war, but here on the front lines, you would never guess that. I've been shot at, barely dodging bullets as I made my way across the battlefield. At one point, a basket of garlic bread was lobbed right at me by a trebuchet. I've been in constant radio contact with my colleagues stationed in the capitals of each subreddit to stay up to date about any developments. The populations of both r/PrequelMemes and r/SequelMemes are currently both holding votes on whether or not they should declare war. The vote on r/PrequelMemes ends at 9 PM EST tonight, but with 90% currently in favour, the formal declaration seems like a certainty.

The scale of this conflict is much larger than the previous meme wars between the two subreddits. Alliances and old grudges have brought many more subreddits into this fight, who have split into two major factions: the Allies, which is made up of r/PrequelMemes and their allies, which include such pretigious subreddits as r/GarlicBreadMemes, the incredible Game of Thrones shitposters at r/freefolk, r/lotrmemes, and r/granpajoehate; and the Axis, which is made up of subreddits like r/SequelMemes, r/BikiniBottomTwitter, r/DeepFriedMemes, and r/dankchristianmemes. The siege weapon subreddits are on opposite sides as to be expected, with r/trebuchetmemes with the Allies and r/catapult_memes with the Axis. Currently, it looks like the catapults are being outmatched, as they cannot lob a 90kg projectile over 300m. While r/BikiniBottomTwitter has sided with the Axis, because one of its mods is also a moderator of r/SequelMemes, it looks like there may be a revolution brewing there. A look at the front page of that subreddit reveal more posts against the mods and r/SequelMemes than those in favour. Perhaps they will overthrow their oppressors? But perhaps what might rise from those ashes might end up being worse?

As for the University of Waterloo, and our prestigious subreddit, r/uwaterloo, we are currently neutral. We have pledged allegiance to neither the Allies nor the Axis. But what side will we take if we even take a side? Considering how old grudges are flaring back up, if our enemies at r/UofT take a side, it is likely we will join the opposite faction. But can we survive this war?

To be honest, we probably will. That being said, I don't know if I— Oh god! The soldier escorting me, a young boy with the Allies, was just hit by a whole bunch of DogeCoin. The blast turned him into a fine red mist.

Holy Crap! By the look of it, the Allies are counterattacking, firing back with GarlicCoin launched by balista. By the looks of it... Oh the humanity. Nobody should have to see this. GAH! Sorry, readers, but I was nearly deep fried by a bunch of Photoshop filters and... I need to leave you. It's too dangerous out here. It looks like r/SurrealMemes is unleashing the giant low-polygon meat. The air is filling with Zalgo text. Oh my god. My god. It's total war out there.



*Hallowed are the bonds we shed,*
*Across these blowing fields*
*And here we mourn the buried dead*
*And those who refuses to bend or yield*

*Young men fought and died in this place*
*Believing their cause to be right*
*Each now lies calm, far from the front page*
*Not knowing what came of their fight*

*And so implore you to heed these words*
*Heed this warning, and heed it well*
*For a total war of memes and reposts*
*Is the closest thing there is to hell*

**Caleb McCaleb (1998-2018)**

*Theodore Bear*

## The fuck do I do now?

GEORGE LAMBROU,
~~EDITOR~~ JUST SOME GUY I GUESS

# WHY MR GOOSE REPRESENTS UW BETTER THAN THAT KING WARRIOR LION DUDE

University of waterloo had pretty lame mascot, some lion dude. I think Mr. Goose would be the perfect way to present the fact that we are beyond ideas and beyond intelligence.

First off the goose's migration pattern represents the co-op and study term that everybody has to do. Every winter geese would fly to Cali for food just like most ECE students would go to Cali for $$$.

Geese are hard working, family birds. They would risk their life protect their mating ground. Just like how the UWaterloo student would risk a WD to protect our memeing ground at /r/uwaterloo.

Thirdly, King warrior does not represent us at all, they should've represent a chad school such as Conestoga College, most of us are just normies try to through the day, working on their shitposts hoping one day their memes would reach on the front page of Imprint.

Also roast goose tastes way better than a lion.

*me*

# BREAKING NEWS: IMPRINT OFFICE RELOCATING ONCE AGAIN

**Waterloo, Ontario** — Imprint, the only independent, student-run newspaper on campus has once again been forced to relocate its offices. Unable to pay their rent, Imprint was kicked out of its current office on the bottom floor of the SLC by the Federation of Students this Friday. After going through and reading their previous issues, a task which drove one Imprint editor insane, they searched for a location that reflected on their writing ability, and found a new location soon after. Imprint's new offices are set to located in the 9$^{th}$ Circle of Hell, where they will continue publishing their newspaper that no one cares to read.

On their new partnership with Satan, the Prince of Darkness, Imprint editor Canté Dit said they are optimistic that they will be able to serve students better. "There's so much less red tape working for the legions of Hell," Ms. Dit said. "It gets a bit hot sometimes, and our newspapers occasionally burst into flame, but at least when they're on fire, they generate heat, and actually serve a purpose to UWaterloo students." Ms. Dit also noted that they would also once again be writing about how Feds was conspiring against them because of Imprint's efforts to hold Feds accountable in their next issue.

On the topic of the Imprint fees, it is unlikely to increase to forcing students to pay with their soul along with the current $4.35. When asked about the relocation, and whether or not they cared for Imprint, students responded with a collective shrug, and went on about their day.

*Theodore Bear*

# A LISTENING EAR IN A TIME OF NEED

Recently, news broke of a certain large online company that was shockingly watching our every move. People are outraged, heartbroken, and feel mislead that such a friendly company would do this to them. They've always seemed so kind and attentive like an older sibling; like they really wanted to get to know us on a deeper level. A shoulder to cry on when you're feeling low. A safe place to let the world know who you are and what products interest you. A convenient way to connect every single thing you do online. Is this to say that all the other companies that offer convenient and free services have some kind of ulterior motive too?! There's no way of knowing without reading some sort of agreement or giving it a second thought, but it is clear that the people have been betrayed!

Now, when the people need them most, one company has stepped forward to help. This platform (unnamed for privacy reasons) has become a haven for those affected to express their woes. If you're feeling down and hurt, join the many others turning to this platform. People are outpouring their feelings on the matter, posting about how unfair this is, and sharing news on the issue with their closest friends and anyone who will listen.

In response to the new needs of their clients, they are looking into new methods that cater to them. New advertisements will be up soon for private storage in their own, self cared-for facilities for anyone showing interest in increased privacy, as well as megaphones for those who talk to friends about their concerns just outside of recognizable earshot of a phone. Coming soon, mind reading technology to cut out the annoying need to write or voice one's thoughts. They really are listening carefully to our needs

ε-UNIT

**Send more profQUOTES.**

THE ENTIRE mathNEWS READERSHIP

# RE: QUESTIONS REGARDING SEXISM IN THE MATH FACULTY

Thanks to Awim for raising important questions in **mathNEWS** 136.5. As a current math HeForShe faculty advocate, I want to reiterate our commitment to gender equity in our faculty. The sexist remarks and attitudes brought forward in the piece are unacceptable in our faculty, and if anyone wants to discuss concrete incidents further, they can approach faculty members and staff support (see the end of this for a non-exhaustive list of people you might approach). The general article was also very valuable, because open discussions of these issues will keep us moving forward towards our goal of gender equity.

What is HeForShe? The University of Waterloo's IMPACT 10X10X10 commitment is part of the UN Women's HeForShe campaign to promote gender equity worldwide. This year, our math HeForShe team has promoted gender equity in a number of ways. We are working on guidelines for instructors to promote an inclusive classroom environment. We are working to ensure that all opportunities are widely advertised. We have held sexism response workshops, as well as an Exploring Healthy Masculinity workshop. We welcome input into our activity planning and initiatives through our working group meetings.

Are you interested in learning more about Math HeForShe and related events, or attending our working group meetings? Sign up for our mailing list at https://lists.uwaterloo.ca/mailman/listinfo/math-equity-wg

Want to know more about relevant UW policies and Ontario law? See:

Policy 33 Ethical Behaviour: https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-33

Policy 42 Prevention and Response to Sexual Violence: https://uwaterloo.ca/secretariat/policy-42-prevention-and-response-sexual-violence

Ontario Human Rights Code: http://www.ohrc.on.ca/en/guide-your-rights-and-responsibilities-under-human-rights-code-0

There are a number of places to turn on campus if you have equity related issues to discuss. The person you feel most comfortable talking to might depend on the seriousness of the situation, and how far removed from the environment you would like that person to be.

Math HeForShe Faculty Advocates, Barbara Csima csima@uwaterloo.ca and Barry Ferguson baferguson@uwaterloo.ca

Director, Conflict Management & Human Rights Office, Matt Erickson, erickson@uwaterloo.ca

AVP Human Rights, Equity and Inclusion, Diana Parry, dcparry@uwaterloo.ca

Sexual Violence Response Coordinator, Amanda Cook, amanda.cook@uwaterloo.ca

Most importantly, whether it be among your friends, family, colleagues or support services, keep the the conversation going!

*Prof. Barbara Csima*

# A LENGTHY AND EMOTIONAL FAREWELL TO mathNEWS FROM A LONGTIME EDITOR AND CONTRIBUTOR

I quit.

quizED (Zishen Qu),

**mathNEWS** author, Fall 2014, Winter 2015.

**mathNEWS** editor, Fall 2015, Spring 2016, Fall 2017, Winter 2018.

*quizED*

# ED(1) IS TURING-COMPLETE

Yet another tool has been added to our list of accidentally Turing-complete things. This time, it's the venerable line editor, ed(1) (ed is the standard text editor).

Ed, the original Unix text editor, was written in the 1970s, back when teleprinters were the computer's main interface. Unlike virtually all modern editors, it's what's called a line editor: you manipulate the file as lines through a command line interface instead of displaying a live copy of the text as you edit it. It enjoys only niche use today, but its influence has spread to many utilities, including sed, grep, vi and even perl.

If you aren't familiar with ed and you decide to try it out yourself, your first session will probably look like this:[1]

```
$ ed
help
?
h
Invalid command suffix
?
?
^C
?
exit
?
quit
?
^Z
$ killall ed
$ vi
```

It isn't a terribly friendly editor, but it was good enough to write Unix in. If you know your vi/vim commands, you're already halfway there.

Despite its seemingly simple command set, ed was proven to be Turing-complete by implementing Rule 110, an elementary cellular automaton similar to Conway's Game of Life that was shown to be capable of universal computation. This is the same device that was used to show that HTML+CSS3 is Turing-complete.

Here's the script, licensed under the MIT by tPenguin**LTG**:[2]

```
$a

.
-t.
.g/^\(.\).*\(.\)$/s//\2&\1/
.g/^.$/s//&&/
s/./&\
/g
d
?^$?+,$-2g/^/+,+2t.\
-2,.j\
s/111/0/\
s/110/1/\
s/101/1/\
s/100/0/\
s/011/1/\
s/010/1/\
s/001/1/\
s/000/0/
$-,$d
?^$?,$jp
w
!exec ed '%' < '%'
q

# DATA
00000000000000000000000000000100
```

You'd run this by invoking ed on it to edit, as well as passing it in as input:

```
$ ed rule111.ed < rule110.ed
```

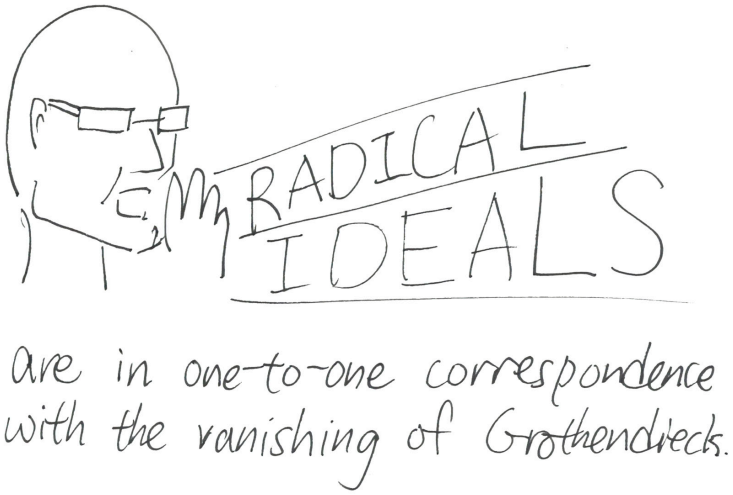
It doesn't terminate by itself, so you'll have to manually kill it. The result of the simulation is written to the end of the file.

Long story short, the script implements each step of Rule 110 using a bunch of substitutions, and it achieves recursion by shelling out to call itself. Even better, the script passes data between recursive calls by modifying itself. Cheating? Maybe, but it works. A detailed walkthrough of the script and links to the GitHub repo can be found in tPenguin**LTG**'s blog post.[2]

As Reddit user meltingdiamond put it, "The most impressive part of this is somehow getting ed to do anything at all".

AltGr

3. https://sanctum.geek.nz/arabesque/actually-using-ed/
4. https://nixwindows.wordpress.com/2018/03/13/ed1-is-turing-complete/



# A NEW ERA OF MATHEMATICS

The year is ~~3030~~. Twenty years ago President Donald Trump the ~~65~~th enacted new legislature banning the writing and speaking of numbers, making engaging in mathematic activities a crime. This order came a week after the President reportedly failed a grade ~~8~~ math exam he took for fun, but the White House vehemently denies any connection between the incident and the new law. For years, panic spread across the continent of North Trumperica.

All engineers were jailed. This was a surprisingly popular amongst the general population. Cookbooks had to be edited with bible quotes covering all the measurements. The bible had to replace chapter numbers with photos of an aging Jesus to visually represent how far along you are. It took many years for the transition from money to the exchanging of various grunts and guttural noises. The banks were mad at first but eventually they started to enjoy the rush they got whenever they growled. It was the closest bankers came to love. The government almost halted to a shut but nobody noticed. Lettuce rained down from the sky. This does not appear to be related but holy shit wow.

Entire fields of science have been eviscerated. The only biology that remains is the Discovery Channel. Physicists now measure strictly in car honks because nothing matters anymore. There's also been a ~~650~~% increase in chemists blowing themselves up attempting to make meth. Rumour is meth is next to be banned by the president. This comes after reports that the President lost in a race to a meth addict he met wandering on his golf course.

Now this all seems bleak but I am here to break some shocking news. Ever since the ban, a group has been working in the shadows on their way to fight back. The team call themselves "Numbers Are Real and Under-appreciated Today OMG", or NARUTO for short. After studying the law for some time it struck them: the writing and speaking of numbers was outlawed, but what if we developed a whole new way to communicate these ideas? By utilizing the dynamics of human form in new and innovative ways, NARUTO has bravely forged the path for a new era of mathematics.

The number ~~one~~ is expressed by a medium amount of hops, a small amount of spins, and a large amount of handflapping.

The number ~~two~~ is expressed by a hop, skip and a jump. The order changes every day though, check the radio.

The number ~~three~~ is expressed through an appropriate amount of slapping of one's own butt area.

You put your right leg in,
You put your right leg out;
You put your right leg in,
And you shake it all about.
You do the hokey pokey,
And you turn yourself around.
That's how you express the number ~~four~~!

The number ~~five~~ is expressed by a satisfying belly rub.

The number ~~six~~ is expressed by covering your face with peace signs.

The number ~~seven~~ is expressed by crossing your hands and imitating a bird flying away. The more accurate the better.

The number ~~eight~~ is expressed by running in place while sticking your tongue out as far as humanly possible

The number ~~nine~~ is expressed by shaking your head yes, then shaking your head no, then shrugging your shoulders nonchalantly.

The number ~~ten~~ is expressed by literally just punching someone in the face. I asked if this was extreme and NARUTO said there was no other way.

Well there you have it folks, the basics needed for revolution. If enough interest is shown, I will return with more of NARUTO's findings. I believe they are currently cracking the code of addition and subtraction. I sat in on one of these code breaking sessions, and I would say they looked like they had made good progress but I had no clue what was happening. Until next time, stay safe out there.

*ITSH*

ISSN 0705-0410
UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

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# GRIDWORD

# AND THAT WRAPS IT UP FOR ANOTHER TERM

**gridCOMMENT** *136.6*

So it has come to this. It is the end of another term at this illustrious institution, after it had quashed any motivation to continue along with the power of deadlines. At least, that's the reason I'm attributing to the dearth of serious submissions received for this issue. Hopefully people are hanging along alright. After all, first it's the long weekend, then Sköll and Hati on its heels, chasing the sunny period of rest with the dread that is finals. Oh well.

As alluded to, the only submission I have received this issue is a last-minute submission from Letian Chen, who only filled in about 10 words. They had answered last issue's **gridQUESTION**, which was "What is the most ridiculous excuse for not finishing an assignment or project?", with "my cat ate my homework". By virtue of being the only submission, please badger the editors for your prize.

As this is the last issue of the term, I present, as is tradition, a crossword from the past, and offer the solvers no reward. The following **gridWORD** was originally published in volume 109, Issue 2, which originally came out on January 16th, 2009 and was created by Megaton Panda.

In the original **gridCOMMENTS**, they write that "In the spirit of the Imprint's attempt to make things easy on you all, we're giving you the solutions with our gridword this week!" [sic], which, as we will be doing the same, it seems quite fitting that this is the grid that I revive for the end of this term.

Good luck on your exams,

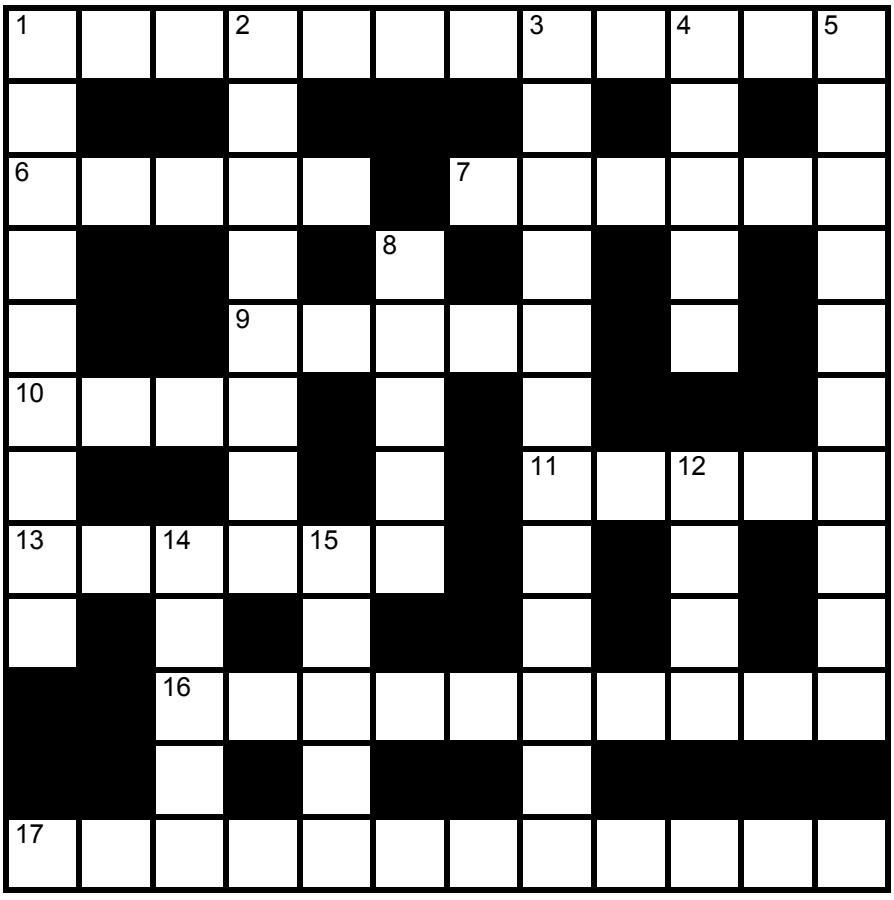
*Zethar*

## dy/dx = 0

1 CO487 subject (12)
6 Real timers play with it (One of my friends loves it!) (5)
7 Does as one sees fit. (2 words) (2,4)
9 Corrupt (5)
10 Someone who can do everything: ____potent (4)
11 Full-length (as in movies) (5)
13 Wrist ring thing (6)
16 Something to eat your Trix with (6,4)
17 Making a "my mom" joke instead of a "your mom" joke (8,4)

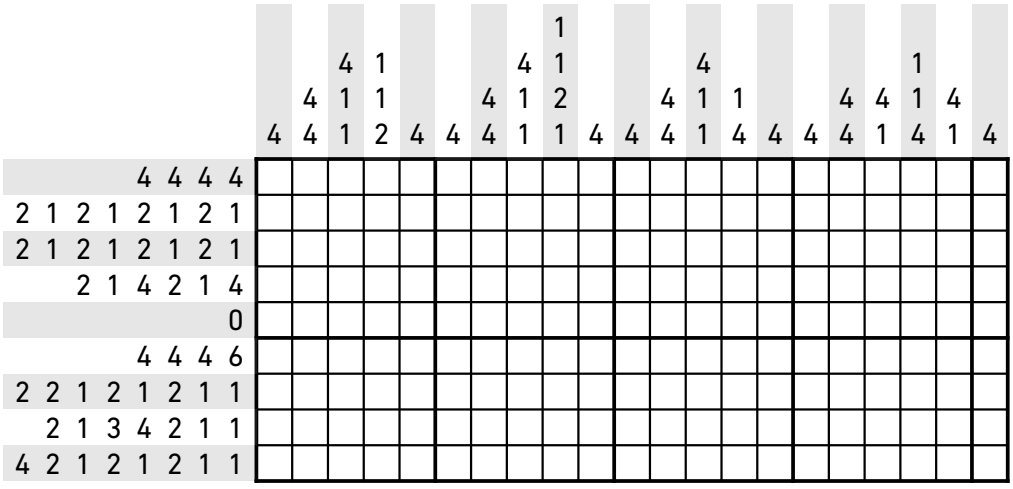
## dx/dy = 0

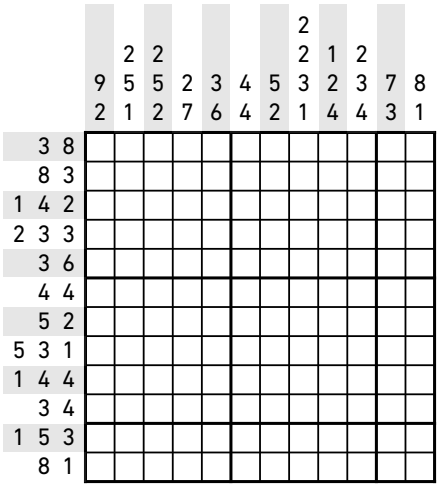
1 An a-"maze"-ing place in Paris (9)
2 Chinese people invented it: _____ press (8)
3 French dish turned into animated feature (12)
4 Gesture to accuse (5)
5 Delicious species of fish (2 words) (10)
8 To wash without soap (5)
12 Psychic Miss (4)
14 A specific market (in terms of targetting) (5)
15 Attracted unsuspecting victims (5)

**Drop your gridWORD solutions off at MC 3030. And yes, we do award points for creativity.**

A PERPETUALLY BORED mathNEWS EDITOR




# SURPRISE NONOGRAM CLUSTERFUCK MANEUVER

**haltingCOMMENT** *136.6*

Oh come on, you didn't expect me to leave *peacefully*, did you?

Pfft, nope.

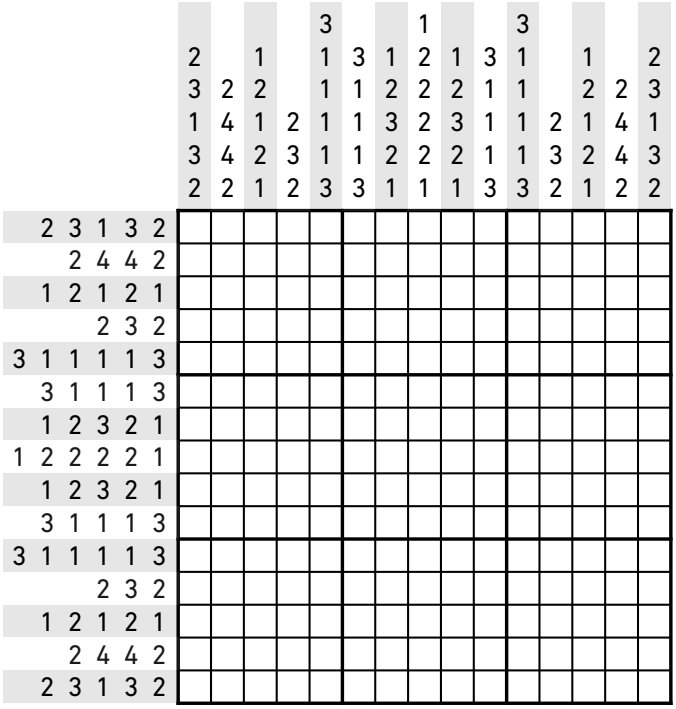
This week, for your puzzling perusal, I present to you a four-course smörgåsbord of **haltingPROBLEMS**, both to make up for the mistakes I made in previous issues, and also because I really only made two puzzles this term, and I needed a way to end the term saying I did six.

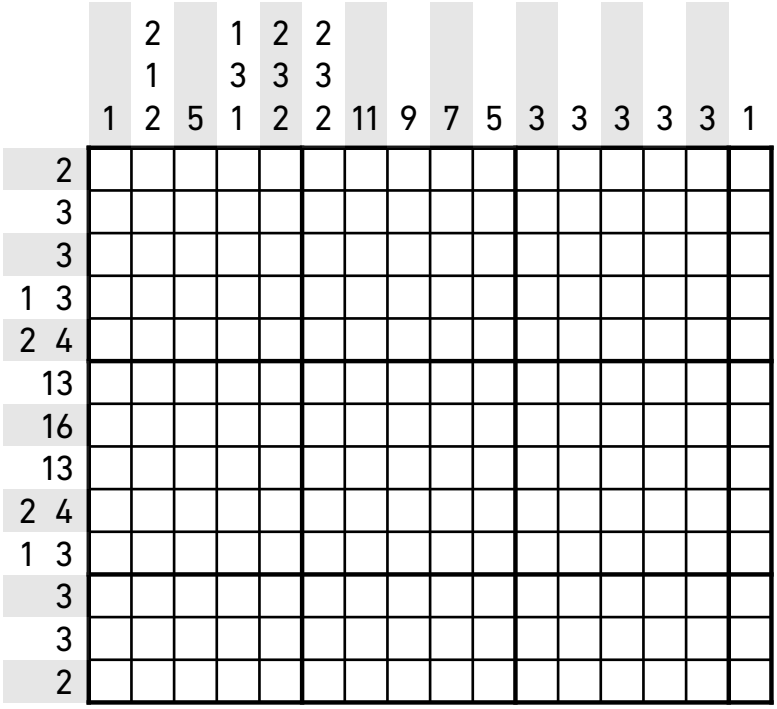
They're not particularly difficult puzzles — I prioritized unique solutions over completion time — but hopefully, these'll keep you busy over the next ~~month you'll have without **mathNEWS**~~ **ten minutes**.

And of course, each one is guaranteed to be at least x% error free, where x is some number that might not be 100. Or maybe it is! Who knows? I triple-checked the numbers this time, but at this point, doing the **haltingPROBLEM** just gives me a bad feeling, y'know?

Not that that's gonna be an issue anymore, since, y'know, retiring and all. Still so weird… but I guess I should stop stalling, and wrap this up. Later, everyone. Good luck on your exams, and may all your future plans work out for the best.

*George Lambrou*
~~*Editor, mathNEWS*~~



# lookAHEAD

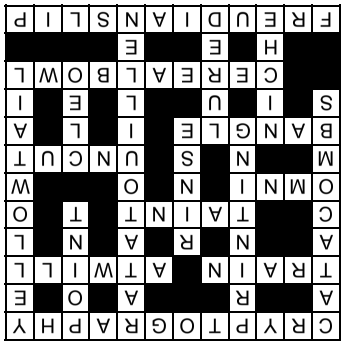
| SUN APRIL 1 | MON APRIL 2 | TUE APRIL 3 | WED APRIL 4 | THU APRIL 5 | FRI APRIL 6 | SAT APRIL 7 |
|---|---|---|---|---|---|---|
| Easter Sunday<br>April Fool's Day<br>National Poetry Month (Nation Unknown) | ~~Easter Monday~~<br>Not a Holiday Day | | Last Day of Classes (Friday schedule)<br>CS Club EOT | ~~Study Day~~<br>Relax Because All Your Assignments Are In and You Can Breathe for a Minute Day | ~~Study Day~~<br>Realize Just How Fucked You Are for Exams Day<br>National Tartan Day | Begin Cramming Day<br>United Nations World Health Day<br>National Beer Day |
| **SUN APRIL 8** | **MON APRIL 9** | **TUE APRIL 10** | **WED APRIL 11** | **THU APRIL 12** | **FRI APRIL 13** | **SAT APRIL 14** |
| ~~Drop Penalty 2 Period Ends~~ **THERE IS NO ESCAPE**<br>Easter Sunday (Orthodox) | ~~Final Examination Period Begins~~<br>The Beginning of the End<br>Vimy Ridge Day | | | Grilled Cheese Day | Online Examination Day<br>Melt Day<br>Friday the 13th | Online Examination Day<br>Cake and Cunnilingus Day (I **dare** someone to fire me for this now that I'm retired.) |

## CS CLUB EOT

The CS Club is having an end-of-term event this upcoming Wednesday, April 4th. When this sentence is written we don't know where or when the event is, but it's probably in the evening. Check our @watcsc facebook page or look for our posters — it's a treasure hunt to the event!

*Chairbeing Extraordinaire, ctdalek*

## THIS WEEK'S gridSOLUTION




## APPLY TO BE A mathNEWS EDITOR FOR SPRING 2018!

Do you love **mathNEWS**? Do you want **mathNEWS** to not die in the future? Then be an editor!

Seriously, in case the mentions of retiring editors and the **blackBOXES** about editor applications didn't tip you off, **mathNEWS** is currently looking a bit understaffed for Spring 2018.

If you enjoy **mathNEWS** then please consider applying to be an editor. It's a hard job, but being a part of making this paper is extremely rewarding.

If you're interested, just let us know at mathnews@gmail.com. It doesn't matter what your qualifications are, I sure didn't have any when I applied.

*swindlED & itorED*
*Spring 2018 Editors,* **mathNEWS**

## SAD IT'S OVER? SUBSCRIBE TODAY!

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