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"WHAT MAKES A GOOD PROF / INSTRUCTOR?"

Welcome back, everyone, to the THIRD issue of **mathNEWS**. A prime number, and of course, a prime issue, indeed. We're two weeks into June! Time really swims when you're ~~dying~~ having fun with ~~enormous~~ manageable amounts of schoolwork, doesn't it? I think it's great, since I have no desire to remember any of my days anymore! They're all the same: blurred, monotonous, gray, cold, flat...

Wait a minute, this isn't my blog! Hold on...

Welcome back, everyone, to the THIRD issue of **mathNE** — Okay, let's cut right to the chase.

Hope everyone is having a lovely, goosepoop-less summer term so far. To brighten your day, I'd like to introduce our fabulous and famed professor, Ross Willard, for this issue — I can already see his former students yelping in joy. Settle down, for Professor Willard regales a story that targets our anxieties about failure in all of us, yet it's not as bad as school forces it to be. Thank you for sharing your story, *and* for giving me some cool music recommendations!

Speaking of music, it seems like I have already listened to Cat Stevens in the past, and it's all thanks to my handy `last.fm` account for scrobbling it! What the hell is `last.fm`, you ask? It's a website that tracks all the music you listen to through Spotify, Google Music, Apple Music, etc., and at the end of each week/year, you receive a detailed-enough report of your listening habits of that time period. It's also been a way for some music snobs to brag about their music, which is always a fun time, especially with friends with divergent tastes.

Thankfully, my friends and I are functional and respectful adults who are able to appreciate different genres of music while snootily sipping on tea — with our pinkies up, of course. It's also an excellent litmus test to see if you'll get along with someone; I know I couldn't *possibly* be friends with someone who listens to (Sandy) Alex G. Shudder. He's just an Elliot Smith copycat anyway.
[Editor's note: Hi, this is itorED. It's quite unfortunate that staplED and I are no longer friends, but that's life I guess!]

I was kidding! Is our friendship over? Find out in v140i4!

staplED
Editor, **mathNEWS**

sillycone	Says a lot of **profQUOTE**-able things.
Steve, the Craigslist Psychologist	Having teaching skills AND academic knowledge.
Craig	Peppers on Rate My Prof.
Liz, the lizard	Having lots of free flies and dead rats.
Beyond Meta	Being able to maintain student's attention and explains things clearly.
waldo@<3.LE-GASP.ca	Teaches so well you not only pass the class the **first** time, but REMEMBER that stuff later/ consistently!
Zethar	Is capable of discovering what the student does not know and effectively explaining **that**.
Various Pseudonyms	Appropriate level of detail in explanations, isn't afraid to experiment with the standard lecture style (in class practice problems, etc.).
quiz	Demonstrates a good theorem, is rigorous, and covers all the important ideas.
permanentpseudonym	Honesty, good explanations, and approachability.
SIGSEGV	A unique profile photo on UW Flow.
Finchey	The ability to beat me in a game of jumbo death Jenga®. I'm still alive; take that fact as you will.
confusED	Sugar, spice, everything nice.
itorED	Let me follow you on last.fm too! Wait, how did I get here?
staplED	Everything everyone said here, but also has cool style. Also has good taste in music.
swindlED	A good instructor knows how to effectively explain something that's obvious to them, but not to their students. Instructorial perfection, however, is achieved by those instructors who are fans of **mathNEWS**.
terrifiED	Is able to clearly explain concepts without being boring, and is always helpful outside of class.
unsophisticatED	Passion, caring, and loving what you do.

ARTICLE OF THE ISSUE

This week's article of the issue goes to water for *Things to Make and Do While Studying*, entertaining and yet still informative is a difficult harmony to hit. And I mean really, if you're not going to be eccentric in how you study, what's even the point of doing an undergrad in the first place? Congrats again to water! Remember to swing by the **mathNEWS** office in MC 3030 to pick up your prize.

swindlED
Editor, **mathNEWS**

Let me follow *and* judge you on last.fm!

ESTHER AHN, mathNEWS EDITOR FOR SPRING 2019
ALONG WITH TERRY CHEN, ANUJ OPAL AND JOSH RAMPERSAD

mathASKS 140.2

FEATURING PROF. ROSS WILLARD

CC: WHAT IS YOUR OPINION OF THE QUANTITY OF GEESE ON CAMPUS? HOW ABOUT THE QUALITY?

Quantity: excessive. Quality: lazy

ZETHAR: WHAT IS AN INTERESTING TIDBIT OF MATH FROM YOUR RESEARCH YOU CAN SHARE?

I don't really do tidbits. I'm more into complicated, arcane lemmas and such. If you'll allow me to change the question slightly, there is a possibly interesting non-math tidbit in my "Solution to the Chautauqua problem" paper (1999), in which I mention one of my least-favourite foods in the first sentence. Which reminds me, I once tried to insert a formal definition of a potato ("an edible starchy tuber") in a computer science conference paper, but the editors forced me to remove it "because of space limitations."

EPSILON SCREWN: WHAT IS YOUR FAVOURITE LOGICAL PARADOX?

The Raven Paradox. Because I like ravens. Or did you mean a mathematical-logical paradox?

THE42NDRHOMBIDODECADRON: IF A RANDOM PERSON ON THE STREET ASKED YOU TO PROVE SOMETHING, WHAT WOULD YOU HAVE IT BE AND WHY?

Ooh, I guess it would have to be easy (because I'm lazy) but also nontrivial (teachable moments must be grasped) and yet accessible (ruling out the Feit-Thompson Theorem). That leaves proving that you can't cover a "mutilated chessboard" (an 8-by-8 chessboard with one pair of opposite corners removed) using 31 dominoes (each covering two adjacent squares). Of course I would explore generalizations if the random person were interested.

BOLDBLAZER: WHAT DO YOU THINK OF DJAO? (DADDY JAO)

He da man!!!!!

VESICA PISCIS: WHAT FUELS YOUR DISDAIN FOR WESTERN?

C'mon, are you serious? It's WESTERN!! Sheesh.

WILLARD'S DOGS: BUT SIR, HOW MANY CHILDREN HAVE YOU SIRED?

It's weird how many times I've been asked this. OK: two adult children presumably sharing my DNA, a third whom I helped raise to maturity, and three more who affectionately call me "their mom's current husband."

PILLOW PRINCESS: WHERE IS YOUR FAVOURITE BATHROOM LOCATED ON CAMPUS?

NH 3914. Always worth the trip.

SANDWICH EXPERT: IF YOU COULD BE ANY ALGEBRA FROM UNIVERSAL ALGEBRA, WHAT ALGEBRA WOULD YOU BE?

I'd like to be a finite Heyting algebra. Almost a Boolean algebra, yet not as constrained as one, allowing space for creativity and meaning in my, um, operations.

LICENSE2DERIVE: ISN'T OUR MATH 146 CLASS AVERAGE TOO HIGH?

Yes, I'll probably get in trouble for them.

LICENSE2DERIVE: I THINK YOU'RE THE BEST MATH PROFESSOR EVER — DO YOU?

Ha ha, not a chance (and no, I won't increase your mark).

SANDWICH EXPERT: WHAT IS YOUR FAVOURITE VECTOR SPACE?

I love them all equally (even the fruity ones).

SANDWICH EXPERT: FAVOURITE ROSS WILLARD MEME?

http://share.isnowillegal.com/R%20Willard (thanks to W17 MATH 146, on the occasion of my renouncing my US citizenship). Close second: the weird Western homecoming cheerleaders one (thanks W19 MATH 146).

LICENSE2DERIVE: WHAT IS YOUR FAVOURITE COURSE TO TEACH?

PMATH 348 (Fields and Galois Theory). Insert your favourite metaphor for profound, ecstatic pleasure; THAT is what it's like to teach PMATH 348.

SANDWICH EXPERT: ANY ADVICE FOR SOMEONE WHO WANTS TO BE A PMATH PROF?

If you solve one of the Millennium problems, you shouldn't have trouble getting at least a post-doc.

CIX: WHAT IS YOUR FAVOURITE MEMORY OF THE WINTER TERM?

Last lecture, MATH 146, section 2. Weird questions from the class, plus an art show. You had to be there.

DAWDLING: WHAT'S YOUR FAVOURITE SURPRISINGLY-STRAIGHTFORWARD PROOF OF A STRANGE RESULT?

Ken Davidson showed me a great one a year ago. (Fix an n-gon, not necessarily regular; if its angles are allowed to vary while keeping its side lengths the same, the area inside will be maximized when its vertices all lie on a common circle.) You can still see the 2-picture proof on my office blackboard.

NOMORESUBGOALS: WHAT IS YOUR RELIGIOUS AFFILIATION AND HOW DID THAT HAPPEN?

OK, I'll bite. I'm an active member of Waterloo North Mennonite church, which is a local Anabaptist (protestant Christian once removed) peace church on Benjamin Road. "It" happened, I guess, due to the influence of family and community, childhood role models like Gandhi, Muhammad Ali, and Martin Luther King Jr., and countless other prophets of peace and justice.

QUANTUM GOOSE: HOW MANY EYES WOULD AN EYEBALL BALL IF AN EYEBALL COULD BALL EYES?

$\zeta(\frac{3}{2})$

STAPLED: DO YOU HAVE ANY MUSIC RECOMMENDATIONS?

Yes. How much time do you have? To keep this short, I'll mention three. Live performances by local musician Danny Michel are fantastic. My first musical crush was Cat Stevens; try "The Wind" (first track from Teaser and the Firecat, 1971). The best musical piece ever written is "Canzon ii a 4" by Giovanni Gabrieli (late 16th century).

TERRIFIED: WHAT ARTISTIC ADVICE DO YOU HAVE IN STORE FOR US TODAY?

Keep your brush on the canvas.

BLOCKCHAIN DEVELOPER EXPLAINS BLOCKCHAIN AT 4 DIFFERENT LEVELS

1B:

It's fancy linked list.

2B:

It's a fancy linked list with hashes to verify the data.

3B:

It's a fancy linked list with hashes to verify the data that's distributed.

4B:

It's a fancy linked list with hashes to verify the data that's distributed and in some implementations, creates a Turing-complete global supercomputer.

Blockchain Expert

N THINGS THAT ARE SURPRISING ABOUT BEING AN ADULT

ADULTING SO HARD AFTER EXPERIENCING THESE.....

- You feel you can do ANYTHING to get things done, until you realize you probably shouldn't do absolutely anything and everything (because that's how you get speeding tickets for trying to get to work on time)
- Navigating political vitriol long enough so that you can vote properly by having an informed opinion, but also realizing the future is important and you should vote for a having a good one
- Actually having respectful conversations with other adults on various contentious issues going on in the world and coming up with reasonable solutions for change
- Having the power to enact said change in the last point, and so you DO SO (hooray for helping people in need and actually seeing your donations in action and helping in the way it's supposed to!)
- Finding a job after graduating is strenuous labour that gives you the feeling that you are never going to make it ever again (even though you've already made it by getting your degree)
- Doing taxes is still fun (especially if you're doing them all by yourself and you actually have more complicated stuff to deal with this year)
- Parental obligations shift to whether or not you are meeting the traditional family and societal milestones that are expected of you
- You actually FEEL like an adult, and realize that age is an inevitable part of moving forward and living (all the while still hearing people younger than you be like, "I'm so old")

Narf Dert

DECLARATION #2: DEALING WITH ALABAMA

Last time on **mathNEWS** is a country, **mathNEWS** annexed Alabama with Roy Moore as the only casualty.

But this creates a big problem for our fledgling nation: we now have Alabama, which is a shitty place. So, we will take a page from the Rhinoceros Party's playbook and pave all of Alabama, making it the world's largest parking lot. Everyone currently living in Alabama can leave Alabama and make a better life for themselves.

The High Council of Editors

HOW HEAVY WOULD DYNAMAX GROUDON BE?

With the new Pokémon Direct released last week, people have been flooding my inbox asking for my take on the new Dynamax mechanic. By far, the query I most frequently receive is that of how thicc I expect Dynamax Groudon to be. In this article, we will explore exactly this question. How heavy would Dynamax Groudon be, given the information we currently possess.

Let us begin by determining the factor by which a pokemon's height is multiplied when it goes Dynamax. For this, we will use the following frame from the video Get Ready for Dynamax in Pokémon Sword and Pokémon Shield! at timestamp 2:12. (https://www.youtube.com/watch?v=p_dgvgpC8Nw)

Let p be the height of Grookey and let t be the height of the trainer. We can see by inspection that $t = 3p$. Since the age of the main character of Pokémon Sun and Moon is canonically 11 years and the protagonist is designed to be a blank palette on which the player may project themselves, we will assume that t is the height of the average 11-year-old boy in the UK. This is because the Galar region is based on the real world UK. As a result, we have that $t = 144\text{cm}$. From this, it follows that $p = t/3 = 48\text{cm}$.

Now, we will look at another frame from the video at 2:22.

From the above screenshot, we can establish that for the height of Dynamax Grookey P, we have that
$P = 10t = 10(3p) = 30p = 1440\text{cm}$

From this, we can glean that Dynamax increases the height of a Pokémon 30-fold. We can now apply this knowledge to the case of Groudon. Groundon is canonically 3.5m tall. This means that Dynamax Groudon would be 105m tall!

Now, as some of you more science-minded kids may know, changes in height are not directly proportional to changes in area or volume. This is due to a mathematical principle known as the Square-Cube Law. It can be stated as being that "When an object undergoes a proportional increase in size, its new surface area is proportional to the square of the multiplier and its new volume is proportional to the cube of the multiplier" (https://en.wikipedia.org/wiki/Square–cube_law). As a result, while the height of a Dynamax pokemon would be 30 times its original height, its weight would be 27000 times its original weight. Given that Groudon normally weighs 950kg, Dynamax Groundon would weigh a whopping 25650000kg!

For a little perspective, that is about two and a half times as heavy as the Eiffel Tower! Imagine the Statue of Liberty became 10% heavier, came to life and had the power to create continents. That is Dynamax Groudon. Imagine 15000 cars in a huge parking lot. Dynamax Groudon is as heavy as all of those cars combined into one massive continental Pokémon!

All of this is fun in speculation, but remember kids, size doesn't matter. It's about how you use it!

Xavientois

MAJOR SPORTBALL EVENT HAPPENING

This past week, all of Canada has been excited about a major event in sportsball. The particular sportball being focused on is atypical from the more usual sportball obsession. The excitement for this development came from the fact that the only Canadian team is likely to win the major sportsball event, despite the fact that the team comes from a city that most of Canada has a polarizing opinion about. The national unity has trumped the general dislike of the city. Jurassic parks have now become things that people actually want to go instead of running away, screaming. I personally have just enjoyed seeing all the hype that this event has generated. It's fun to have shared experiences. Who knows? Maybe one day, the team of discarded tree parts will one day also earn a victory, though that might take another generation.

Beyond Meta

ODE TO FAILURE

profTHOUGHTS *140.3*

Universities typically sell themselves as pathways to success. "Coming to Waterloo positions you for a successful career in X." The flip side to success is failure, and failure is "really, really bad" in universities. The Math Faculty has policies regulating the number of times you may fail courses before you must withdraw from your program. And so on. Yet in real life, failure is quite common – perhaps initial failures that paved the way to later success, or perhaps bigger failures to win "the prize" that someone else snatched before you were able to.

We are defined by our failures as much as by our successes, and we should embrace them both. As an example, I will tell my story of a recent, thoroughly deflating failure.

It starts in 1993, at a theoretical computer science conference (STOC) in San Diego. One of the papers presented there was "Monotone monadic SNP and constraint satisfaction" by Tomas Feder and Moshe Vardi, two computer scientists at IBM Almaden Research Center in San Jose at the time. This paper organized known tractable cases of a class of problems called "constraint satisfaction problems" over fixed finite templates, and raised an insidiously intriguing question: might it be true that every such problem is either as hard as it could theoretically be (NP-complete) or quite easy (in P)? I wasn't in attendance at this conference, and didn't hear about the questions it raised until around 2000. Even then I didn't seriously start working in the area until around 2006. By then, all the cool people in my field (universal algebra) had jumped into this problem, or variants of it, because of deep connections between constraint satisfaction problems and universal algebra that had been revealed starting around 2000.

Some really smart people in my field made some amazing discoveries and important breakthroughs in the years 2000-2010, and I became something of an expert in the algebraic methods in use, but then progress slowed down. While special cases of the problem were knocked off each year, the full problem seemed hopelessly out of reach. There were several different approaches being considered at the time, but in my opinion, none of them would be sufficient to solve the full problem. Around this time I developed my own private theory of a way forward. The full complexity of the problem, it seemed to me, could be found in a special case, the "Maltsev case," which had already been solved in the early 2000s (in two different ways). I reasoned that the existing solutions of the Maltsev case masked the complexity of the general problem with a trick that couldn't be repeated in the general case. So (I argued) if we found a new, better solution to the Maltsev case, one that avoided using the trick, it should provide the key to the general case.

I went on sabbatical during January-December 2015, which means I didn't have to teach, hold office hours, sit on committees, or even show up to work for a whole year. I decided to go for broke: I would work to find the elusive new solution to the Maltsev case during this year. I had already been working on this problem for a couple of years and had lots of ideas of how I expected the solution to go. During January and February I basically created a plan for the year, with subgoals and benchmarks for progress. I worked flat-out in March on the problem, and then went to Nashville for the month of April, where I could work night and day on it. During that month I made great progress, but not of the kind I had imagined. Each week, and soon each day, I "succeeded" in refuting my latest conjecture for how some technical such-and-such should always go. My eager daydreaming of success was now turning into nightmares of unanticipated technical problems and complications.

I spent one of the summer months in Europe, at conferences and in seclusion, working continuously on the problem. Already the year was more than half over and I seemed to be further and further from my goals. I continued working into the fall of 2015, and somehow I convinced myself (or deluded myself) to be optimistic that "this was going to work" – I was going to find a new solution to the Maltsev case. When December came around, however, I had to face up to the undeniable fact that I was not going to solve this problem. As hard as it was emotionally, I had to stop thinking about and working on this problem and start preparing for lectures which would start in January.

This was a dark period for me. I had been beaten. I was exhausted. My dreams of glory had evaporated and been converted into sharp memories of pain. Professionally I had failed, since I had spent a full year on research and had not one paper to show for it. To top it off, I was unable for the first couple of months of 2016 to stop thinking about the problem, and my failure to solve it. Thankfully, I did not become clinically depressed or require treatment. Gradually, I managed to move on, licking my wounds and knowing that I wasn't smart enough to solve my problem.

And then: in the summer of 2016, a bright young Russian mathematician (and really nice guy), Dmitriy Zhuk, announced in an email that he thought he had a way to prove the full conjecture! A bunch of us excitedly gathered for two weeks in Nashville to hear him explain his ideas. They were too complicated for us to tell whether the ideas would work. Zhuk went back to Moscow and disappeared. On February 21, 2017, Zhuk wrote to us to apologize for going silent (he had found a bug in his proof) and to announce that he now had a solid proof but which wasn't fully written down yet. On March 10, one of the senior experts in the field, Andrei Bulatov (another really nice guy) from Simon Fraser University, wrote

13 doesn't exist.

ROB HACKMAN

to say that he too had a solution to the full problem, and his 70+ page proof could found on the online arXiv. Zhuk eventually posted his full 40+ page proof on the arXiv in May. Short summaries of both proofs were submitted to one of the leading theoretical computer science conferences (FOCS); both were accepted, and they jointly won the "best paper prize" from the conference. At the end of 2017, Lance Fortnow in his complexity theory blog called their joint result the "theorem of the year" in complexity theory.

It's a beautiful story, except for that part about me being a failure. But looking back on it, I kind of like that part too. If I had not tried so hard to reprove the Maltsev case, I would never have been in a position to understand the complications that any solution to the full problem must address. Because of my painful year, I am one of the few people able to evaluate and understand Bulatov's and Zhuk's proofs, which, I've found, are beautiful and ingenious. Even in failure, I've gained something precious that I will never lose.

And so you too should consider your failures as painful events that were worth it. Do not be afraid to fail, and know that even when you fail, you will learn something and be a wiser person for it.

Prof. Ross Willard

HOW TO PROPERLY HIT ON WOMEN

As a woman, I have had the dubious pleasure of witnessing many attempts of people trying to hit on me and most of these terrible. So, in hopes of perhaps saving myself and other women from these undesirable and awkward experiences. Here are some helpful do's and don'ts.

Listen. I get it. You want a relationship, so perhaps you decide to attempt the shotgun approach. Don't do this; you will fail and most likely be perceived as creepy.

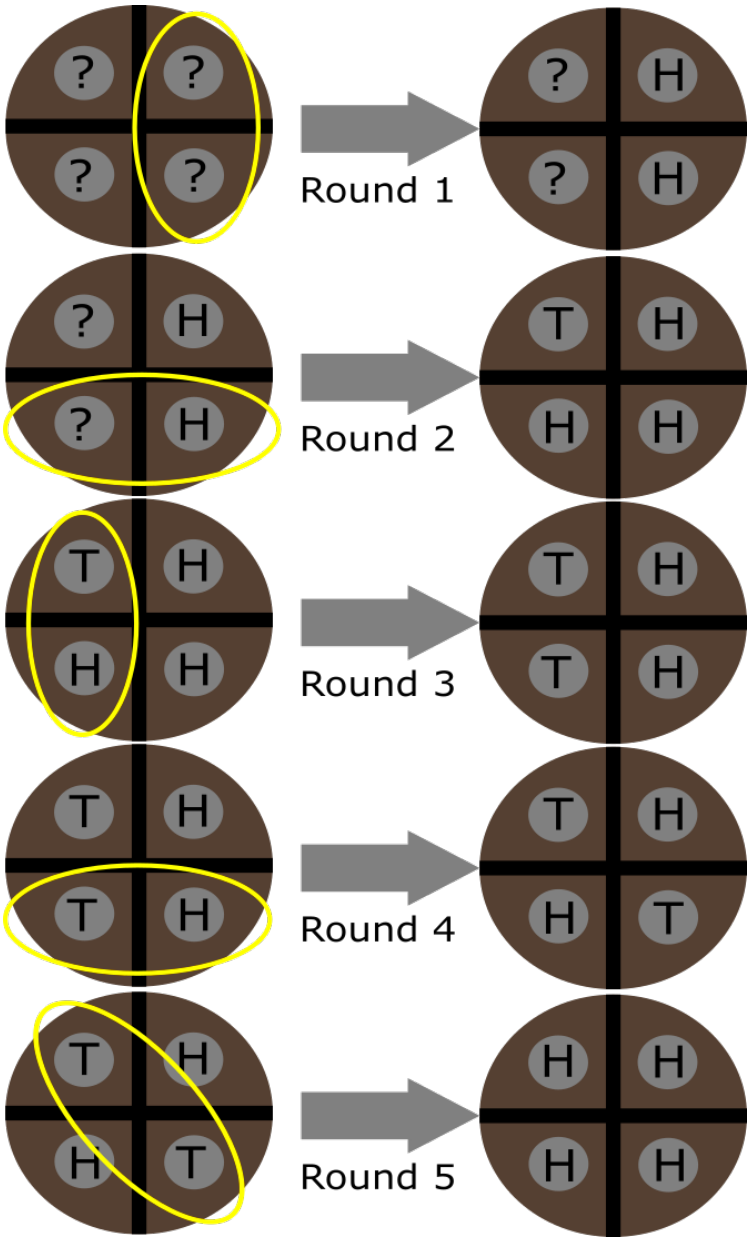
I actually don't mind being asked out by someone I am not interested in, as long as it's done respectfully as I fully believe that being able to express your feelings in a mature way is important. The major difference between someone asking me out being super unwanted to something I don't mind is whether I feel like the asker actually values me as a person.

The worsts are the random strangers that ask me out on the street. I know they don't value me as a person because they don't know me. The general rule of thumb is only ask someone out if you have actually had a meaningful interaction with them, and then don't get offended if the person says no.

Beyond Meta

LAST WEEK'S haltingSOLUTION

First of all, note that this solution is obviously identical whether you choose to start with heads or tails. We will use heads. Begin by selecting any row or column and flipping both coins to heads. Assuming the light does not come on, spin and select a diagonal and once again flip all coins there to heads. Once again, assuming we haven't won, we know there can only be a single tails surrounded by 3 heads. So, we spin again and once again select a diagonal. If the one remaining tail is there, we win by flipping it to heads. If not, we flip one heads to tails. We now have one row/column of two tails and one of two heads. Entering round 4, we pick any row or column. If the coins are two heads or two tails, once again we flip both and win. If they're a heads and a tails, we switch their positions. We now have a diagonal of tails and a diagonal of heads. So, for the final round, we select a diagonal and flip whatever coins we find to their opposite, winning in 5 moves (or less).



THOUGHTS ON THEME PARK RIDES

Hi Mathies! I went to Canada's Wonderland with Finchey last weekend and it was awesome :). Although some rides seems to be using some new technologies and fancy designs, they have at least evolved from old ideas. Thrill rides are the majority in theme parks since coasters get all the attentions and make loads of money. In essence, most of the rides are designed for human beings to experience G-force more than just gravity, and centrifugal force is the most budget friendly and controllable to be applied on coasters. To know more about the rides in general, I will give a brief introduction about the rides in theme parks.

TYPES OF RIDES THROUGHOUT THE HISTORY

Gravity rides: Thrill rides in general but mostly refer to roller coasters. The average G-force of coasters are 4 to 5G. The record holder is Tower of Terror in South Africa with 6.3G. [You blackout at 9G since blood can no longer be pumped to the brain.]

Drop tower rides: Pull a string upwards and imagine yourself attached to the top end of it.

Pendulum rides: Remember the motion of a fixed pendulum in high school physics? Well you become the bob.

Carousel: It is simpler to interpret it as merry-go-round. [There we go.] The earliest carousel was essentially a cavalry training mechanism built to prepare and strengthen the riders for actual combats while they swing their swords at the mock enemies.

Swing rides: Presented at the earliest amusement parks as a variation of carousel with seats suspended from the rotating top of the carousel. Some later versions also added rider interactions such as Skyhawk [The one enables you to flip your seat while spinning] in wonderland to make the ride more fun.

Water rides: These rides can be combinations of everything mentioned above but slower and safer. No shirts required.

Ferris wheels: You must know what that is already. The experience mostly depends on what view you can see above the city.

Omnimovers, haunted attractions, and simulators are not considered as rides since you don't "ride" on them, so let's move on. Doing this research made me think why people go to theme parks. For food and pics? True, some peaceful folks do, but most people go there for the rides.

P.S. Don't ask me which category bumper cars belong to. You go at ppl and cause a car crash without injuries? I really don't know :(.

WHY DO PEOPLE GO ON RIDES?

The hidden truth is people want to behave wild on the rides since screaming loudly and moving your body weirdly are not acceptable in the city. Thrill rides are especially appealing to those who feel stressful and controlled. Also, extreme sports such as skydiving, rock climbing, downhill longboarding, and jumping off your roof have certain risks while getting killed on rides have odds lower than being struck by a lightning. So theme parks almost became the only appropriate place to let out the inner beast for most people.

IDEAS FOR NEW THEME PARK RIDES AKA N WAYS TO TORTURE PEOPLE

There are only two types of people on earth in general: the ones who want to torture others and the ones want to be tortured. Amusement parks achieved that with a method - torturing people with G-force. What else could be good ideas for rides? I might have come up with some ideas to make people behave wildly with or without using G-force.

Screaming competition: An arena contest involving two people in one combat. Each of them need to scream for at least 10 seconds in each round. The loudest and highest screamer after five battles gets free lunch with bottled water included. [Oh those vending machines in theme parks are robbing money from us!] The volume will be measured in decibels with noise dosimeter and pitch monitor. How is it torturous? Your vocal cord will hurt AF after 5 rounds just like riding 5 roller coasters. [See? Simple as that.]

Downhill bubble roll: Guest will be contained in a transparent sphere with hardened shell, roller-coaster seats, and shock absorbing materials as interior. The sphere can roll to any direction within the boundary of the field. Potholed hills are preferred.

A BIG ASS Seesaw: Y'all know what I mean. Go big or go home.

Drilling machine: Imagine sitting on the threads while a screw is drilled down into a piece of wood.

Ice bucket gamble: A device with five paddles which will randomly trigger the ice bucket above five players. Each of them will know whose bucket they can trigger, but they could lie or tell the truth to the others. You never know if a bucket of cold water will be poured straight down. Get ready to scream!

Table tennis drop: Smash a tennis ball on the floor as hard as you can and imagine yourself sitting inside. Although I have no idea how to rotate and bounce at the same time, scientists might figure out a way in the future since torturing people is so much fun.

Helium rocket: Guests will stay in the inner shell of a sealed but transparent container wearing oxygen mask. The outer

container is locked to the ground by a hook while also attached to the ground through a chain. Inject helium in between the two containers while draining the air until the amount of helium is enough to give 1G acceleration, then remove the hook. Let the facility take a tour in the air as the wind flows then slowly change the ratio of helium while pulling the attachment until the facility lands smoothly.

I did some rough calculations and found 382 cubic meters of helium with the total cost of $206 will be needed for every launch to give a 200kg object 1G acceleration upwards. Although most of the helium could be reused, we should save helium for research instead of entertainment due to the current helium shortage. [until we are able to mine helium from the lunar surface]

A FEW PERSONAL THOUGHTS

Going on rides too many times gives you roller coaster dreams.

I hate being spun backwards and would rather get on a 6G roller coaster.

Why do I love containers so much? It's like a transparent prison.

Finchey said bumper cars belong to cart rides.

Autowired

References: Wikipedia, Coasterpedia, BBC News

MINORITY REPORT

This issue, I'm going to try starting a recurring segment. This column will appear in every issue, reliably, like death or taxes, but more fun.

So, what is Minority Report? First of all, it's a great movie more people should watch, but it's also going to be a look at the minority and I don't mean racially or politically. If you want deep issues, go take a PSCI course. Instead, we're going to look at the unseen minorities, on the issues you don't think about.

Mostly because you thought no one was insane or stupid enough to disagree. Take our first topic, surveyed by Gallup in 1999:

"As far as you know, does the earth revolve around the sun or does the sun revolve around the earth?"

If you've passed grade three, you too have grappled with this difficult question. Gallup asked Americans this question, and here's what they got.

Earth revolves around the sun: 79%
Sun revolves around the Earth: 18%
No opinion: 3%

Well, that looks like a B+ to me. Not too bad. I understand the uncertainty. If I can't look directly at the sun, how can I know what it does? Take that for data.

But, here at *Minority Report*, we're going to examine the minority. And not that 18% minority. The 3%.

These are truly the outliers among us. When asked a question most people know the answer to by the age of ten, they didn't have the confidence to even go for the true insane answer. Instead, they opted for a lesser insanity: just not giving a shit. I wonder what they were thinking when they answered?

"Well, it doesn't really matter what goes around who. Either way, the sun will rise tomorrow. Not that I care. I have no opinion."

Actually, that argument makes a twisted sense. Does it really affect my life whether or not the sun goes around the Earth? Either way, I can't look at it without my eyes vaporizing into dust and leftover Visine. Though I guess if you were in the three percent, you probably wouldn't have an opinion about that either.

When you think about it, actually, the life of "no opinion" is a good one. Imagine, going through life immune to all that plagues humanity. Living your life impervious to the ancient enemies of civilization: war, famine, pestilence, and people with bad takes on Twitter. With enough ambivalence, you could defeat Death himself. What is a bullet, or a knife, or cancer, or a knife that shoots cancer bullets, in the face of no opinion?

Well, this took a weird turn. Not that you care. You probably have no opinion. Good for you. Or bad. Or ok, I guess.

And one more thing: We don't just analyze polls here. If you're weird in an endearing, non-criminal way, shoot an email to minority.report.mail@gmail.com and tell me why. No guarantees I won't make fun of you though.

UWUnprint

A VERY EASY BROCCOLI AND ASPARAGUS RECIPE

I really like eating food. I don't care where I get the food from, but my wallet seems to prefer food I make myself. Unfortunately, lots of recipes I find online are what I would call Too Hard™, which means that they involve either:

1. more than five ingredients
2. more than two bowls
3. any ingredient with a country name as an adjective
4. heating something for like, eight hours, or
5. scrolling past a three paragraph story about the author's grandparents before getting to the actual recipe.

But recently I discovered a recipe that even I could make, and as you can see, for me most recipes labelled "easy" online are still Too Hard™. It only takes 10 minutes of actively doing stuff, and 20 minutes waiting, during which you can watch YouTube (or if you're one of my classmates, hentai).

Here's what you need:

1. Asparagus and broccoli (as much as you want to eat)
2. 5 tbsp of olive oil/butter per baking pan (use cheaper oils at your own peril - nothing bad will happen, but it'll taste slightly worse and clog your arteries slightly more)
3. Salt and pepper (other spices if you're fancy)
4. Cheese to sprinkle (amount depends on personal taste)

Here's what you do:

1. Preheat your oven to 200°C/400°F/473K/852°R .
2. Cut some broccoli and asparagus into appropriately bite sized pieces and spread across a baking pan (use foil or parchment).
3. Drizzle lots of oil over it (or melt some butter in a pan and pour over it). About 5 tbsp, but feel it with your heart. Put your salt and pepper on it now, too (but not the cheese yet)
4. Bake in your heated oven for 20 minutes.
5. Remove from oven and sprinkle some cheese over top, because cheese is delicious. I recommend slightly pricier old cheddar, or parmesan. Don't subject yourself to cheap cheeses.
6. Eat it!

Some tips:

1. Do wash your veggies, but dry your veggies before baking them. This will help your veggies be crispy and not mushy. Usually you'd use paper towel, but in a pinch, you can put your veggies in front of a desk fan for a few minutes - you'd be surprised how well that works for drying.
2. Parmesan is fairly cheap for how good it tastes, but is really hard to grate. Keep that in mind, lest your veggies get cold while you're grating.
3. The part of the asparagus stalk closest to the "base" is tough and woody, so you should chop it off and discard it. To know how much to cut off, take one stalk and bend it near the base. Where the stalk breaks naturally is where the woody part transitions to the tender part. Use that stalk as a baseline to cut the rest of the asparagus.
4. The broccoli stalks are edible, but cut of the very base rind-looking bit, and slice the stems thinly. It should come out not too tough after 20 minutes in the oven.
5. Eat it with rice!

sillycone

N THINGS OVERHEARD AT mathNEWS

- I could produce child right now!
- No, I mean the royal now!
- That means he's going to fuck the Queen.
- A: Has anyone in this room ever cheated on a computer science assignment?
- B: Are you asking how to do it, or what?
- A: I already know how to do it.
- A: I still haven't finished my article.
- B: That's okay, your quotes have already written an article.
- Carbone is a lifestyle.
- Pride month means eating carbone pizza.
- Is it an academic offence to not cite my sources in a **mathNEWS** article?

swindlED

profQUOTES 140.3

QIC 823: DAVID GOSSET

❝ We are going to think about this for 10 seconds and then give up.

❝ [a while later] Alright, I think my 10 seconds are up.

❝ I listen to a talk by [the author of a certain paper] and I read the abstract of the paper, therefore I concluded that they solve the problem.

❝ There is this ancient lemma by Jordan which just pops up everywhere.

CO 351: MARTIN PEI

❝ Oh, music! I like music! No, wait, I actually don't like it.

❝ Applications! I don't like applications to real life because... what *is* real life?

❝ Student: Any tips [for the midterm]?
Martin: Any? 10%? 15%?

CO 480: STEVEN FURINO

❝ What's between you and Rome?! This dude and sheep.

❝ Child sacrifice works.

❝ What do you eat as an elephant 7000m up in elevation?

❝ Old age, terrible thing.

❝ As academics, I don't think our work ethic has really improved.

❝ I don't mean dominatrix; I meant directrix!

CS 245: TIMOTHY NG

❝ Gordon Ramsay's dog loves CS 245.

CS 454: SAMER AL-KISWANY

❝ Threads are like kids: They're easy to create, but hard to manage.

❝ Don't create too many kids.

❝ Some of you still need to finish the assignment, the others need to go to Toronto to watch the Raptors game.

CS 458: IAN GOLDBERG

❝ We will likely not prove any theorems in this class. Some of you may sigh in relief, some of you may go "aw darn."

❝ *shakes fist* Internet!

❝ The program is allowed to do anything, including exploding and killing your cat.

❝ Remember CS 245? Maybe you've wiped it from your memory.

ENGL 294: TRAVIS MORTON

❝ Thanks to denial, I'm immortal.

MATH 245: BLAKE MADILL

❝ Orth-Orthonormality. I'm never gonna say that again, because I can't.

❝ [in RCH 305] I told the engineers to go home.

N WAYS TO MEET YOUR SOULMATE

- Discovering your names produce a SHA-256 collision.
- Meeting someone at **mathNEWS** production night and being recognized by your name as a Piazza instructor-endorsed answerer.
- Meeting at an employer info session.
- Super-liking each other on Tinder.
- Adding them on LinkedIn to reach your 30th connection.
- It's exam season, and you're looking for a seat in DC. You both arrive at the same desk at the same time. You lock eyes, and from that moment you know, *this is your soul mate.*
- Getting ready to kill the exam when the proctor taps you on your shoulder. You turn around, and the love of your life is glaring into your soul. You look back at the paper, then at your student ID. Whoops, wrong seat.
- You're on your way to Conrad Grebel to check out the Mennonite Archives, as you always do every Thursday night at precisely 5:30 PM. As you walk over the wooden bridge, over the clear running water that gleams bright underneath the afternoon summer sun, ruminating about all the Mennonite history you're going to learn that day, you bump into someone.|
"Oh, sorry," you murmur.
"Worry thee not, dear."
What a beautiful and strange voice. You fall in love with the sound, then have a flailing seizure. But it is okay. You are happy. You have found your soulmate.

Sandwich Expert, water, and Finchey

36 QUESTIONS TO FALL OUT OF LOVE

If you've heard of BuzzFeed and have a cellphone, you've probably heard of "36 Questions To Fall In Love". According to the New York Times, a study was done to explore intimacy between strangers after asking 36 personal questions "broken up into three sets, with each set intended to be more probing than the previous one".

Many online video production companies like Jubilee have adapted this experiment into a speed-dating format to get strangers to fall in love onscreen for views. Some of these videos have actually ended in the strangers liking each other and wanting to go on a second date.

As I watched video after video of strangers developing crushes on each other after following this formula, I wondered if there was an inverse to the "36 questions". Perhaps the strangers were merely struggling actors mining Craigslist for work and don't have the time or energy to be in love and need an antidote? Maybe someone asks out their crush and the feelings aren't reciprocated and they want to shed their feelings for them? Maybe my inner MATH 239 student is trying to find an inverse to the "36 questions" so that I can establish a bijection? My hypothesis is that very strong relationships will be very unchanged by this experiment, but less stable ones may crumble.

Whatever the motivation, let's get into it. I present you "36 Questions To Fall Out Of Love". This activity is meant to be conducted between two people with a potential or established romantic and/or sexual relationship. Take turns asking each question to each other until you're done. Answer honestly and maintain normal eye contact. At the end, feel free to spit in each other's faces or hug (whichever seems most appropriate at the time…just don't break any laws against violence).

SET A:

1. When you shower, do you wash your legs?
2. Have you ever cheated (sexually) in a relationship?
3. Have you ever cheated (emotionally) in a relationship?
4. Have you ever cheated (virtually) in a relationship? (@S5E1 of Black Mirror on Netflix)
5. When you make plans with your friends, how often do you show up late?
6. How much money is in your savings account?
7. Are you very religious?
8. Do you vote in federal elections?
9. Do you vote in provincial elections?
10. Do you vote in municipal elections?
11. How many hours per week do you spend watching Netflix/Youtube/any type of entertainment video?
12. Who is your celebrity crush?

SET B:

13. Given the choice between working for an employer that shared your values/ethics and a higher paying employer that did not share your ideals, which would you pick?
14. What is your definition of "feminism"?
15. Would you spank your kids?
16. What is your greatest fear?
17. Do you neglect your mental health?
18. Which of your parent's personality traits do you not want to have?
19. When was the last time you hurt someone and didn't apologize?
20. Do you believe that racism exists in Canada in 2019?
21. Do you want to have kids?
22. What is the cause of overpopulation?
23. Rate the physical attractiveness of your conversation partner on a scale of 1-10 (ten is your celebrity crush from SET A).
24. How much debt do you have?

SET C:

25. If you could be given this tomorrow, would you rather have a $1,000,000,000USD or world peace?
26. What controversial views do you hold?
27. Would you ever murder a human?
28. Are you a nice person?
29. If any of your exes wanted to try and rebuild a past relationship, would you accept?
30. What are your top five physical insecurities?
31. How would you order the following from least to most important in your life: Family, God, Romantic

relationships, Friendships, School, Work, Physical health, Mental Health?

32. Have you ever had a healthy, satisfying, long term romantic/sexual relationship?

33. What is your average stool like? Texture, colour, frequency, texture, taste (if applicable), size, smell?

34. Do you think you and your conversation partner are compatible enough to have a successful 50+ year long relationship?

35. **FREE QUESTION** Ask any (yes/no) QUESTION to your conversation partner and they must answer honestly (NO FOLLOW UP QUESTIONS OR EXPLANATION ALLOWED).

36. Do you believe that pineapple on pizza is humanity's greatest mistake (if not, then what is it)?

Steve, The Craigslist Psychologist

SUMMER IS FINALLY HERE, AND I HAVE JUST ONE THING TO SAY ABOUT IT

THE SUN MAY BE SHINING, BUT NOT EVERYTHING'S DANDELIONS AND ROSES.

AAAAAARGHH you shitbitch MOTHERFUCKER!!! I don't even have time to write a rambling 600-word introduction to this article like I normally would because it's fucking MOSQUITO SEASON and I'm about to LOSE MY **FUCKIN'** *SHIT*. Holy FUCK!!!

The weekend before this issue comes out was the hottest weekend we've had all year. My skin would probably have burnt to the consistency of a spring roll shell if I didn't have my parasol. And the goddamn weatherman's saying that the temperatures'll be up in the 20's for the rest of the week. Fuckin' sweltering stuff. Not that I mind it — in fact, I actually kind of like it. I was born with the circulatory system of a Galápagos marine iguana, and summer's the only time of the year where I can sustain a viable internal temperature. For the other eight months of the year, my body gets cryogenically frozen in a big glass tube in the seventh floor of MC while the contents of my brain are uploaded to an ancient IBM 305 RAMAC at the bottom of a well in Bavaria.

I digress. Summer's finally arrived, bitch, and it's here to fuckin' stay. BUT. And this is a big BUT. I would enjoy summer one million times more if it didn't have this *one* damn thing about it. Oh, you know where I'm going with this. The fuckin' cursed-ass mosquitoes. Sucking blood and spreading West Nile Virus like the goddamn lowlife shit-eating bitches they are. I fucking **deplore** them. Useless and wicked stains on the face of this nation. No, on the face of this PLANET. Goddamn. I need to take a fuckin' breather, pop a Klonopin tab or something. I'll be back soon.

Alright, so I'm back and I'm feeling much better. Those damn mosquitoes nearly cost me my wits just thinking about them. Let that be a testament to how awful those vampiric insectoids really are. I'm sure you feel the same way. Unless you were dropped on the head as a baby, you also know that mosquitoes are the very bane of human existence, the incarnate of death, destruction, and galactic entropy themselves. And if you *were* dropped on your head as a baby, I'll let this go, but you're on thin fucking ice.

Why do mosquitoes have to exist? Fellow Ontarian brethren, I implore you to recall memories of the sustainable ecosystems unit from your Grade 9 science class. We all learned that every living thing has its "niche", the special purpose it serves in maintaining its ecosystem. Lemme just ask you one thing: what the fucking hell is the ecological purpose of a mosquito?? To be food for birds and shit? I mean, seriously? They're literally spreading around hundreds of horrible diseases like malaria and dengue and yellow fever (not *that* yellow fever, you shitbrained asshole), killing millions of people per year. How the FUCK is that worth giving some shitty birds a bite to eat every once in a while? And birds don't even *like* eating mosquitoes! It's a fuckin' raw dog game out here. We, the entire human race, got the short end of the stick, and those shitty fucking MOSQUITOES get to live like freaking KINGS, drinking up our fatty, additive-laden blood like tourists at a four-star hotel's continental breakfast buffet.

Okay. Okay. I've got to confess. Last weekend I was hanging out with Autowired and it was *splendid* and *dandy* and *great* and all those other nice words. EXCEPT WHEN IT WAS NIGHTTIME AND WE WERE SITTING ON THE GRASS AND I GOT FUCKING **BIT** BY A MOSQUITO!!! AAAA**AAAAAAA*AAAAHHHHH***!!! Holy FUCKING SHIT, MAN! Now I have a big-ass red welt on my leg and it's super FUCKIN' **ITCHY**! Not even toothpaste or raw garlic cloves will help me now. It's so itchy. I'm dying. Going rabid. Oh God, is this foam coming from my mouth? I've scratched my leg raw with my lizard claws; the blood keeps flowing but I can't stop itching. The mosquitoes. They did this to me. And with the onset of summer, I'll have to suffer with this for the next four months. I don't know if I can go on. There's nothing left for me on this earth. I no longer have any hopes in life nor anything to live for.

Fuckin' mosquitoes.

Finchey

9 THINGS I HAVE LEARNED IN MY 9 YEAR DEGREE

HOLY HERA, I ACTUALLY DID IT!!!!!!

1. Life exists as a delicate balance that needs to be maintained, even as things change. In my university life, there needed to be a balance between academics and non-academics, because only focusing on academics led me to make decisions that were detrimental to me and my academic performance. Having the opportunity to leave my room and do something other than study was really beneficial and gave me things to look forward to outside of school and a great group of people to hang out with.

2. Romance isn't planned, forced, or should feel wrong in any context. It feels natural, enthralling, and meant to feel just right in EVERY context. When you find that person that makes you so happy every time you talk or think about them, when you actually look forward to being with them in person, when every moment of intimacy feels right and you can imagine spending all of your time with them, you know you've found someone worth having in your life <3

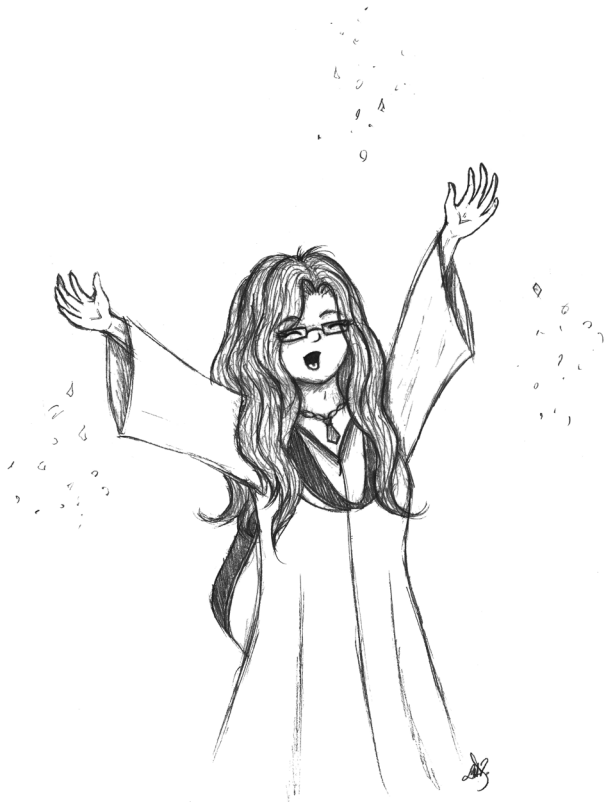
3. If ever something doesn't seem right in the work you produce or the results you yield don't make sense to you, double checking your process (and of course, recalculating the math used) can easily point out where things went wrong and show you where you need to fix things. I think the **mathNEWS** Editors will agree that those who help with copy-editing catch a bunch of things that would have been missed otherwise, but there's a bit more at stake when certain final grades were not calculated properly.

4. The unexpected will happen, and sometimes it can be hard to react to things when you're not in the right headspace. Being proactive and having a safety net of support can really help you avoid certain turmoils should something awful happen. It also really helps you get back on your feet quicker when you know exactly where to go to get the help you need. I cannot thank all the people who supported me when I had to deal with very abrupt and difficult situations - you are all awesome!

5. Dealing with illness means that you're not able to function the way that you once were able to, and it can sometimes take a lot longer than you think to truly be able to get back to that level of function. Put in the work you need to get back to that level of functionality, and don't do things that can make it worse. Most significantly, do not EVER write your exams sick in any capacity. Verifications of Illness exist for a reason, and you deserve the best chance to succeed at the work you do! That and spreading illness to other people REALLY sucks.

6. When you've been working on things for a super long time, it can be important and necessary to take time away to breathe, recharge your batteries and enjoy doing something else. Well timed breaks and well spent breaks doing something fun can do wonders to boost your productivity and engagement in your work when you return to it later. When you've been doing something every 4 months for a number of years, be it studying or working on co-op, taking a term off to just travel with that special someone is worth it.

7. Frustration with not being able to succeed is normal, but there are things that influence whether or not you achieve some level of success. First and foremost is finding what your definition of success is, and then figuring out whether or not you have access to the right tools to help you meet that definition. It makes all the difference when you have accommodations for the learning challenges you experience, and have access to extra resources like tutoring to help you better understand the material presented. It makes an even bigger difference though, when you have a definition of success for yourself that you can work towards without worrying about everyone else around you "succeeding" when you are seemingly not. Your definition is very likely not going to be the same as those around you, so focus on you and getting to where you feel you need to be.



8. The future will always be daunting, no matter what you're working towards. Societal and familial pressure to achieve the stereotypical life milestones are no help either, especially when you haven't even finished getting to the one milestone you set out to reach yet. There really is no time limit to achieve what you want to, and sometimes those societal milestones that others expect of you are not what you expect of yourself. Your future is yours and yours alone, as you are the one who will have to live through it when the time comes. Face the challenges of deciding what comes next head on, and always question whether or not a particular future path is truly right for you. If an angry goose crosses your path, just hiss back at it and move forward!

9. There is a lot of good to enjoy and look forward to in life, no matter what you may be feeling. The journey was worth it so far and it will continue to be worth it in future, no matter how long it takes to get to where you want to go, or how many choices lead you down interesting paths and experiences. The fact that you have made it this far is a testament to your perseverance and your will to be here (in addition to, no doubt, just a bit of luck). I made it and I am so happy I did. You made it this far too, and I am proud of you <3

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N HOT, COLD, AND ROOM TEMPERATURE TAKES

- Lottery tickets are actually worth it.
- Objective C is horrendous.
- 2019 is the worst year in pop music since I started keeping track.
- #DontDriveHigh ads make me want to drive high.
- EVE Online is fun.
- Agile development is a scam to make developers feel more athletic.
- 3-space indentation is a good compromise.
- The Liberals will win the 2019 election because the Conservatives keep alienating voters named Justin.

water

HOW TO (REALLY) PROVE A THEOREM

If you read my article last issue and found it to be filled with over-used or impractical advice, fear not! This article holds the true secret to theorem-proving. Last issue's tips were fodder in comparison to the true wisdom contained herein.

Step 0) Remember hearing *something* about the details of the statement. It's kinda foggy, but you *definitely* recognize those hypotheses. Were they necessary for a theorem or sufficient? If and only if? No, that's not it… "*Proof*," you write, hoping against hope that something will come to you if you just noodle around with the hypotheses enough.

Step 1) Instead of proving the main statement, try rewriting it. You'll prove the contrapositive. Yeah, that's it! Prove the contrapositive! They're logically equivalent, right? Are they? You don't remember, not that it matters anyway — you've only got twenty minutes left and a good 20 marks across three proofs. Maybe you'll try looking at the converse and see if that's false.

Step 2) Rack your brain for that one lemma you saw in class off-hand and then never again. What was that called? No, not Poincaré's lemma, that's… what subject is that again? Oh, who cares? It won't help you prove a damn thing about an arbitrary Turing machine anyway.

Step 3) Wait, it's a "prove or *disprove*?" You scarcely understand the statement, let alone whether it's true. "Try some counterexamples," you hear, ringing through your head. You try a couple typical cases and it seems true (though you find out later that a trivial case is a perfect counterexample), and so you get a couple lines in, then abandon it for the next question.

Step 4) Alright, well you've done everything you know how to do, time to go over your exam. You sift through the pages, the PAC air closing in on you as you do, the university logo on your sweater seeming more and more taunting with each passing second. You'll never prove those statements with the time remaining. You're not even sure you've passed this exam — this term, even.

You're dejected, you're angry, you're disappointed in yourself, and you just want to go to bed and cry (not that you'd be able to anyway).

You can't though — you've got another exam to study for.

permanentpseudonym

THINGS TO MAKE AND DO WHILE STUDYING

I attribute a lot of my successes to having mildly quirky ways of studying. At the cost of some extra time and effort, making your studying creative and interesting can help you retain more knowledge and keep yourself engaged. Here are some of the weird things I've made and done in the past while studying.

THE EVERYTHING FLOWCHART

There's beauty in simplicity, but there's awesomeness in complexity. Small separate flowcharts make sense, but how do you know you've covered everything until you've made a single flowchart describing the entire course? How about a flowchart for how to solve every possible computation question in your algebra course? A step-by-step guide to first aid? A flowchart for a computer program that uses every feature covered in the course? Do it digitally unless you're ready for a lot of erasing.

Take ECON 102 for example. Anyone who has it should know that the first three quarters of the course are all exposition leading up to the most ambitious crossover event in macro-economics: monetary policy transmission. Every market is the setting of its own plot, with a different cast of variables running up or down because the central bank is coming to intervene. This is what flowcharts are made for! Gather all your variables and colour-code them by whether they go up or down, and draw arrows between them to show how they affect each other.

⅖ effectiveness (the big assumption of the Everything Flowchart is that you already know all your definitions and stuff)
⅕ convenience (⅗ if you let the arrows cross)
⅘ satisfaction when you zoom out on the finished product (⅕ if you let the arrows cross)

PAPER 4

Think tests are evil? Join the dark side and embrace it. The only thing better than practicing really hard exam questions is coming up with your own and sending them to your victims (friends). It's even better when your study partners are actually willing.

Write questions throughout the term whenever inspiration arises, and challenge yourself to make them as difficult as possible. It's a lot easier to reverse-engineer a question from an answer, than it is to solve the question the normal way. Then when preparing for the exam, it's a lot easier answering a question you created a few months back, than answering one you've never seen before. At each step, you stretch slightly beyond your comfort zone, until by the end of it you have ascended.

The name Paper 4 comes from the grade 11 physics course where I first got that idea. The final exam featured three papers, and this was jokingly the bonus one. Quite poetically, 4 is also the Chinese number for death.

⅗ effectiveness
⅖ convenience
⅗ satisfaction (⅗ for writing the questions, ⅖ for using them to terrorize your classmates)

COMEDY

I've been naming my normal study documents "X in a Nutshell" for so long that I no longer remember when I started doing it. All I remember is that "Nutshell" has always been a misnomer - they easily exceed thousands of words by the time they're finished. I've tried a lot of styles in the past, from full-blown serious textbooks to narratives, but the one style that always gets me is to throw the odd wisecrack in the middle of an explanation.

My French teachers always say that you only really master a language once you understand humour in it. The same goes for almost anything else. Unfortunately, math doesn't lend itself to be particularly humorous, but I'm sure some of your other courses do.

Humour can find its way into your study notes in many ways. Sometimes it's just a cleverly drawn diagram. XKCD is teeming with examples of that. Other times it's as easy as spicing up the word choice when you're paraphrasing the lecture notes. Taking risks is great. How far can you stretch a description before it starts to lose it's original meaning? Exactly as far as how well you remember what it's supposed to mean. Pushing that limit will give you the mental workout it takes to memorize that last bit of content.

⅖ effectiveness
⅘ convenience
⅗ satisfaction (occasionally you will look at your notes and realize how funny you aren't)

water

CORRECTION FROM THE TRENCHES OF ALABAMA

In last issue, I wrote that the only casualty in **mathNEWS**'s war with Alabama was Doug Jones. This was a mistake. I meant to write Roy Moore. Doug Jones is fine, but Roy Moore is dead.

General Sandwich Expert

A CELEBRATION OF THE 75TH ANNIVERSARY OF D-DAY

"My fellow Americans: Last night, when I spoke with you about the fall of Rome, I knew at that moment that troops of the United States and our allies were crossing the Channel in another and greater operation. It has come to pass with success thus far." — Franklin D. Roosevelt, June 6, 1944.

On June 6, 1944 — 75 years ago June 6, 2019 — The largest amphibious landings in history took place. Consisting of majority American, British, and Canadian forces, these operations marked the beginning of the liberation of France.

In the name of remembrance and celebration, I joined in on a game of Hearts of Iron 4 commemorating D-Day. The game started with a listening to the FDR speech on D-Day, followed by some words from the host recommending that we attempt to stay historical.

The game started on a good note for the allies, with Australia obtaining "Fighter II" technology for the rest of us to license production for. South Africa obtained the much needed Heavy Tank technology, and started the production of the South African heavy tank divisions. Such luck did not continue, as the UK did not remember to research sonar for a number of years. This was followed by a lack of RADAR research until 1939, which lead to the allies being hindered in both the skies and the seas. Before the start of the war, the UK stated all off-limits sea zones, being the ones that would not be protected from U-boat convoy raids by the UK and US navies.

Danzig or War! The violation of Polish independence lead to the Allies joining the war, surprisingly including the US and Mexico. South Africa, the UK, and Mexico were in good position to begin the war, holding key points on the Mediterranean coast such as Gibraltar and El Alamein.

The Polish simply did not last, and the French quickly fell after a bug deleted all of France's divisions on the German front. The allies pushed forward in French Algeria and Tunisia facing Italian West Libya, but the front stagnated on the side of British Egypt facing East Libya. German tanks suffered heavy attrition in the hot desert areas, but they easily brushed aside the Mexican "Immigrants" divisions, the UK special forces, and the one South African heavy tank division.

"We're losing Gibraltar", or some words to that effect, and we realized that Nationalist Spain had joined the war with the Axis. Before the western strait of the Mediterranean was cut off, the British fleet withdrew. The Germans followed with a concerted push to El Alamein, easily reaching the line that once held Rommel. The Commonwealth placed their best troops on the line, but it was to no avail. The Panzers continued, reaching Cairo and threatening to both cut off the forces remaining in the Sinai and the Levant, and blocking off access to the Mediterranean. In a last ditch attempt, the allies tried to hold long enough to blow up the Suez canal, but this failed as the Germans overran the position. Parts of the British and the South Africans escaped to Cyprus, cut off from escape to their home nations, while the rest of the UK forces and the Mexican immigrant divisions were encircled and destroyed on the tip of the Sinai peninsula.

In western North Africa, the Allies fared no better. The port facilities on the Atlantic were insufficient to supply the troops in the region, leading to the UK requesting impolitely for France to improve the naval supply situation. This was met with inaction, which the UK did not take well to. The Spanish proceeded to invade across the strait of Gibraltar, and with the rest of the axis, pushed the allies to Sidi Ifni.

On the high seas, the lack of RADAR and sparse sonar did the Allies no favours. While the Italian fleet was impotent, German submarines were undetectable as they raided every Allied convoy. The UK ran out of convoys quickly, not helped by the fact that their operations required more than 5000 convoys. After investigation, it was discovered that most of these convoys were transporting one infantry equipment a month from British India. This was realized, and after the cancellation of this generous lend-lease, the British convoy requirement fell to the double digits. It must have been a superb singular rifle.

After much failure on the side of the Allies, the Germans went for war with the Soviet Union. This lead to the Axis making little progress.

To summarize the next two years, the Allies simply did nothing for a while. The UK was invaded by Germany around Hull, but Germany failed, losing six heavy tank divisions. The UK was invaded again in Dove, but even with US help, they barely held. Meanwhile, South Africa and Mexico recaptured most of Africa, recaptured the Suez Canal (good thing we didn't blow it up), and the Soviets pushed the Axis back to the original borders.

As an end note, the US attempted a D-Day by himself, landed 10 divisions adjacent to Dunkirk, and was promptly destroyed. After this, the game de-synced, and became too difficult to continue playing, as with all Paradox multiplayer games. The Allies claimed victory, the Axis claimed victory, and both sides claimed that their Wunderwaffe was just around the new year, ready to crush the other faction.

I've left out the Benelux antics.

Yours in amphibious assault and invasion,

quiz

gridCOMMENT 140.3

Time flies when you're busy enjoying the string of good weather, does it not (while I write, having arrived during a torrential deluge), and it seems that the year is already half-done. Surely everyone is mired in the muddy trenches of Verdun— wait..., wrong century and continent.

Come to think of it, to many people the stress of midterm examinations is not entirely unlike those faced in the fronts of war, for the decisions made during combat and examination will determine the outcome of the future. Perhaps it is wise to decide to spend some time relaxing by working on this humble crossword.

It seems that for last issue, a certain Zaddy2 had taken this advice, for they have submitted the most correct (although not entirely so) submission to last issue's grid. Their answer to last issue's **gridQUESTION**, "If you needed to give an over-the-top Oscars-esque thank-you speech for something, what are some unexpected recipients of your thanks?", they had responded with "Thank mr goose for teaching me to run (away in fear) before I could fly". Please come to the **mathNEWS** office at your leisure when the editors are around so that you may pick up your prize.

For those of you who are only just tuning in, if you submit before 6:30PM on Monday, June 24th, 2019 to the **BLACK BOX** (or electronically to mathnews@gmail.com) a solution to this issue's **gridWORD**, you may be eligible for a prize for most correct submitted grid. To be eligible, please submit along with the grid your name (and optionally an alias to be credited under) and an answer to this issue's **gridQUESTION** (of which my favorite answer shall serve as a tiebreaker in the event of a tie for most correct), "What are your best goose attack defense tactics?"

Temporally confused,

Zethar

LAST WEEK'S gridSOLUTION

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

ACROSS

1. Flub
5. Actor
10. Uncertain
14. Kind of exam
15. R, on 51A
16. Aria, e.g.
17. Long
18. Strange
19. Feast in 3D
20. e.g. avoir (2 words)
23. Bad day for Caesar
24. Post-___
25. Troubsome
31. Sine ___ non
34. 100 kopecks
35. Flatfish
36. Vase
37. Church alcove
38. μ
40. Naif
41. Golf peg
42. New Mexico Indian
43. It's a wrap
44. Poetic adverb
45. Found everywhere
48. Delivery vehicle
50. Some jeans
51. Radios
57. Philippine island
58. Mideast land
59. Indian bread
61. Movie
62. Poverty-stricken
63. Almond
64. Harmonia's father
65. Lock
66. Without 12D

DOWN

1. Former Portuguese colony in India
2. Ocean predator
3. Pearl Harbor locale
4. Not rigid
5. Town in County Kerry
6. Modern medical philosophy
7. "blood" suffix
8. Soothsayer
9. Pay (up)
10. ___ of Langerhans
11. A pre-modern cyrptographic cipher
12. Midriff blubber
13. A crossword solver?
21. A break, for processes
22. Clamp
25. Chatter
26. Indian coin
27. The Universe?
28. What most programmers still assume text to be
29. Anonymous communication software
30. United Nations agcy.
32. Metropolitan
33. About
38. Silent
39. Lodge
40. Where you might find a 40A
42. Strike
43. Hunt for
46. Kilt patterns
47. 29D is formed of these
49. Grads
51. Dam
52. Fails to be
53. Appraiser
54. Has a root
55. Individually
56. It's a wrap
57. What a CFM student might persue
60. Letter before samekh

6 THE HARD WAY

haltingPROBLEM *140.3*

The challenge here is simple: Complete each of the below formulae using any arithmetic operations so that they are valid and true. The rules are as follows:

1. You may not add any additional letters or numbers. This means no logarithms and no $\sqrt[x]{}$ (though the base $\sqrt{}$ is fair play).

2. You may not touch the equals sign or anything to its right side (I.e. the 6).

3. All other arithmetic is valid. Use all the divisions, additions, etc., that you please.

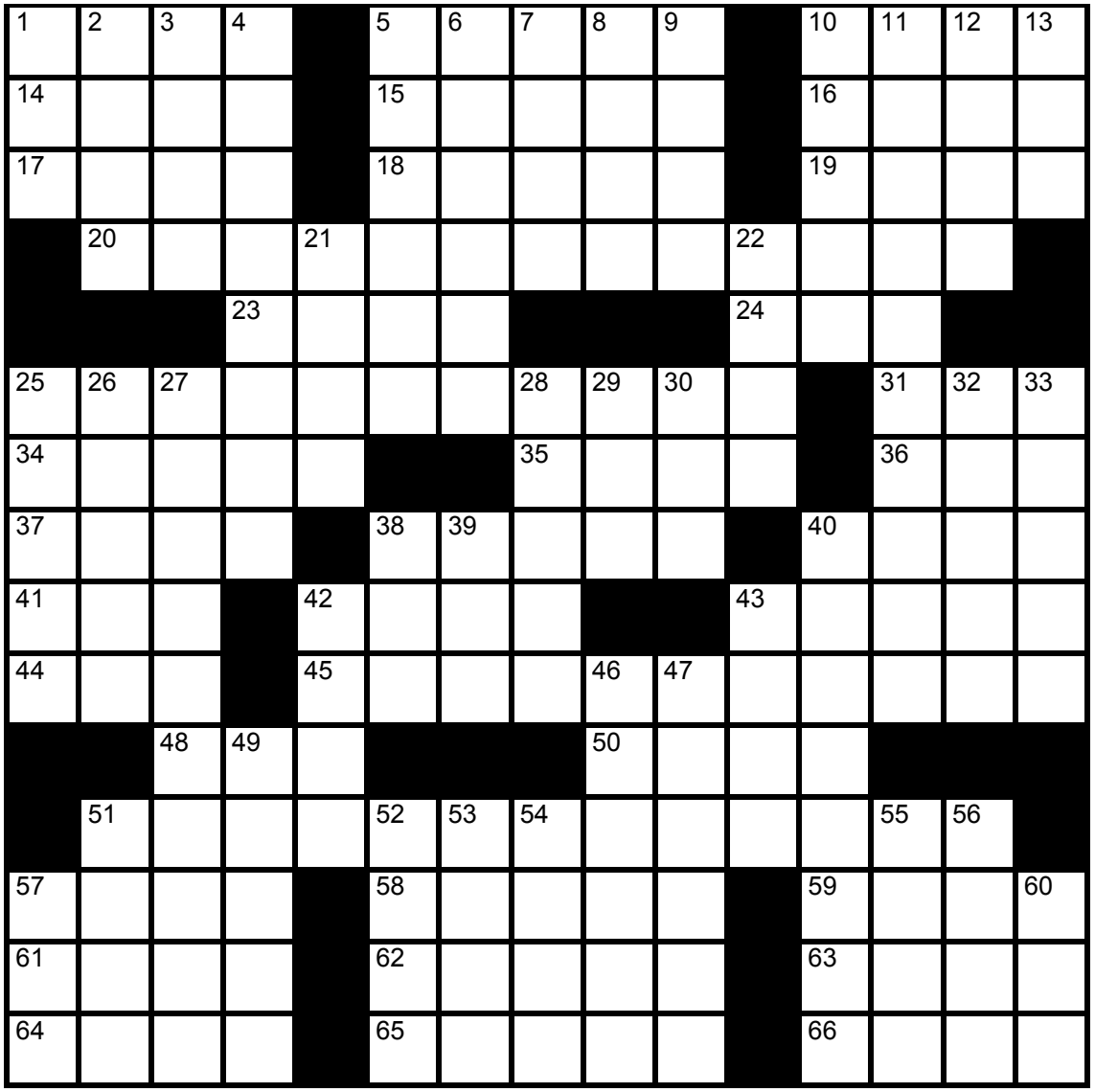
As an example (and also because it's the easiest), 6 has been completed in the next column.

$0\ 0\ 0 = 6$
$1\ 1\ 1 = 6$
$2\ 2\ 2 = 6$
$3\ 3\ 3 = 6$
$4\ 4\ 4 = 6$
$5\ 5\ 5 = 6|$
$6 + 6 - 6 = 6$
$7\ 7\ 7 = 6$
$8\ 8\ 8 = 6$
$9\ 9\ 9 = 6$

This puzzle is brought to you by the UW Puzzles & Brainteasers club, who meet every Friday at 6 pm in QNC 1507.

UW Puzzle Club

GRIDXGRID GRIDXGRID



GRIDXGRID GRIDXGRID

lookAHEAD

SUN JUNE 16	MON JUNE 17	TUE JUNE 18	WED JUNE 19	THU JUNE 20	FRI JUNE 21	SAT JUNE 22
				Last day of first round co-op interviews MathSoc games night	1st DAY OF SUMMER Employer rankings released in WaterlooWorks at 12 PM Deadline for 50% tuition refund	

SUN JUNE 23	MON JUNE 24	TUE JUNE 25	WED JUNE 26	THU JUNE 27	FRI JUNE 28	SAT JUNE 29
	Student rankings close 2 PM Job match results available in the evening **mathNEWS** 140.4 production night	**mathNEWS** editor appreciation day		MathSoc games night	**mathNEWS** 140.4 published	

N GREAT THINGS ABOUT WORKING AT A TECH STARTUP

- Company barbecues with free food
- Company barbecues with free beer
- Free beer on tap in the office
- Getting to brag about having free beer on tap in your office

Sandwich Expert

"THE MIDTERM'S GOING TO BE QUITE HARD, ACTUALLY."

Fuck.

Every UW student

IMPORTANT UPDATE ON SLC CONSTRUCTION

Shit's ***still*** broken.

Fruitboy

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UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

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