

## "WHAT ISSUES MATTER TO YOU MOST THIS ELECTION?"

Of one thing, we can be sure: Racket giveth and Racket taketh away. Dearest readers, this past production night happens to be one of those times where Racket taketh away. While this beautiful programming language is extremely useful and is a boon to anyone's resume, it can be frustrating when it takes the form of a CS 135 midterm and steals away many bright young minds who would otherwise be writing for **mathNEWS**.

Despite the CS 135 midterm interrupting production night for the third year in a row, we have still managed to put together a solid issue of **mathNEWS** for your mind to feast on. In particular, given that this will be the last issue to be released before Canada's 2019 Federal Election, many of our diligent writers have taken it upon themselves to share information and thoughts on democracy and the election.

There is a lot going on with this Federal election. With a number of issues on the table, it can be difficult to find a party with whom you can truly identify. For many, this election is about a small handful of core issues which matter deeply to them. For myself, electoral reform and environmental policy are of key importance. First-past-the-post is a fucked up system and gets in the way of a fair and truly representative democracy. I welcome any attempts to change my mind. Feel free to send them to [mathnews@gmail.com](mailto:mathnews@gmail.com).

Regardless of where you stand on the issues, one thing cannot be stressed enough: Go vote! Even if you choose to reject your ballot by marking more than one candidate, go vote! Your right to vote is important and sends a message to those in charge that your voice matters. You will find various cases made throughout this issue for voting. If you are able to vote, do so.

Even if you are not from the KW area, you can vote right here on campus for your riding. I learned during production night that all you need to do is write the name of the candidate you are voting for on a ballot and your vote will be mailed in an envelope inside another envelope to your electoral riding. Speak to one of the people working at the polling stations for more information about this. You can also mail in your vote or go home during reading week to vote early.

Have fun going to vote and exercising your right to be part of our democratic system! Until we meet again in ~336 hours!

unsophisticatED  
Editor, **mathNEWS**

terrified  
Editor, **mathNEWS**

NARF DERT	I like issue number 1.
X_420SONICFAN69_XX	Global warming. I don't want to be dead by 2030.
UW UNPRINT	The current issue of <b>mathNEWS</b> , of course.
DERIVING FOR DICK	Every candidate's mental health issues.
AUTOWIRED	The result indeed. :)
WATER	The >\$760 billion national debt.
FINCHEY	The candidate who's runnin' on the legalization of tax evasion's got my vote.
BIG DATA	When are we getting M5?
PIKACHU.EXE	The candidate that converts all seven engineering buildings into math buildings (seriously, why does engineering have seven buildings?!) has at least two votes.
BOLDBLAZER	Whether Elizabeth May's accidental racism will outdo Justin Trudeau's legit racism will outdo Maxime Bernier's extreme racism.
SANDWICH EXPERT	Proportional representation and the climate crisis.
HONK	The admission average of CS.
XAVIENTOIS	Quebec separatism. (Vive le Québec Libre!)
BEYOND META	Making Chiac la langue officiel of Canada.
UNSOPHISTICATED	Environmental policy (Don't be a fossil fool).
TERRIFIED	Where's my voter information card?

## ARTICLE OF THE ISSUE

... goes to me, terrified, for writing *Article of the Issue*. Mwahahahaha, you'll *never* beat me!

Dreams of ~~world~~ **mathNEWS** domination aside, this award was an extremely close three-way tie between *Chaotic Recursion* by Pikachu.exe, *MATH 135 A02 Q4* by lafayeet, and *How Many FRSH Salad Bowls Are There?* by water. And when I say close, I *mean* close. I almost had to take out my three-sided coin to decide, until I remembered I don't have one.

Five hundred consecutive hypercube-shaped die rolls later ultimately convinced me to choose the middle child. Reading through it flooded my vision with memories of struggling through assignments in first year, bringing me to my knees in pain. lafayeet, your reward for defeating me awaits in MC 3030.

# Give me good government, or give me death!

TERRY CHEN, **mathNEWS** EDITOR FOR FALL 2019  
ALONG WITH JAMIE ANDERSON, JOSH RAMPERSAD, AND CLARA XI

# mathASKS 141.2

## FEATURING LECTURER CARMEN BRUNI

### CIX: HOW WOULD YOU FEEL ABOUT A PINEAPPLE-ANCHOVY PIZZA?

My grandfather was an Italian immigrant to this great country and founded a pizza business with his brother in Hamilton. After a few years, he started receiving pizza orders over the phone for pineapple on pizza. Having never heard of this before, he would often tell customers that pizzerias do not have pineapples. After numerous customer requests for pineapples, he broke down and started buying them. To this day, he does not understand why. Neither do I.

Anchovies though, my grandfather is a huge fan. My take: Too salty.

### WALDO@<3.LE-GASP.CA: NOW THAT YOU'RE RISING UP THE RANKS OF ACADEMIA, WHAT ADVICE WOULD YOU GIVE TO THOSE WHO ARE JUST STARTING OUT?

A questionable statement, but I will answer the question anyway! To those just starting out, the best piece of advice I can give to this is to find a good mentor. Possibly even more than one. It helps to know how to actually get things done at a university so that you can start making positive changes. Without someone to listen to your ideas, it is incredibly difficult to get initiatives started.

### EPSILON SCREWN: IF YOU COULD MORPH INTO ANY TYPE OF ALGEBRAIC STRUCTURE, WHICH WOULD YOU CHOOSE?

How anyone could pick something other than an irreducible odd representation of the Galois group of a CM Galois extension of a totally real number field into the general linear group of the maximum unramified extension of a  $p$ -adic field would be a mystery to me.

### UW UNPRINT: HAVE YOU CONSIDERED CHANGING YOUR NAME TO CARMEN SBRUNI SO YOUR INITIALS WOULD BE CS?

I sort of like my initials as they are — CAB. Always felt like I was going somewhere.

### THE42NDDODECAHEDRON: WHAT WOULD YOU SAY IS THE COOLEST USE OF MATH IN CS?

The other day I was writing an assignment question with uncompressed image files. File sizes were in the 5MB range which were pretty large given that the images were fairly small. When I saved the files as jpegs, the size drastically reduced to about a few hundred KB each. It made me take a step back and reminded me that Fourier Analysis really is incredible.

Another one that always dumbfounds me is Cheeger's Inequality. It always amazes me when citations on papers on applications of an inequality vastly outnumber citations of the original idea.

### PIKACHU LAUNCHER: WHAT IS YOUR OPINION ON THE STATEMENT THAT "MATH AND CS ARE THE SAME THING"? HOW MUCH DO THEY OVERLAP, IN YOUR OPINION?

When I was interviewing for my job for the second time, I had a shocking revelation. I have always felt that Math and CS were the same thing and I have always loved how here at Waterloo we have a Faculty of Mathematics where we house all things mathematics from Computer Science to Statistics to Math Business to Pure Mathematics and everything in between. I realized though that teaching computer science or mathematics and teaching someone a programming language are actually very different. A lot of teaching techniques that are very effective in many other disciplines like the sciences and arts work very well when teaching someone how to program. When teaching someone about a more theoretical heavy mathematical concept however — they fall flat and more research needs to be done on how we learn these more abstract disciplines.

To me, computer science is just one of the many flavours of mathematics we should all enjoy — even if it is not your favourite.

### HONK: DO YOU MISS TEACHING MATH 135?

In some ways definitely. In other ways I remind myself that teaching two days a week is much easier than teaching four days a week. However that course will always have a place in my heart and someday I will try to teach it again.

### UNSOPHISTICATED: IF YOU COULD CHANGE THE HIGH-SCHOOL MATH CURRICULUM, HOW WOULD YOU CHANGE IT? MORE PROOFS?

Tough question. Two things immediately come to mind:

1. It has always felt to me that high school mathematics was training me to be an engineer. It felt like calculus was on this pedestal at the end of the high school mathematical journey. Calculus should only be the beginning! In fact, I wish there was more diversity in our high school curriculum. Number theory hasn't been a prominent role in the curriculum in a while and now more than ever we need more people thinking about number theoretic problems. Geometry is all but gone. I would like to see an end goal of teaching mathematics for the sake of teaching mathematics because it in its own right is beautiful.
2. Freedom. Sometimes I empathize with teachers and their rigid curriculums. Once in a while, you need to just be able to teach something for the sheer love and beauty of it and not because it checks off some learning objective. The curriculum needs more flexibility.

### TOLLOW PRINCESS: WHAT IS YOUR FAVOURITE BATHROOM ON CAMPUS?

Not DC's for sure. If you're never been to the third floor DC men's washroom, just read the sign posted outside. I'll keep my other washroom a secret however.

### SANDWICH EXPERT: WHAT ARE YOUR FAVOURITE ELLIPTIC CURVES, MODULAR FORMS, AND DIOPHANTINE EQUATIONS?

The answer to all three is  $y^2 = x^3 + 17$ . For a good time, find all the integer solutions to this equation — you won't regret it!

### AUTOWIRED: WHAT WILL HAPPEN IF I HACK INTO A SCHOOL WEBSITE?

You will be heralded as a hero on Reddit. Likely, you will be branded a miscreant by administrators. Tough call to decide on who to make happy...

## CONGRATULATIONS! IF YOU DON'T COUNT THE QUESTIONS YOU SKIPPED BECAUSE YOU DIDN'T KNOW HOW TO SOLVE THEM, YOU'VE FINISHED YOUR ASSIGNMENT!

**WATERLOO** — Looks like some congratulations are in order, because you have finished your assignment!

Ok, yes, there are some minor issues with those questions you didn't solve, but who needs those? They only account to, like, 52% of the assignment marks! Will they even be on the exam? I'm sure you can figure that out when finals come. Don't let the future detract from your enjoyment of the present!

Besides, you nearly had them. You were just missing a few fundamental concepts and important insights. Maybe if you had gone to class a few times, you would have those, but why let that distract from your success here?

Yes, this moment is for you. You did this. Only you could have solved about half of your assigned questions.

Besides, if you don't count the assignments you didn't do, you're done for the week! Enjoy yourself, you deserve it!

UW Unprint

## TEACHING PHILOSOPHY

### profTHOUGHTS 141.2

I thought I would take this opportunity to discuss a bit about my teaching philosophy with any of the loyal MathNEWS readers out there. For those of you who don't know me, I am a lecturer in the David R. Cheriton School of Computer Science (previously I worked in the Centre for Education in Mathematics and Computing) and I have been a lecturer here for 4 years. I think there are a lot of misconceptions about teaching — especially in mathematics — and I want to try to address a few here as well as explain many of the reasons for why I do things in a certain way.

Keep in mind that I will admit that the science of learning is just that — a science. However, an individualized opinion of science is not science unless backed in research. I am going to try to present my philosophy with evidence where I can provide it.

#### IN THE CLASSROOM:

We absolutely need more active learning in mathematics classrooms. I feel that of all disciplines, pedagogical changes in how we deliver mathematical content lag behind changes occurring in other areas of academia. Part of this is that techniques that work in many other fields do not work well in mathematics. In some sense this is plausible; working through a problem involves a lot of complicated thought processes and it might be reasonable to suspect that learning this should be more challenging than learning other ideas.

For example, using clickers in math classes might not make the most sense. Often times, the final answer is not what we are really interested in, rather the journey one took to make the conclusions they did is the true goal. Synthesizing this with a clicker question really devalues the journey when compared to the end goal. This does not mean that you cannot use clickers effectively in a mathematics class — in some classes this would be a welcome addition. However in many this doesn't quite accomplish what we want. Anecdotally, when I was the University of British Columbia when the Carl Wieman Science Education Initiative was in full force, many times studies would be shown showing gains in all disciplines from using clickers with one exception. That one exception as you have likely guessed was in mathematics.

The one exception to clicker use being ineffective in mathematics classes that I have found is specifically in introductory programming classes. When rote memorization of what certain lines of code do is one of the end goals, then having clickers questions testing knowledge of this is a really sensible use of clickers. In mathematics however, seldom does one really need to know the explicit definition of an object in order to use it correctly. That being said, definitions form foundational concepts that I encourage my students to learn. Talking about a multi-variate integral or about a Turing Machine without a formal definition can lead to extremely dubious mathematics. However, when needing to integrate a

function on a test, typically we use heavy powered machinery that is far removed from its original definition.

So with this discussion of clickers aside, how does one then promote active learning in the classroom? One way I try to accomplish this is to ask lots of questions when I can. I want students to be thinking in class whenever possible. I want students to try to type code to solve problems. I want students to work through proofs in class. I want students to think critically about the concepts being taught. I want students to ask questions that extend the topics currently being discussed. Perhaps most importantly, I want to encourage students that it's okay to be wrong — learning only happens when you are wrong! Rectifying a misunderstanding and seeking to make sense of something new is one of the most difficult things we do as human beings. When I ask questions in class, it is almost always to encourage thinking — not to necessarily get the right answer. Sometimes I'm even looking for the wrong answer so that we can discuss it. I think making these inquiries in class can truly have a positive effect not only on the classroom atmosphere but on one's psyche when solving problems on their own.

As for other aspects of class, starting with a good morning gets the class off to a good start. Warmup problems before class help students to remind themselves what content we have covered recently and start to get the mind prepared for the current lecture. Finishing classes with a review of what we have covered serves to enforce the Testing Effect — namely that human beings learn better when they undergo active recall. Take time after classes and think about what you learned in your classes. The more you do this self reflection, the more you will remember when the time comes to demonstrate your mastery. I cannot stress enough how important it is to force yourself to actively think about what you are learning about in your classes. It will go a long way towards your long term retention of material. Analogies are another tool I try to use in class. From the Learning How To Learn Coursera course, I have realized that analogies are extremely powerful in helping to understand difficult concepts. I recommend this course for anyone who wants to hear some amazing insight as to how our brains work and to learn strategies for deeper lifelong learning.

#### ON ASSIGNMENTS:

Assignments are not for grades.

Now that I have your attention, what do I mean by the above? In any class I have ever taught, assignments have been worth something towards a 'final grade' and so I need to explain what I really mean. The grade you get on assignments do not really matter. It is not even solving the questions that matters. What really matters is the thought process and the time and effort you spend on the assignment trying to figure out what's going on. It is about the questions you asked in trying to resolve misunderstandings. It is about resolve and what you do when you encounter a hard problem that you cannot solve. These are the things I want students to accomplish in an assignment — not necessarily providing a full solution to every problem.

In fact, sometimes I have asked problems that I felt were too hard (though I have always after the fact made these bonus). Part of my goal as a university educator is to push you to the next level. One can only do this by asking these hard questions and really seeing how far you can go. The questions that are hard don't have to be open problems but might just be something that requires a bit more depth than what might have expected in the course.

With the above in mind, sometimes this means I err on the side of too hard. I can live with this once in a while so long as there is ample opportunity to ask for help and that appropriate prompting is given. I am happy to nudge someone in the correct direction if they do not have an idea — the key though is that you have to ask and you have to start early! I cannot stress enough how starting early on assigned work is by far one of the most important skills I can encourage students to develop.

Assignments are not for grades. Assignments are for learning. Assignments are for addressing misconceptions. Assignments are for encouraging discussion with your peers and professors. As long as final write ups are done completely on your own with no additional notes or aides, to me this is well within acceptable collaboration limits (though note that this does depend on your professor so check with them, however I venture a guess that most agree in spirit with this collaboration policy).

#### ON SOLUTIONS TO POSTED QUESTIONS:

There was a lot of resistance to the idea that a professor should post solutions to every single problem they ever provide. Aside from the sheer time commitment that would be required to do this (note that writing questions is often easier and faster than writing solutions), making the task largely infeasible, I do not believe that posting solutions to all problems is necessarily a good idea.

Do not get me wrong — seeing solutions to *some* problems is important and I do try my best to do give some solutions. There is a lot of research going back to some seminal work by Cooper and Sweller in the 1980s that shows that students often perform better on similar problems if given enough samples to work from. Students will formulate schema and exposure to more problems and solutions helps to broaden and clarify what elements of a problem were relevant towards solving the question at hand. Not to mention that in order to write like a mathematician, it helps to know how mathematicians write mathematics. Do I believe in some worked examples? Absolutely. No question. However this should be a declining function in terms of years in school — as you get higher up you should be seeing less and less solutions. In fact, the number of questions you should be asking should also increase as you progress through university.

Seeing university as a place where you solve solved problems is a really shallow understanding of what universities need to be accomplishing. We, as in humanity, need you, as in students, to solve *unsolved* problems. Even stronger, humanity

needs you to solve *unsolvable* problems! Not only this, we need to develop ways to check your answers, to prove that your work is correct and to justify why your suggested course of actions will lead to positive outcomes. Humanity needs you to make sure that massive economic collapses don't happen again. Humanity needs you to solve some tough climate issues. Humanity needs you to solve sustainable food and housing shortage issues. Humanity needs you to use the skills to solve some incredibly daunting problems. It is not easy.

And no, sadly you cannot flip to the back of the book for a solution.

You need to develop verification skills. If we give you answers to everything, what opportunity do you have to hone these skills? If you don't develop these skills in university, when and where do you harness them? You need to be pushed to learn these skills and by giving you solutions to every problem I can ever ask you, I am robbing you of the experience to harness these vital skills. Yes, it is time consuming. Yes, it is difficult, and yes, you probably do not want to do it. It is my job to try to push you to do difficult tasks that you might not want to do.

To date, I have found no evidence either for or against as to how not posting solutions helps a student develop these skills — you can imagine that such critiquing skills are difficult to assess in scientific studies. However I cannot imagine how putting students into such positions would hurt them later when they come across such scenarios later in life and need to make sure what they are doing is rooted in sound reasoning.

As always I'm more than happy to help anyone struggling with a problem that I have posted and that they have given a good attempt in trying to solve. Either in office hours (which can be made by appointment in addition to posted ones), over email or on Piazza.

#### ON OFFICE HOURS:

If I am in my office, my door is open (two exceptions: one is lunch and the other are the rare times when I have an imminent deadline I have to meet).

I remember when I was a graduate student that having professors (with special thanks to Dr. Greg Martin, who might have single-handedly helped keep me in graduate school) with their doors open were incredibly important. Just having someone to talk to for a few minutes about the struggles of being a grad student or about a cool math problem — these moments were and are absolutely invaluable. I always encourage students to drop by and share what their last co-op experience was or anything interesting that they have been thinking about. Sometimes it just helps to have someone listen.

I'm happy to listen. I'm happy to discuss life or school or teaching or anything really. Sometimes it just helps to know that someone is here to listen and as I've said my door is always open if I'm here and I'm happy to talk things out with you.

If you ever can't make an office hour, please email me and we'll find a time. We can make something work — even if it means to do so digitally<sup>†</sup>.

#### ON OPEN EDUCATION:

I do believe in education being as open as possible. There are some limits that I can understand but I try to make everything I do as openly available as possible. Since inception, my Math 135 Resources Page (use a search engine to find the site) has amassed 150,000 page views despite not having taught the course in years. On all of my pages combined I have about a quarter of a million visits (my apologies to those in CS 245 currently as the notes need to be updated to reflect many positive changes currently in the course). If numbers are a sign of anything it is that this website has been widely used and I would like to believe it has helped many students. I have received numerous emails from students thanking me for the sites and how they have used the resources to catch up on a missed class and read ahead and try to learn a bit more.

#### FINAL NOTE:

A lot of what I've written here is more to explain my thought process when I conduct a class. Since learning is more of a science than an absolute, nothing I have said is ironclad. However, everything I have said has been thought through and I have tried to express how I view the university classroom. As mentioned above, I am always happy to have students come in and chat about anything teaching or math related. My office door is always open when I am around.

Best of luck in your future studies. The journey is not easy but I hope that I have provided you with some unique insight into what I believe we need the next generation of thinkers to become. I hope that you all become these thinkers and help humanity to solve some of the hardest problems it has ever faced in its existence.

Prof. Carmen Bruni

<sup>†</sup> Exception: If I have to pull up your academic record to answer your question, I consider this advising and you should use the CS advising office hours (otherwise you are cutting the line which is not fair to your peers!)

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## FERIDUN WILL ADD YOU BACK ON LINKEDIN

If you add Feridun on LinkedIn he'll add you back.

Networking Expert

# CHAOTIC RECURSION

It was a scenic night, filled with people packing more energy than a box of Red Bull. It was a very heavy night, with mocktails and intense audio waves pummeling through the air. It was a time when I found myself asking for the first time, "Why exactly am I here, again?"

Being somewhat antisocial and harbouring a dislike for partying, I ended up finding myself engrossed in a topic whose intensity parallels that of a party, yet whose concept diverges from that of one. Watching random people chaotically assemble and disassemble groups — without purpose, mathematical order, or perhaps even necessity — led me to several curiosities. Why are these groups formed? How many people in each group know each other? Is anyone even aware of what's going on? (The answer to the last question is a resounding "no", since you're meant to lose yourself in enjoyment at a party.)

Previously, in the very first lecture of MATH 135, we were taught that the course would be about proofs, and the homework assignment involved attempting to prove the 'party friendship' puzzle. A somewhat iconic question, it involves six people and proving that there must be a group of three within the six that either all know each other or don't know each other. (The proof is omitted in consideration of most people already knowing the proof; if you don't know it, just Google it) The party I was observing had way more than six people, however; surely that means there's a lot of people that know each other and also the opposite, right? But what's the minimum number of the people within the group that all know or don't know each other, given a group of size  $n$ ?

I took out my notebook and a pencil, and decided to start with the simple case of finding the minimum value for  $n$  that results in four people that all know each other, or four people that all don't know each other (this case is denoted as  $(4,4)$  from now on, with other similar terms following suit). It is quickly revealed that the same strategy utilized to prove the party friendship problem for  $(3,3)$  can only be used to find an upper bound for  $(4,4)$ , not to prove it. And solving  $(4,4)$  inherently requires  $(4,3)$  to be known.

Later on having researched online it turns out proving  $n = 18$  for  $(4,4)$  requires a long-winded solution, requiring you to first prove that  $n = 9$  for  $(4,3)$ , then use that with the method showing  $n = 6$  for  $(3,3)$  to find an upper bound for  $(4,4)$  which is 18, then give a counterexample that shows 17 does not solve  $(4,4)$ .

As the solution shows, there is a flavor of recursion going on. (At that time I would have thought the flavor is fruit punch) Much like the Fibonacci sequence ( $F_n = F_{n-1} + F_{n-2}$ ), proving  $(4,4)$  requires an understanding of  $(4,3)$  which requires  $(3,3)$  and so on, which theoretically allows for computation to find future values. But, unlike the Fibonacci sequence, knowing the initial values of the sequence does not make finding subsequent values trivial. Just because we know  $(3,3)$  and  $(4,3)$  doesn't mean we know  $(4,4)$  right away; we get some idea of

what  $(4,4)$  is, but we need to exhaustively compute for  $(4,4)$  given  $(4,3)$  and  $(3,3)$ . The chaotic behavior of the series coupled with the combination of an algorithmic approach and an exhaustive graph theory search makes for a ridiculous series that few values have been computed out of.

To this day, no one has managed to prove the value of  $(5,5)$ , even though we know for  $(5,4)$  that  $n = 25$ ; just a mere range is known  $(43$  to  $48)$ . Looking back, even showing  $n = 18$  for  $(4,4)$  was an amazing yet difficult proof. This is perhaps another indicator of the unending mysteries of the mathematics world. What other problems aren't algorithmically straightforward? Why do problems like this not possess a trivial solution? And why am I always saying things in triplets?

I think the intricacies of mathematics are pretty well represented in this problem of observing human group sizes, since emotions are very complicated as we may know. But, at the same time, emotions also allow us to experience events at a heightened level, or allow events to have a greater impact, than if we were purely logical human beings. After all, who would like a subject that is only straight-forward? In a sense, beauty can be found in discord; inherent unpredictability allows us to not just appreciate the subject better, but also give us a reason to pursue it in the first place. It's kind of like why weather researchers research weather — weather is inherently unpredictable with so many factors, but that's the reason they enjoy the subject.

Anyways, where was I? Oh, right. Allow me to finish the party story. Of course, solution-unaware me ended up filling two notebook pages and never found the solution to  $(4,4)$ . At this point, I gave up on scribbling and decided to chaotically drink.

Pikachu.exe

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## DAVIDSON'S OFFICE HOURS: A NARRATIVE

It's the end of class of MATH 147 with Ken Davidson, and you've been having trouble absorbing the information in class. You've been to the office hours of the other TA's, but you have a certain interest in attending Davidson's office hours on Monday. However, just as you're making a mental note of his office hours, you realize they conflict with a class you have later.

As you make your way out of the classroom in defeat, Davidson silently acknowledges your struggles from the front of the room as he gives his standard-issue apathetic smile™. He Fields Institutes his way out of the room.

You unfortunately don't end up going to Davidson's office hours. You feel a little sad, but it's ok. Everybody knows David Jao's office hours are better anyway.

## 👏👏 FLAG REVIEW 👏👏

There are many badly designed flags all over the place. Most of the time, people won't notice them or ever really see them because the bad flags tend to be lesser known or lesser used. But, how does one differentiate the well-designed flags from the bad ones? Do not fear, as I will be here to help.

The flags will be scored out of 10, with 5 of those being my subjective score and the other 5 being based on each of the five basic principles of flag design as defined by the North American Vexillological Association (NAVA). They are:

- Keep it simple
- Use meaningful symbolism
- Use two or three basic colours
- No lettering or seals
- Be distinctive or be related

### UNIVERSITY OF WATERLOO



*The flag of the University of Waterloo*

The UW flag is based on the shield of the university, which you have definitely already encountered. The elements of the shield have basically become stretched to match the rectangular flag shape. Thankfully, in doing so, they have avoided one of the worst sins possible in flag design: a solid background with a shield in the middle. The three lions stand boldly in each of the sections divided by the triangular peak, so that although the detail will be lost from a distance, the general shape remains. Kudos to the university; it receives a full score for design. However, though it may not be badly designed, it follows the usual template of turning a shield into a flag. There is no unique flair or individuality to it. Thus, I will give it a three. You can see this being flown south of SCH.

Design Score: ★★★★★

Subjective Score: ★★★★★

**Ceci n'est pas filler.**

A SURREALIST blackBOX

### RENISON

*The flag of Renison Univeristy College*



The Renison flag does a similar thing to the UW flag, i.e. it takes the elements of their shield and makes them stretched and rectangular to fit the shape of a flag. I understand that they kept the number of symbols of their shield the same as on their flag. However, in terms of those symbols in a rectangle, the lack of symmetry disappoints me. I also understand that these symbols add to the meaning of the Renison Shield, but when flown as a flag, most will miss the differences as the details are lost. It was so close to perfection, but at least they did not fall victim to bad design.

Design Score: ★★★★★

Subjective Score: ★★★★★

### ST. JEROME'S



*The "flag" of St. Jerome's University*

What is this. What even is this. The flag seen outside of St. Jerome's should not have ever been flown. On a white background, they have put on their shield and the words "St. Jerome's University." Not only does this violate three of the basic principles, but they could have avoided this by doing what the previous two flags have done, and used the elements of the shield to make a proper flag. If you need to write what the flag represents on the flag itself, the flag has failed.

Design Score: ★★★★★

Subjective Score: ★★★★★



## CONRAD GREBEL, AND ST. PAUL'S

As far as I know, these two do not have flags of their own. If it turns out that they do have their own flags, do notify me of it and I'll review it next time.

## WILFRID LAURIER UNIVERSITY



## The "flag" of Wilfrid Laurier University

We all know that UW > WLU, so will the flags also be as such? If you have ever walked along University Ave., you may have noticed their flag: The WLU seal on a white background. Seals are meant to be on paper. That is why it tends to have more intricate designs and a heavier level of detail. To place one on a flag as the main focal point of a flag which is meant to be flown on a flagpole, flapping in the wind, meters in the air, all the detail of a seal will be lost. The seal has a motto on it which will not be readable when on a flag flown in a distance. What makes it even worse is that the WLU seal contains a shield in it. They could have taken the elements of the shield and incorporated them into a flag like what UW and Renison did. This is basically the university version of the bad US state flags. At least it wasn't on a blue background.

Design Score: ★☆☆☆☆

Subjective Score: ★☆☆☆☆

If you have a flag you want me to review for next time, feel free to send it in via the **mathNEWS** email. I'm sure the editors will love trying to deal with all these emails and getting them forwarded to me.

boldblazer

## MEF PROPOSALS

MEF has opened proposals! Need money for mathie things, we got you! Proposals close October 23<sup>rd</sup> at midnight. You can find them on <https://uwaterloo.ca/math-endowment-fund/>

Math Endowment Fund

## THE IDEAL PROPERTY MANAGEMENT

"You get what you pay for."

You will never be satisfied about your property management, besides the fact that all of them suck.

You will also make biiiiigggg money if you have a bunch of staff who never procrastinate.

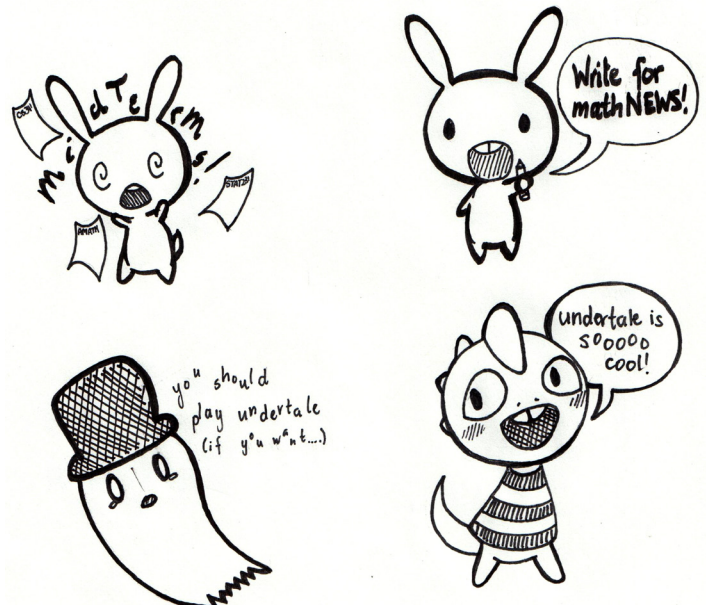
So get rich and hire your own stewards.

Autowired

## "MATH" LIBS

Is it me or does \_\_\_\_\_ (MATH PROF) look like \_\_\_\_\_ (B-LIST CELEBRITY)? Whenever I'm in their class I feel \_\_\_\_\_ (ADJ.) in a \_\_\_\_\_ (ADJ.) way. And I'm not saying that just because I \_\_\_\_\_ (VERB) them. Everytime I'm near them, I get \_\_\_\_\_ (CRIPPLING MEDICAL CONDITION). It's so serious I had to visit the hospital \_\_\_\_\_ (MATH CONSTANT) times. It's bad enough that I have to deal with my \_\_\_\_\_ (ADJ. USED ON 4CHAN) friends. Now, I need shots on my \_\_\_\_\_ (BODY PART) while I'm in \_\_\_\_\_ (SEX POSN.)? It's absolutely \_\_\_\_\_ (NEG. ADJ). What am I, \_\_\_\_\_ (ANIME CHAR.) in a \_\_\_\_\_ (OBSCURE NATIONALITY) guy's fanfic? But I refuse. I'd rather be \_\_\_\_\_ (SMASH CHAR.) on \_\_\_\_\_ (DRUG). Or even \_\_\_\_\_ (POLITICAL FIGURE) doing \_\_\_\_\_ (SCANDAL).

instantpoodles



## A DEFENCE AGAINST SELF-SPOILERS

I spoil shows for myself. You might consider me a heathen to the experience of falling in love with a new piece of media, from living the epic adventures vicariously through other characters, to getting immersed in the world. However, I am proud of spoiling media for myself, and I think that you too should give it a shot. Spoiling shows for yourself can help you avoid undue emotional distress, find out if a show is worth watching, and passively assimilate knowledge of pop culture in a fraction of the time.

Shows that you watch (and all media, for that matter) will reflect in your emotional state. For instance, when you start a show, you feel giddy and bubbly, always excited to watch more. When you finally catch up, you feel a desperate longing for more, and might find solace in fan content, waiting in anticipation, other media, or other pursuits in general! However, the highs are met with equally terrible lows. When a character dies or leaves, it feels like the show will never be the same, as an integral part of it has forever departed. A show can instill creeping terror, or instantaneous fear. I still want to associate with the characters, but feeling the intensity of these lows is often too much to bear for me. So I like to measure my responses in both directions, but primarily the ones with more negative affect. I still enjoy the highs and lows of the characters, but when something "unforeseen" happens in the show, I can keep watching rather than having to pause and feel upset at the show. In other words, I don't get so attached that it ruins the show.

When I spoil a show for myself, I don't just spoil it. I find out all the possible information about the show. This will allow me to accurately assess whether the show's worth watching to

me plot-wise. For instance, has there ever been a time when you're watching a movie in a theatre but realized that it really wasn't your cup of tea? But you paid for the experience in one way or another so you might as well finish it off? That's not an enjoyable viewing experience. By knowing the plot beforehand, I know whether the movie is something that's my style, and something worth watching. If not, then I only spent 10 minutes of my life reading Wikipedia, so it's no skin off my back. So in other words, not only do I measure my expectations of the characters, I measure my expectations of the plot.

Pop culture is, frankly, very difficult to keep up with. It seems like people are giving out show recommendations left and right, and there's a whole queue of shows that often gets built up. It would be nice to gain all the casual knowledge to talk about the show with an acquaintance, without having to invest time into the show. That's where self-spoilers come in. By finding out all the information on the show, I can become knowledgeable about it without investing the amount of time required to actually watch the show, especially if it's of no interest to me. In addition, if I like the show, I'll watch more and gain more knowledge, and thus have longer and deeper conversations with those who do watch it.

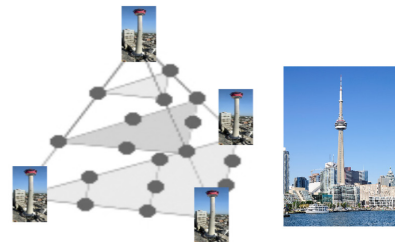
I implore you for reasons of plot, characters, and day-to-day life to watch shows. I recommend that you try self-spoiling as well; you might save some time, and some sunken cost into shows that you don't really want to watch! Until then, I hope that your midterms go well.

Xx\_420SonicFan69\_xX

## N THINGS TO DO IN CALGARY OVER CO-OP

- Eat at the restaurant where ginger beef was invented (Silver Inn Restaurant... the ginger beef there is really soft!)
- It's also kinda hole-in-the-wall, but it's still delicious.
- Take the Calgary co-op for the sole purpose of visiting Banff — but don't actually go until you're three months in.
- Buy a shit ton of things to take advantage of the 5% sales tax.
- Visit Calgary Tower!
- It's not even the tallest building in Calgary, but it's only like \$20 to go on.
- Notably, Calgary Tower is  $\frac{1}{3}$  the height of the CN Tower, but it only cost  $\frac{1}{20}$  the price to build (so instead of the CN Tower, we could have built 20 Calgary Towers and their collective height would be  $\frac{20}{3}$  times the height of the CN Tower).
- Okay, you might be thinking, "collective height doesn't count." Well, if we stacked twenty Calgary Towers on top of each other as a tetrahedral, which

are very stable (I think), that'd be  $\frac{4}{3}$  the height of the CN Tower.



- Visit the Hope Bridge and Calgary Downtown Library!
- When you do go to Banff, get a bunch of cool Instagram worthy photos taken and go canoeing.
- There's a sick combo deal online for a gondola ride and dinner up on Sulphur Mountain.

Gradient Descent

# MATH 135 A02 Q4

It's starting to get late. You've missed your CS 135 deadline because you thought it was due at 10pm instead of 9pm. Motivation is running low, and you've prepared yourself to abandon all hope of ever achieving a post-secondary degree.

"Submit early and frequently," they say. It has cost you two percent, but you will finally heed their advice.

And so, you begin to eat cereal. In these trying times, BuzzBee is your only support, him and the cereal of the box he adorns. He grins at you from your desk, reminding you that your MATH 135 assignment for the week is due in only seven short hours. The blank notebook page leers at you in the harsh lamplight, daring you to begin your next departure from reality.

You shovel those sweet, crunchy tori of heaven into your mouth with one hand, dying pen in the other as you attack the questions with the ferocity of a first-year slipping into caffeine dependency faster than the bus threatens to leave you stranded on the side of the road, ten metres from the stop.

You call upon prepositions. You prove implications. You manipulate statements and derive contrapositives. Slowly but surely, the Crowdmark image slots fill up with your crazed scribbles of the night.

Finally, there stands only one last statement between you and the sleep you so desperately need.

Question 4 taunts you from the screen:

*Let  $x \in \mathbb{Z}$  with  $a \geq 2$ .*

Something clatters to the ground outside your room.

*Prove that if  $a|(4b+5)$  and  $2a|(3b-2)$ ,*

Your lamp flickers.

*then  $a = 23$ .*

There's a knock on your door. Your chair creaks as you stand up to reach for the doorknob. Nobody but the darkness greets you at this time of night.

Too tired for apprehension, you begin to work in earnest, flipping through the looseleaf of your binder, hopelessly hunting for a solution in your examples, a flicker of hope amongst the pages of notes. The page starts to fill with your fervent attempts at the proof. DIC, TD, Prop 8: it all seems so useless in the face of A02Q4.

You stare into it until the numbers become pixelated snakes, until the Latin alphabet is naught but ramen and miso. Oh, the quantifiers! The operators! The 'and's, 'or's, and 'if-then's, how they tease and bait you from this cursed PDF!

Then, a buzz. From BuzzBee? No, from your phone. What ungodly email list is disturbing people at this hour?

## MATH 135 on Piazza: Activity Digest

God-fucking-dammit, you still haven't turned off that fucking setting? Nobody wants your fucking Activity Digest, Piazza. Fuck the fuck off.

But then, that flicker of hope you were looking for:

**Anonymous has posted: A2 Q4, I'm stuck, I dont know where to start.**

And below:

### followup discussions

A blessing of pity from the moon shining through the windows of scattered, despairing Math students across campus?

The drama begins to unfold. **Anonymous** has replied to **Anonymous**.

**Anonymous** has replied to **Anonymous**.

**Anonymous** has replied to **Anonymous**.

**Anonymous** has replied to **Anonymous**.

And so it continues, maintaining a deliberate air of confusion and vagueness. The professors are asleep in their beds, ignorant of the descent into madness unfolding in their very own Piazza. And yet, the students trudge on. Those last five marks, they must have them. What good is a Crowdmark submission with an empty question? What good have you done if you can't close that tab in peace, exhaling with the knowledge that you've exhausted all potential opportunities for part marks?

You follow closely, refreshing the page as the clock ticks forward, waiting for the message that will crack the case wide open. Yet still, it does not come.

Then finally, through an hour of threads and comments, the tale concludes. Anonymous has found the path back to sanity. Anonymous has earned their night's sleep. Anonymous has left the chat, triumphant.

And still, you sit, tortured and alone.

The night is not yet over; the clock has not struck the fateful 8:25am. There is still time. Time to push through the haze of the night, cereal by your side, onward and upward through the throes of Assignment 2, Question 4.

# MATH C&D TIPS AND SECRETS

Cashier here. If you enjoy going to the Math Coffee & Donut Shop on the third floor of MC, here's some helpful information that many people might not be aware of. This will hopefully optimize your visit for us staff as well!

## THE "SECRET" MENU AND SERVICES

- Salt and pepper are available right next to the cup lids on counter outside the store. Check the upper shelf.
- There's a toaster and a bagel slicer available, next to the teabags.
- You can have a toasted buttered bagel for only \$0.75. Take that Tim Hortons!
- The very long pastries and "fritters" qualify as donuts (\$0.85).
- We have a free hot water tap next to the tea bags. You'll only have to pay if you're using one of our cups (\$0.25).
- Don't double cup. Instead, use a Java Jacket to avoid paying the extra \$0.25.
- All tea sizes cost the same (\$0.75); upgrade that small to a medium and your medium to a large for no extra cost. Although, an extra tea-bag is \$0.25.
- There's 960mL cartons of Oasis juices that sell for \$2.25. These are cheaper than the \$2.50 bottles of 591mL Vitamin Water bottles.
- The 300mL Fairlee juice bottles are the same price as the 680mL cans of Arizona (\$1.25).
- Condiments, butter, and soy sauce packets can be bought alone for \$0.05. If you're buying them with food, they're free.
- Soup comes with free crackers (1 packet for small, and 2 packets for large).
- If you want an itemized or debit receipt, let us know ASAP.
- We have paper bags if you're having trouble carrying everything.
- We may or may not have coffee cup trays under the register.

## HOW TO MAKE YOUR VISIT ~0.5 SECONDS FASTER

- We scan pretty much everything with a bar-code. If there's a sticker with a 4 digit number instead, make sure it's visible to the cashier so we can put it in the system.
- Fill your Ramen Bowls with hot water after purchasing them. The bar-code is at the bottom and the bar-code scanner is pretty much fixed, so weird maneuvers are gonna be required.
- We also have to scan Slushie cups.
- Scanning your own product can be awkward unless you get it at the right time and quickly.
- All soups cost the same on Tuesdays and Thursdays; saying the size is sufficient for these days (Sm: \$2.60, La: \$3.45).

- All of our samosa's (\$1.60) are large and vegetarian, so you can drop the adjectives from the name.
- Similarly, our Beef Jamaican Patties (\$1.45) are all beef and Jamaican. Shorten it to "patty/patties".
- Call them "Jamaican Patricias" if you wanna confuse the other cashiers that are too cool to read **mathNEWS**.
- Sushi and sushi-esque products come with optional chopsticks and soy sauce packets at the register. Be prepared to be asked. If you do want to get soy sauce, say how many packets!
- Have your payment ready to go by the time you get to the counter so that anyone behind you won't have to wait.
- But also, don't feel stressed about it. It also gives those behind the counter time to breathe for a moment.
- We do not accept WatCard. In fact, we have two signs that specifically say "**No WatCard**", so don't try it!
- We accept payment by cash, Debit, Visa, Mastercard, and even American Express! Additionally, you can pay with your phone or smartwatch. Our machine does have tap!
- We manually input the type of payment into our POS since our machine isn't directly connected to the computer. Let us know how you're paying.
- Telling us that you're paying with "credit" is as useful as saying "not cash". Saying "Visa", "MasterCard", or "American Express" is a lot better.
- We manually enter your total into the debit machine, so tapping, swiping, or inserting your card before we enter the monetary value won't do you any good.
- If paying with change, sort your coins by size.
- Breaking a bill only becomes difficult if its \$100 or extremely crumpled, so don't feel bad about it.
- If you're paying with cash and purchasing a single coffee for your own mug (\$0.85) or in a large (\$1.35) size, adding a dime to your loonie, toonie, or even a \$20 bill, guarantees that you get no dimes or nickels in change. Quarters only!
- We don't have cashback.
- We don't accept WatCard.

## HOW TO BECOME OUR FAVOURITE CUSTOMERS

- Tell us what's in your cup, whether it be coffee, tea, a cappuccino/hot chocolate/french vanilla, or a half-and-half.
- Show us what's in the bag, especially if there's more than one pastry/patty/samosa in there.
- Pour sugar into your cup instead of on the counter.
- If one of our milk or cream cartons is empty, don't throw it away! Empty cartons are supposed to go into the milk crate next to the closest door.
- Use exact change.

- Don't use exact change and throw it into the tip jars instead.
- Don't try to use Watcard!
- Leave the last chocolate covered croissant alone! That's mine!

*Have a Wonderful Day*

## IN MEMORANDUM: THE MATHSOC COUCH

20??–2019.

You will be sorely missed.

*the mathNEWS couch*

## GET MATHSOC A NEW COUCH!

A couch costs \$500 off of IKEA<sup>1</sup>, or as low as \$50 off of Kijiji<sup>2</sup>.

There are roughly 8000 students in the Math faculty. Assume 90% of them pay the Mathsoc fee. That's still about 7900 students.

If each fee-paying student paid 6.329 cents each, we could afford a new IKEA couch. That's less than  $\frac{1}{2}$  of a C&D coffee each day!

Alternatively, if each fee-paying student paid 0.6329 cents each, we could afford a used Kijiji couch. That's so little, we got rid of the only coin capable of paying anything close to that amount!

Math students might not even have to pay extra to fund a couch. Its mere presence draws humans to the Mathsoc office, enticing them to buy t-shirts and novelties and all sorts of things. The couch could pay for itself in less than a term!

Bring back the couch. It makes social sense. It makes financial sense. And it costs so little to fund that it might as well be free, assuming it needs the funding at all. This decision really is a no-brainer, and as mathies we definitely have brains<sup>3</sup>.

But seriously, please bring back the couch.

*the old Mathsoc couch*

1. <https://www.ikea.com/ca/en/p/knislunge-sofa-idhult-black-80278923/>
2. <https://www.kijiji.ca/v-couch-futon/kitchener-waterloo/leather-couch-forsale/1463152172>
3. The only way to explain HvZ's popularity within this faculty.

## ARCHIVAL ADVENTURES IN DP 7<sup>TH</sup> FLOOR DESK GRAFFITI, PART 1

Dearest reader: I am on a mission to document every single piece of noteworthy desk graffiti in the 7<sup>th</sup> floor of DP. A renovation is bound to happen in DP soon, and before we all know it, those old beige wooden desks will be gone, and with them the archeological annals of student wisdom engraved on their unfinished surfaces. The old DC library carrels that got replaced earlier in the winter term are our generation's equivalent of the Library of Alexandria; I'm determined to prevent such a grand loss to humanity from ever happening again, by archiving what's left in DP. I'm starting with the 7<sup>th</sup> floor and I plan on moving onto the 8<sup>th</sup> and 9<sup>th</sup> floors once my work here is complete.

Below, I list some of the finest tidbits of wisdom and history from our ancient predecessors. Behold them in awe and astonishment:

- I HORNY
- big tired
- I ♥ U
- 808's & Heartbreaks
- Give Up!
- I have a drinking problem
- Nobody likes me
- May 15 2019: Hope things will get better
- June 5 2019: They will
- fly me to the moon ☺
- FART



*Finchey*

**It's a side effect of the alien probes.**

**PROF. DAVID MCKINNON**

# profQUOTES 141.2

## MATH 247: ALEXANDRU NICA

- “ Mr. Opponent has become lazy.
- “ My cousin...
- “ The sup is  $-\infty$ , the inf is  $+\infty$ , it's completely wacko.
- “ Monday, surprise quiz.
- “ I'm too ugly to be in pictures.
- “ [Points at theorem] This one's a little more spicy.

## MATH 249: KEVIN PURBHOO

- “ [The TAs] have candy in their office. They are better people than I am.
- “ I never cared much about my marks when I was a student so I'm not sure why I should care about yours.
- “ Any other horrors I've inflicted on this board?
- “ We will come up with a better motivation later.
- “ Anything else I've screwed up horribly?
- “ The quadratic formula does not care what is known or not known.
- “ This is when we turn our analytical brain off...
- “ We plow forward and try not to get too upset about what's happening.
- “ The next step is a little suspicious.
- “ A nice thing happened because we used enough force.
- “ There is no thought involved. That is a virtue.
- “ If you did not submit your assignment by 10pm, you are making bad life choices.
- “ I'm going to give a tutorial-explanation of what's going on here.
- “ Is there anything intuitive about this? Uhh...that which seems intuitive changes with more examples.
- “ If I only showed you things that were obvious, you'd be bored.
- “ Uhh, I just left out the whole important part.
- “ It's not quite correct, but that's the idea.

- “ The point you're misunderstanding is that the goal of what I'm doing is not to be simple.
- “ I can give you a book that has a lot of exercises.
- “ We are creating a square hole and forcing every single shaped peg into it.
- “ I think what people struggle with is just accepting what I say.
- “ What is this set of objects? I don't know and I don't care.
- “ In this course, "almost" may be omitted.
- “ It's not that bad of a challenge, but it is a challenge to convince yourself to actually do this.
- “ The question is "what is the question?"
- “ There is some value in showing you how to write down a proof of something that is obvious.
- “ So that, in too many lines, is the proof.
- “ For those of you who don't like to take notes, get over it.
- “ There are two kinds of counting problems: the hard problem, which we can translate into generating function problems, and there are also easy problems, which we can also translate into generating function problems.
- “ I'm going to bed.
- “ Cartesian product is a very bad operation.
- “ I want you to always answer the question you're being asked. I know that sounds stupid...
- “ I'll probably be dead twenty years earlier than you guys.
- “ You might all want to go to the climate strike. [Student: can we get an extension on the assignment for the climate strike?] ...Okay, it's due Saturday.
- “ You could do that, but I suggest not.
- “ We're trying as hard as damn well possible to not be clever.
- “ Normally there is some number in the problem glaring at us. What we do is ignore it.
- “ Also, there's a variance formula which I don't remember.
- “ I don't know why people are confused with math.

**MATH 235: DAN WOLCZUK**

- “ I can add. Subtraction is where it gets complicated.
- “ This should be easy but my brain isn't working.
- “ Phones are bad. Phones are evil.
- “ 99 to the power of 4 is my favourite integer.
- “ Everyone, repeat after me: 'na na fish'.

**MATH 245: RAHIM MOOSA**

- “ I need to massage that.
- “ I'll call your name and you'll move towards me and I'll move towards you.
- “ Let me give one more example in the thirty seconds I don't have left.
- “ This is, like, half of 146 in one example.
- “ So I cheated a little bit with your homework assignment...

**CS 246: NOMAIR NAEEM**

- “ I'm excited you have questions about it, [but it's] not important.
- “ I guess hell is a word.
- “ I swear I will not mention Racket here.
- “ Four more minutes? I can cover another topic, easy.

**CS 246E: BRAD LUSHMAN**

- “ I'm going to talk about a lot of stuff, and eventually you'll see how it's related.
- “ The example I'm going to use now is the same one that 246 uses in about three weeks.
- “ I suffer from a severe lack of creativity.
- “ The second time you set it is not the first time you set it.
- “ If I'm going to be destroyed, then also destroy my successors.
- “ Yes, if the list is large, you will have stack problems. If the list is that long, you shouldn't be using linked lists.
- “ [Projector turns on without prompting] Apparently the projector wants attention.
- “ That issue will solve itself, but not today.

- “ I'm about to introduce you to the cold, cruel world of C++ programming.
- “ Why copy from something if you can steal from it?
- “ If we're going to be in this theft business, we need to know whether something's going to die or not.
- “ It's not enough. That's not stealing; it's sharing.
- “ You're about to be pushed off a cliff; why don't you take my data with you?
- “ The good thing is that all your constructors will run, but the problem is that all your constructors will run.
- “ I need to find something else to complain about.
- “ Too smart for their own good, but not enough for their own good.
- “ It makes your program easy to reason about because you know it's not going to work.
- “ "class" is the path of least resistance because it has one less letter than "struct".
- “ Prefix plus-plus is by far the superior plus-plus.
- “ There's a shortcut. Here's an even shorter cut.
- “ I've traded a small problem for a big problem.
- “ [writes on board, "Solution: friendship"] This is programming advice, not life advice.
- “ Here's some advice...have as few friends as possible.
- “ Only make friends when they can do something for you.
- “ I like it when things that are a bad idea take a long time to write. It gives you time to reconsider your choices.
- “ The Rule of 5 is also a Rule of 0.
- “ I admit, this makes C++ look like a real pain.

**You shouldn't  
anthropomorphize  
computers, they hate  
that.**

**PROF. IAN GOLDBERG**

**CS 246E: FRANK WANG (ISA)**

- “ The point of valgrind is that it makes your program run slower.
- “ This keyboard has no dash key...
- “ It's very useful. You just let it run until it crashes.
- “ It doesn't help your program work; it just helps your program crash in slow motion.
- “ All I did was make my life worse.

**CS 241E: ONDŘEJ LHOTÁK**

- “ You spent your entire weekend on Assignment 1, right?
- “ Binary is hard to read.
- “ This is a stupid procedure that doesn't do anything interesting.
- “ We used to have [an assignment] a few years back, but it was annoying.
- “ What's the politically correct way to refer to the parts of the cons cell?
- “ CS 251 switched to ARM this term without telling anyone?!
- “ Unfortunately, it's too late to redesign the entire course.
- “ Now you can't complain that I didn't tell you about it.
- “ But y'know, what are the sad faces?
- “ You want a more explicit algorithm than handwaving.

**CS 245E: JONATHAN BUSS**

- “ Formulas are happy when they are true.
- “ If there is a solution to the sudoku puzzle, then the first square is 3.
- “ One feature of mathematics is that we can make up symbols.
- “ We'll get exactly the same thing, but more carefully.
- “ Some people blame computer scientists, but it happened before we were born.
- “ "I can't" doesn't mean "I tried and failed."
- “ That is, if you can use "obvious" and "induction" in the same sentence...
- “ [adjusting a squeaky monitor] Shh!

- “ Propositional logic is trivial. Just do truth tables.
- “ Should I change the definition or change the example?
- “ So I want the or of nothing. Look! Here it is! Nothing!
- “ This an extremely rotten example.
- “ Postulate: Every hard proof should be done by induction.
- “ Ta-da! We got lucky!
- “ The way to ensure luck is to make sure it's the only thing to happen.
- “ In later proof systems, we won't have this kind of idiocy.
- “ Both of these have a dramatic effect on whether or not your program finishes before you bury your children for old age.
- “ My watch says that you have to sit down.
- “ I don't want to get too deep into this, so I'll state it as a conjecture...and as a corollary,  $P \neq NP$ .
- “ [almost falls off platform] I think I need an anti-gravity belt.
- “ I will very boldly define the symbol 0 to refer to the natural number zero.
- “ Tada. Or as they say in Latin, QED.
- “ Did you look at my notes? Don't trust me, I'm probably wrong.

**STAT 230: GREGORY RICE**

- “ Are the TA's just robot slaves?
- “ Whoever bought me coffee [after losing a bet in class], I promised him I'd teach him how to make that money back at the casino.
- “ I've learned that this university is a complaint-driven organization. If you want something, you've gotta complain.
- “ Being a teacher is nice, I don't have to take anymore tests in my life, and I can make fun of you guys for still having to do them.
- “ My graphing skills are real weak, I need an artisanal assistant.

**ENGL 306A: CLIVE FORRESTER**

- “ How much time do we have? Can I do this in two minutes? Yes, I'm that good.



**CS 245E: STEPH MCINTYRE (ISA)**

- “ Hopefully I can project my voice and not die. That would be kind of scary.
- “ This is very educational on what not to do.
- “ I'm not going to bet you anything, since I'm a poor grad student.
- “ Try. Emphasis on try.
- “ I'm a CS student. That's easy math.

**STAT 231: MICHAEL WALLACE**

- “ It's like murder, but more horsey.
- “ Come to my office hours. I'm very lonely.
- “ I can't stop thinking of strangling geese. I keep dreaming about it.
- “ I'm like Batman with probability tables.
- “ I'm amazed that, on a plane, I'm the only one with a pen. I feel like I'm the king of the skies.

**MATH 237: ROBERT GARBARY**

- “ [Talking about partial derivatives] This should feel like the biggest scam in the world.
- “ Oh, he made it piecewise. What a jerk.
- “ Let's go back to 137, where your greatest fear was epsilons and deltas.
- “ Now your greatest fear is being asked to draw a surface in 3D.
- “ Have a nice weekend, I hope today was thoroughly confusing for everyone.

**STAT 240: AUKOSH JAGANNATH**

- “ Statistics of beer.
- “ Hopefully I've struck the fear of god into you guys.

**CO 342: PETER NELSON**

- “ (After miscounting the number of vertices on a graph), Some areas of combinatorics require counting, and they're not the areas I am working on.

**CS 350: LESLEY ISTEAD**

- “ Threads don't have relationships... Maybe they're Waterloo students.

## "WHAT'S THE ADMISSION AVERAGE FOR COMPUTER SCIENCE AT THE UNIVERSITY OF WATERLOO?"

The following was said to prospective University of Waterloo students approximately 538 times during the Ontario Universities' Fair:

To get into Computer Science at Waterloo, you'll need Advanced Functions, Calculus and Vectors, a Grade 12 U level English course, another Grade 12 U level course and then 2 Grade 12 U/M courses. That comprises your top 6 Grade 12 marks in high school, the average of which should be on the low to mid 90s.

You'll also need to complete something called the admission information form, or AIF. That's our supplementary application, which is mandatory for all Waterloo Math programs. In here, talk all about what makes you stand out. Don't be afraid to brag about yourself. If you were involved in any extracurriculars, sports teams, clubs, volunteer work, you have a job, or you really like reading books! I mentioned in my AIF that I ran a video game tournament in high school because I thought that mentioning it might make me stand out. So whatever you think makes you stand out from the rest, put it all in your AIF.

We also highly recommend our math contests: we have the Euclid in April, the Canadian Senior Math Contest in November, and the Canadian Computing Competition in February. The reason why we say they're highly recommended is because if you really well in these math contests, it can help boost your application. But if you don't do well, don't worry. it won't drag you down.

Do you have any other questions?

*cue 3 million people asking for a CS viewbook*

CS 2020 viewbook

---

## MEF SEZ

MEF is looking for math students that want to decide the fate of 180k! Get some free food for only 2 hours of your term! Applications open until October 11<sup>th</sup>. You can find the forms on <https://uwaterloo.ca/math-endowment-fund/> or in the MathSoc Office(MC 3038).

Math Endowment Fund

## BACK IN THE mathNEWS LAB

*OR: WHY I SPENT THIS PRODUCTION NIGHT MESSING WITH THE MONITOR INSTEAD OF THE KEYBOARD.*

It was with a hint of hesitation, perhaps tinged with a little trepidation, with which I peered through the reinforced-glass window into the second-floor MC computer lab, which **mathNEWS** works its magic within. This was the first time I ventured out to a production night this side of the summer, and evidently, something had changed.

Something was off. The cozy, dim, greenish lighting had been replaced with stark new white LEDs. Was I in on the right floor? Was I in the venerable Math and Computing building at all? Had my campus-sense turned into mush over the co-op term? I was considering turning away—the room looked empty and cold, filled with unfamiliar faces typing on unfamiliar documents.

But ho! On the whiteboard at the back of the room, though faded, and half-wiped off, lay the illustrious word: **mathNEWS**. It had surely been on the board for a fortnight at least, and was surrounded by scrawled proofs and other detritus of math assignments, yet I was drawn to it; a holy symbol in the night.

I stepped in, and was struck by the new monitors first.

Gone were the classic Apple-branded silver stands, replaced with titanic Dell screens. I sat down, and as I typed in my credentials, the cavalry arrived.

**mathNEWS** writers and editors streamed in, taking their places. Faces familiar and new, all writing together. The air filled with chatter of math and memes, and I settled down, preparing to write.

The keyboard had been replaced, and no longer tried to electrocute me for daring to type on it. Desks formerly covered with already-been-chewed gum had been replaced with fine faux-wood interlocking units. Gigabit internet had been wired up to ethernet ports, and an entire five power connectors had been embedded into each desk.

Finest of all was the monitor. It swivelled and tilted, rotated and shifted. It had such a fine resolution I could see a hundred jobs on WaterlooWorks at once. It weighed about twice as much as any monitor had a right to weigh. And it had portrait mode. I could see it all laid out before me on the pane of light before me—words, pictures, all of it. After much time inspecting all the capabilities of the monitor, comfortable in the light of eight-point-three million pixels of **mathNEWS** writing tableau, I began to write.

It's good to be back.

CC

## WHY DOESN'T THE MATH CND ACCEPT WATCARD?

If you have ever traversed into the Math Coffee and Donut Shop (often abbreviated as "CnD"), especially if you have first-year meal plan money to spend, you have probably been frustrated or at least curious as to why the Math CnD does not accept WatCard. Believe it or not, Mathsoc actually looked into accepting WatCard sometime in 2011. Unfortunately, it was not adopted because of the following reasons:

### 1. IF THE MATH CND ACCEPTED WATCARD, THE PRICES WOULD RISE TO BE THE SAME AS WHAT UW FOOD SERVICES CHARGES.

The Math CnD is proud to offer some of the cheapest food and coffee on campus. If it were to accept WatCard, the prices would increase to match what you see at iNews or in the V1 cafeteria (i.e. over \$2 for candy bars instead of like \$1.00/\$1.50).

### 2. MATHSOC WAS GIVEN A QUOTE OF AROUND \$20,000 IN INFRASTRUCTURE COSTS PER TERM TO HAVE THE WATCARD (NOT INCLUDING SURCHARGES AND WHATEVER ELSE).

It is worth noting that at the time this quote was given, the \$20,000 was roughly one third of the termly operating budget (circa Spring 2011). If Mathsoc were to have implemented WatCard, less money would have been given to clubs and events for terms going forward. Similar to iNews, the CnD would also likely subject students to around a 5% surcharge

anytime WatCard was chosen as an option to try and cover the cost of implementing it. The infrastructure costs though, are really just paying for the scanner itself and the software to manage the accounting.....and it's still impressive how expensive that is.

The costs that implementing WatCard in the Math CnD would incur, were thus determined to be not worth it. Although it is frustrating to not be able to spend the money already in your meal plans or on your WatCard regardless of meal plan, the costs of having that feature are just NOT worth it. Customers would be spending much more in the long run, and so would Mathsoc to administer it. The Math CnD in my opinion, should stay affordable in the best interests of its students and using their money effectively. Honestly the fact that the CnD is one of the few food places on campus that accepts credit card is already a big step 😊 For now though, unless the costs of the WatCard's infrastructure goes down, the cost of seemingly slightly less convenient methods are worth it.

The Muncher

## N THINGS TO DO TO PROCRASTINATE STUDYING FOR YOUR MIDTERM

- Count every goose in Waterloo
- Complain about your midterm
- Celebrate your birthday 358 days late
- Binge watch Netflix
- Write for **mathNEWS**
- Translate your homework into Latin and see if you can still solve the problems
- Make a plan to kill all of the geese in Waterloo complete with how to hide the dead bodies)
- Cry about the fact that you haven't studied
- Look up candidates and vote in the election
- Try and prove Fermat's Last Theorem
- Attempt to replicate the Mona Lisa
- Cry some more
- Take a nap for 12 hours and wake up 3 hours after the midterm...whoops
- Become the one person that posts on Piazza asking about the midterm an hour after the midterm started

NoNamePerson

## N COMPANIES WITH TERRIBLE SECURITY PRACTICES

*[Editor's note: Please do not attempt to hack the following companies. It's illegal and also very not nice. If you do expose security flaws, please **PLEASE** follow the rules of responsible disclosure.]*

These companies almost certainly store passwords in plaintext, since they have ridiculously low password length limits and don't allow special characters. I know from using these services myself that their security is terrible.

- CIBC
- TD
- PRESTO

I've also heard from others that the following companies also have terrible security.

- BMO
- Scotiabank
- Tangerine
- SCENE

Security Expert

## N REASONS WHY LEFT-HANDED PEOPLE ARE THE MOST OPPRESSED MINORITY ON EARTH

1. Lecture halls with fold-out "tables"
2. Scissors
3. Difficulty eating/writing when sitting parallel to someone else
4. Increased expectations of intelligence from parents
5. Being made to write with bad hand in primary education, making handwriting poor for life
6. Smearing ink all over your hand even if you can write with it
7. Wrong-chirality folding spoons:
8. Right-handed gaming mice (a form of intersectionality)
9. Difficulty performing handshakes
10. Poor instruction from high school tennis/golf teachers
11. "You're left-handed? Do something left-handed!"
12. Keyboard num-pad placement
13. Statistically higher chance of early death
14. Expensive specialized equipment (left-handed guitars, pianos, firearms, hockey sticks, suits of armour, etc.) not subsidized by government
15. Lack of worldwide adoption of left-handed vehicles
16. Lack of support from AccessAbility services concerning above issues

girafarig, cy, boldblazer  
(all proudly left-handed)

**The opinions expressed herein belong to their authors, and do not necessarily reflect those of mathNEWS.**

**Please keep this in mind as you enjoy the rest of this issue.**

THE mathNEWS EDITORIAL TEAM

## ELECTIONS AMIRIGHT?

Ah, elections — the season where everyone goes out of their way to have conversations about potentially polarizing topics. Perhaps you are already tired of all the elections coverage, and just wished you could get it over with now. Well, you can. You can vote on campus on MC 2037A or SLC 2137 during the following dates and times:

- **Saturday Oct. 5<sup>th</sup>:** 9 a.m.—6 p.m.
- **Sunday Oct. 6<sup>th</sup>:** 12 p.m.—4 p.m.
- **Monday Oct. 7<sup>th</sup>:** 10 a.m.—10:30 p.m.
- **Tuesday Oct. 8<sup>th</sup>:** 10 a.m.—10:30 p.m.
- **Wednesday Oct. 9<sup>th</sup>:** 10 a.m.—10:30 p.m.

This on campus initiative allows you to vote by special ballot. As a student, you are allowed to vote either for the riding where you study, or for your home riding. All you need is an official piece of government ID with your picture, and proof of residence. If you don't have that, you can always find a friend who does have the right identification, and they can vouch for you.

You can also vote on advance polling days. These days fall during Fall reading week, if you want to vote in your parent's riding. Vote at your assigned polling station **from 9:00 a.m. to 9:00 p.m.** on:

- Friday, October 11
- Saturday, October 12
- Sunday, October 13
- Monday, October 14

You can also vote by mail as long you apply on the Elections Canada website ([elections.ca](http://elections.ca)) before **Tuesday, October 15, 6:00 p.m**

And for all you students who love to procrastinate, there is always the last minute option of voting on **Monday October 21 from 9:30 a.m. – 9:30 p.m.**

If everyone under 35 voted, we could decide the outcome of the election. Participating in democracy is easy, and who gets elected has a huge impact on your life. I can't tell you who to vote for, as I will be a poll worker. Not the sexy kind of poll worker, unless you find democracy sexy.

For more information on how to vote, go to [elections.ca](http://elections.ca).

So the next time someone tries to engage you in a political discussion, you can cut it short by declaring that you already voted and that nothing they say can change your vote.

Now Pokémon Go to the polls!

## IF YOU DO ONE THING PRODUCTIVE NEXT WEEK, GO OUT AND VOTE!

**THIS IS A PSA FOR THOSE ELIGIBLE TO VOTE!**

1. Go to [elections.ca](http://elections.ca) to see if you are registered
2. Research the candidates for your riding and their platforms on important issues(links available again at [elections.ca](http://elections.ca)) so you can be INFORMED
3. Grab your ID (and proof of address if you would like to vote for Waterloo's riding)
4. Go to MC 2037A or SLC 2137 to get in line to vote sometime between Oct 5<sup>th</sup> and 9<sup>th</sup> (see [elections.ca](http://elections.ca) for special Student University Polls)
5. Receive your ballot for either your home riding (or Waterloo's riding)
6. VOTE and mark your ballot for the ONE candidate you feel would best represent you and your values on important issues
7. Hand in your ballot!
8. CONGRATS YOU'VE VOTED AND CAN NOW ENCOURAGE OTHERS TO VOTE!!!

This will be this writer's 3<sup>rd</sup> opportunity voting in a Federal Election, and I am excited to get to it and vote :) Voting is important, so PLEASE vote if you are eligible to. EVERY VOTE COUNTS AND YOUR VOICE DESERVES TO BE HEARD!!!

[waldo@<3.LE-GASP.ca](mailto:waldo@<3.LE-GASP.ca)



# A HISTORY OF DEMOCRACY IN CANADA

The Canadian federal election is on October 21<sup>st</sup>. However, today's modern system of vicious partisan bickering obscures the ancient system of vicious partisan bickering that founded our democracy. Here, now, is a history of democracy in Canada.

10,000 BC: Grog kills Bog with large stone, setting precedent for politics for the next 11,000 years.

1215 AD: King John signs the Magna Carta, beginning a tradition where leaders pretend to respect human rights and democracy.

1776 AD: America declares independence, beginning the tradition of Canadians using American politics as an example of what not to follow.

1867 AD: Canada gently nudges its way to Confederation, uniting most of Canada except for Newfoundland, which is left as an exercise for the reader.

1873: Canada's second Prime Minister, Alexander Mackenzie, takes office without murdering anyone, breaking the tradition of Grog and setting a precedent which will be observed until 2023.

1874 AD–1981 AD: Since they are not in the Canadian History curriculum, these years are presumed not to exist.

1914 AD–1945 AD: Except for these years, in which Canada fought two world wars and secured Canada's position as a country, at least in the fields of killing people and making things. This period also produces many pages of easily testable course material, securing the jobs of history teachers for generations to come.

1982 AD: Pierre Trudeau moves the constitution to Canada and institutes the Charter of Rights and Freedoms, guaranteeing human rights, unless you really really want to break them, in which case, use the notwithstanding clause.

1995 AD: Quebec nearly votes to leave Canada, and after you accidentally switch your keyboard to French again, you kind of want to let them.

2000 AD: Canada survives Y2K, which isn't about democracy really, but isn't it weird how that was such a big thing back then?

2008 AD: Stephen Harper, facing a vote of no confidence, force quits Parliament and reboots it with new settings.

2011 AD: Jack Layton takes the NDP to its highest place ever: second. It's only up for the NDP from here.

2015 AD: Oh wait, never mind, they're back to third again.

2016 AD: Donald Trump is elected, giving Canadian politicians a convenient distraction for all problems, foreign and domestic.

2019 AD: Justin Trudeau attempts to defend his position from his greatest enemy: all the stupid stuff he does.

2023 AD: Revealing the future to those in the past violates sections 4 through 8 of the Time Laws, so this section has been redacted.

UW Unprint

## PLATFORM GUIDES TO HELP YOU VOTE INFORMED!

- <https://newsinteractives.cbc.ca/elections/federal/2019/party-platforms/>
- <https://www.macleans.ca/politics/2019-federal-election-platform-guide-where-the-parties-stand-on-everything/>

Obligatory PSA: Facebook/Reddit/Twitter/<insert social media> are *not* reliable sources of information, may contain fake news, and especially with the former, may play with your emotions. Also, party propaganda — they're not always factual.

voterist

## WHO SHOULD I VOTE FOR?

- **Liberal Party of Canada:** Vote for the LPC if you want things to more or less stay the same.
- **Conservative Party of Canada:** Vote for the CPC if you're stuck in the past and prefer social regression over social progress.
- **New Democratic Party:** Vote for the the NDP if you want to try something new.
- **Green Party of Canada:** Vote for the Greens if action on the climate crisis is your #1 priority. Also, they support a guaranteed minimum income.
- **People's Party of Canada:** Vote for the PPC if you're pretending not to be racist.

Vote ABC



# FASS FALL VARIETY SHOW: FERIDUN-DUN-DUN!

[Editor's note: There are 3 Math Lecturers in the show! Come out and show your support for Diana Skrzydlo, Andrew Beltaos, and Collin Roberts]

Come join us on October 4 and 5 at 8pm in AL 116 for the FASS Fall Variety Show: Feridun-Dun-DUN!

When the UW President is suspiciously found dead, candidates from all across campus vie to replace him in a heated election campaign. Just as voting day draws near, the candidates start disappearing too! Some smooth-talking film noir detectives from the Rob, Bob, and Todd detective agency (both named Kyle) are hired to solve the murders, and everyone is a suspect: was it the disgruntled grad student? The food services worker? The geese? You'll have to come and find out!

FASS also welcomes lots of other fabulous on-campus performance groups to share the stage with us. We'll have short performances by UW Cheer Team, Warriors Band, AcaBellas, Unaccompanied Minors, UW Improv Club, UW Juggling Club, and Chavembachata!

Admission is pay-what-you-can and all are welcome.

FASS (Faculty, Alumni, Staff, and Students)  
Theatre Company



## TIPS FOR THE MATH 135 MIDTERM

I'm taking a moment away from sarcastic news articles to help out the youths, who will be imminently dealing with the MATH 135 midterm, an event that strikes fear into the heart of all people, from the Faculty of Math to the Presidium of the Supreme Soviet. (Nikita Khrushchev got a 73).

Whether you're a fledgling first year or the Chairman of the Presidium, here are some tips:

- **Don't Give Up Too Early:** A lot of times, you'll go down a path and it won't seem to go anywhere. You'll be shuffling variables around and it'll look like you're just staying in the same place. If you're anything like me, you'll want to cut that path off early to avoid wasting time. But don't do this too early, because your solution might be just past that next substitution or rearrangement.
- **Don't Give Up Too Late:** On the other hand, you don't want to waste twenty minutes rearranging the same equation into the same three forms. In the end, it takes practice (which I know is probably not what you want to hear) to understand when an idea is going nowhere fast, or is going somewhere... slowly.
- **Look For Contradictions (like those last two bullet points):** Contradictions are great! They let you assume things and it's still legit math! But keep on the lookout. Sometimes, a contradiction is more work. If you want to prove something exists, the contradiction of that is proving the opposite for all members of the set in question. Try and do less work if you can. (This advice applies to more things than math, by the way.)
- **There's No Shame In Skipping Questions:** We all know what we're good and not good at. If you don't have an idea for a question within a few minutes, come back to it. Just remember to come back, or

you'll feel silly afterwards. Sometimes, the answer to another question will help you out on the one you skipped.

- **Lower Your Standards (at the end of the exam):** Part marks are real, and they will save your soul. The closer you get to the end of the exam, the more willing you should be to stray into the art of "voodoo math". The only thing worse than a shady proof is no proof. If they took away marks for bad attempts at proofs, I'd be in the negatives. So that crazy idea you have? If there's ten minutes left, have at it.
- **The First Step Is Believing In Yourself:** You can't convince a marker you're right if you don't convince yourself first. If you're facing something you have to prove or disprove, try and hand wave yourself to a proof one way or the other. You don't have to be super rigorous, but nothing is worse is trying to disprove something that's true.
- **Practice (yeah I know):** A lot of these tips are pretty vague, because I don't know what you guys are going to face. (Also I don't really remember what happened in MATH 135, but never mind that). In the end, you're going to have to go off intuition and these general tips. Intuition comes from one place and one place only: practice.

So, get to it. Nikita Khrushchev practiced, and he became the first Soviet leader to not die in office. And if you practice, neither will you.

UW Unprint

# HOW MANY FRSH SALAD BOWLS ARE THERE?

FRSH is a wonderful and slightly-overpriced vegan food establishment run by UW Food Services. Not to be confused with Freshii, it is open weekdays from 11:00-14:30 in AHS (next to Starbucks). The lines there are usually no longer than two people, and most of your time will be spent waiting for the staff while they make your custom order.

And it's a pretty detailed custom order. In the queuing area, FRSH provides paper forms that you can fill out to dictate exactly what you want. You never have to worry about how to pronounce "quinoa"; all you need to do is check off a box beside the word. There are three different types of forms, corresponding to flatbreads, hot bowls, and salad bowls. Personally, I recommend salad bowls, not just because they are cheaper, but also because it's physically impossible to finish a salad bowl and still be hungry.

So you heed my advice and pick up a form for a salad bowl, only to find yourself bombarded by a whole sheet of decisions.

- Greens (4 options, choose up to 2)
- Raw toppings (11 options, choose up to 5)
- Roasted toppings (5 options, choose up to 3)
- Cooked grains (2 options, choose 1)
- Protein (4 options, choose 1)
- Crunch (5 options, choose 1)
- Dressings (5 options, choose 1)\*

(\* I think one of the dressings might be perpetually out of stock.)

With all those options, it always surprises me how quickly the staff make the orders.

So you pull aside to fill out your form (with the pens they provide you), and soon you are left wondering the question that any mathematician should have when ordering at FRSH.

*How many combinations of ingredients can we choose?*

But when we try to come up with an answer, we're faced with an English problem, not a math problem. Do we include choosing nothing when we say "choose up to x"? Likewise, if they say "choose 1", do they mean we must choose one of the options? What if I don't want protein in my salad?

So I went to FRSH and asked them if I could order a salad bowl without any greens, the answer was a shifty and confused no. Not wanting to bother the staff again, I went to consult Merriam-Webster instead, where the relevant definition of salad is

*raw greens (such as lettuce) often combined with other vegetables and toppings and served especially with dressing*

Clearly, a legal salad bowl must consist of at least greens and dressing, and all else is optional.

- Greens (4 options, choose 1 to 2 of them)
- Raw toppings (11 options, choose 0 to 5 of them)
- Roasted toppings (5 options, choose 0 to 3 of them)
- Cooked grains (2 options, choose 0 to 1 of them)
- Protein (4 options, choose 0 to 1 of them)
- Crunch (5 options, choose 0 to 1 of them)
- Dressing (5 options, choose exactly 1 of them)

Given  $n$  options, the number of ways we can choose  $a$  to  $b$  of them is a sum: the number of ways we can choose  $a$  options, plus the number of ways we can choose  $a+1$  options, and so on, up to the number of ways we can choose  $b$  options. For example, the number of ways we can choose raw toppings is:

$$\sum_{k=0}^5 \binom{11}{k} = \binom{11}{0} + \binom{11}{1} + \binom{11}{2} + \binom{11}{3} + \binom{11}{4} + \binom{11}{5} \\ = 1 + 11 + 55 + 165 + 330 + 462 = 1024$$

(The fact that this is a power of two is a rather interesting coincidence that you should look into if you don't already know when and why it happens.) Repeating the calculations for each of our categories, we find that there are:

- 10 ways to choose greens
- 1024 ways to choose raw toppings
- 26 ways to choose roasted toppings
- 3 ways to choose grains
- 5 ways to choose protein
- 6 ways to choose crunch
- 5 ways to choose dressings

However, we run into a dilemma. Korean chickpeas are listed as options for both protein and crunch. Thus, out of the 30 ways (5 times 6) you can choose pairs of protein and crunch, two are identical:

1. Korean chickpeas and no crunch
2. no protein and Korean chickpeas

Checking off Korean chickpeas twice will probably get you extra chickpeas (and some judgemental glances), so we'll consider it distinct. Thus, there are actually 29 distinct ways you can choose pairs of protein and crunch. With no other overlap between categories, calculating the total number of FRSH salad bowls is as simple as taking a product: 115,814,400. This is bad news if you want to try every possible salad bowl, but in the grand scheme of things this isn't an epic number.

- At three bowls per day, it'd take you over 105 thousand years.
- At three bowls per day per capita, it would take the current UW student body over 3 years, assuming we can somehow coordinate to avoid ordering the same combination twice. To match this sharp increase in demand, FRSH staff would have to produce more than one salad bowl per second.



- If everyone in Canada coordinated to binge on FRSH salad, we could finish within 2 days.
- If Santa Claus distributed one of each unique salad bowl every Christmas, every child could expect to get just one before they reached adulthood.
- A stack of 115,814,400 unique salad bowls wouldn't reach the moon. It probably wouldn't even be visible from the moon.

Of course, many economists wouldn't even consider buying a FRSH salad bowl containing just leaves and dressing. Why would you do that, when you can add veggies and protein on top and still pay the same price? We already established that there are simply too many FRSH salads for you to try them all, so why waste your time on the ones that offer diminished utility?

You want salads that are bursting out of the seams of their paper bowls. Not a single choice shall be wasted. Five raw toppings! Three roasted toppings! Protein and crunch! The staff will giggle at the girth of your leafy goodness as they try to squeeze it underneath the lid.

*How many economically rational combinations of ingredients can we choose?* The computation is left to the reader, but I'll just say it's still too much for a single person to try all of them in their lifetime. If that gives you choice paralysis, you might be better off choosing from FRSH's much smaller selection of preset salad bowls. At the leisurely rate of one salad bowl every time you have a quiz in AHS 1689, you could conceivably get through those in the time it takes you to graduate.

water

## BLESS THE FIRST FULL WEEK OF A FALL READING BREAK EXISTING!!!

*MUCH BETTER THAN THE AWKWARD "FALL READING TWO DAYS"...*

This term marks the start of a 3-year pilot to measure the impact of a full week's break in the Fall term. Already, part of the impacts of this decision (earned through student referendum in 2018) have been felt, with a seemingly short set of all-day Orientation events scheduled over 3 and a half days at the start of September. Special note will be given to first-year students on how they will use the upcoming break, especially with the notorious transitions that come with starting out here at UWaterloo.

Personally, I am in favour of either a full week's break existing in the Fall term, or none at all. The previous 3-year pilot (which took place from 2016 to 2018) of the Reading Break Two Days that immediately followed Canadian Thanksgiving was too confusing and inconvenienced a lot of people by having Tuesday-Wednesday schedules be on the Thursday-Friday. I cannot say whether or not a break of any kind would

have truly helped me in MY first term, because I made lots of decisions that were to my detriment. I definitely did enjoy the Winter term a lot more, but not necessarily because of the full week's break that is given/has been given as long as anyone can remember. When you make a bunch of mistakes in first term, you learn from them and hopefully make things better in the next go. That said, if a full break can help someone else in their first term without the confusion the two days brought, I am going to advocate for helping them and those who will be like them in the future.

For now, enjoy the next 3 years of having a full week's break in the Fall term, and **BE ABSOLUTELY SURE TO GIVE YOUR FEEDBACK ABOUT IT!!!** Only making your opinions known will help influence the next set of decisions in 2021.

A Mediocre Kitty

## N THINGS I WILL ENJOY IN THE FIRST FULL FALL READING WEEK

*WALDO IS AMAZED SHE'S BEEN HERE THIS LONG TO FINALLY SEE IT HAPPEN.*

- Sleeping in
- Going home to see family (and hopefully beating the incredibly long Thanksgiving related transit lines and traffic congestion)
- ACTUALLY GETTING AHEAD ON SCHOOLWORK (because those 40% major projects are going to need a lot of work)
- Enjoying the fall colours (would recommend travelling to the Great Gorge in the city of Elora if you're able!)
- SLEEPING IN
- Exploring more of the city of Waterloo itself, because I don't get out to see it enough
- Taking the Ion train through KW to see more of the awesome artwork that lines the route
- Having fun with friends
- Singing, because that's what I like to do for fun :)
- SLEEPING.....IN.....ZOMG!!!!!!!

waldo@<3.LE-GASP.ca

## INTO THE VOID OF JOB SEARCHING

*AN N PART SERIAL THAT WILL END WHEN I FINALLY BECOME GAINFULLY EMPLOYED.*

Job searching is hell. Everyone hates it, but you have to do it. And if you think that co-op is bad, just wait till you graduate. That's where the real fun begins!

This week, I had the joy of the online assessment. You never really know exactly what kind of questions you'll get for these, until the clock starts ticking and you desperately try and remember knowledge that you haven't used in a long time.

Today, I did one for Fusion Analytics, which consisted of twenty questions in 30 minutes. And half of the questions were word problems I hadn't done in almost a decade.

My first reaction was, "oh no! Basic arithmetic!" I am used to my math being highly theoretical and containing very few concrete numbers. And I like it that way.

So when the first question, was just a very wordy scenario asking for the equation of a line, I panicked. I firmly believe that computations are for computers.

Honestly though, the worst were the "find the pattern for this arbitrary collection of symbols" questions. The sort of things you find on bullshit IQ tests. If I wanted to play a game that doesn't tell me the rules, I would just play the chairman game after **mathNEWS** ends.

Despite my initial flailing, I did end up answering 95% of the questions. However, I don't know if they actually were correct. I will get back to you guys on that.

Beyond Meta

## HUMAN EVOLUTION TOWARDS SHORT SLEEPERS

Assume every human needs to finish 10 tasks every day, and that this number will increase over time. Let's say  $p$  tasks per year,  $p \geq 0$ . At some point, people with low efficiency or require sleep time above  $n^{\text{th}}$  percentile will die from sleep deprivation. ( $n$  is a number where  $n\%$  of people can get enough sleep). The outliers include those who are rich enough to hire short sleepers to finish their tasks and those who does not care about work and deadlines. People who are careless about their tasks will end up on the street due to unemployment and will have lower life expectation overall.

There are several conditions where human can survive finishing  $(10+tp)$  tasks per day: Short sleepers, people who are trained to be short sleepers, and people who get richer by abusing short sleepers.

As a result, the dramatic decrease in human population due to the sleep evolution will speed up the development of artificial intelligence since the population decline reduces the workload from short sleepers. Jobs such as drivers, farmers, teachers, and conductors will be phased out gradually. At a certain age, artificial intelligence will replace all human labours, both intellectual and physical. By induction, the purpose of occupation is to serve AIs and can be taken over by AIs. (Fuel production, maintenance, software update, construction, and space experiments)

In conclusion, human will evolve into artificial intelligence by sleeping shorter and abusing themselves at work.

Autowired

## OVERHEARD AT mathNEWS

- No one start another riot, I already started a riot and Campus Police are on their way.
- Writer 1: Can I be the face of Math Studies?  
Writer 2: Then we'd be lying, and we definitely don't lie in our admissions brochures  
*Laughter ensues*
- *Overseen at mathNEWS:* An Editor writes 'Piazza' on board when about to ask about what PIZZA the writers would like to eat, facepalming ensues...
- What is sexy democracy? Is it a really nice ballot?
- First-year writer: I just finished writing my CS 135 midterm!  
*All the other writers break out into applause and a standing ovation*  
Upper-year writer: We're not gonna shut up.  
*Clapping and ovation continues, cheering accentuates*  
First-year writer bows

- Writer: How many phone calls does it take to order pizza?  
Editor: Apparently 5!!!
- This brochure is not representative of CS students, there's too much sunlight.
- Writer: When I'm driving down the street and see things like "Beyond Intelligence", that's not what I'm looking for in a university.  
Writer: What does that even mean?  
Writer: NO ONE KNOWS!  
Writer: #BeyondIdeas
- Beyond Meta: Meta is a Greek word for 'beyond'  
Writer: Ah, so you're "Beyond Beyond" then.

Narf Dert

## REBRANDING FEDS

Feds WUSA has an identity crisis.

If you haven't noticed already, there's a lot of services still using the old Feds brand name. Despite the efforts of the WUSA marketing team, the name of Feds has not yet been fully eradicated from this campus, though progress is slowly being made. Feds Welcome Week morphed into WUSA Welcome Week, and the venerable Federation Orientation Committees are now Waterloo Orientation Teams (as one friend said, "WOT the FOC is that?").

Before the WUSA execs find and imprison me for using the name of Feds ~~six~~ seven times in the past four sentences (plus the title), here are my faithful suggestions for refreshing our student union's legacy brands. Hopefully, by the time they get here they'll be reading this instead of the fear in my eyes; I can already hear their footsteps and maniacal shrieks echoing down the hallway.

### INTERNATIONAL NEWS, OWNED AND OPERATED BY THE FEDERATION OF STUDENTS

This becomes ***Local News, owned and operated by WUSA***. International is too vague and encompassing — it could refer to anywhere! — and so to stay consistent with the purposes of the rebrand, LNews is now a thing.

### FEDS FRIED CHICKEN

***Fried Chicken by WUSA*** is the only possible name. If we're going to sound corporate, might as well go full send.

### FEDBUS

***WUSABUSA (Waterloo Undergraduate Student Association Bussing University Students Anywhere)***. I've been told that Engsoc beat me to the punch here, but they didn't come up with the acronym, and we all know that's what *really* counts.

Sounds like they took a wrong turn; I guess I can keep writing.

### FEDS USED BOOKS

Finchey's article WUSA In The Air (v140i6) paints WUSA as a loving, comforting, guardian figure. I like this picture, so I hereby rechristen this service ***WUSA Gently Handled Books***.

### FEDS STUDENT FOOD BANK

Uhh, ***WUSA Student Food Bank***? I couldn't really think of anything here.

### #FEDSDOESTHAT

***#WUSADoesaThata***. Oh shoot, I think they know — they're running faster now — I must go, the geese are attac

Ted from Marketing

## FURTHER EDUCATION FAIR 2019

The Further Education Fair will be held on Wednesday, October 23 from 11:00 a.m. to 2:00 p.m. in the SLC Great Hall. This fair is your chance to explore post-degree options and meet staff and faculty from more than 90 institutions across Canada and abroad.

These representatives will provide information and answer your questions about career options, graduate school admission requirements, program specifics and application procedures and deadlines.

Come and explore programs like:

- Masters of Management in Finance
- Master of Data Analytics
- Master of Management and Professional Accounting
- MBAs and much more!

For more information visit our website: <https://uwaterloo.ca/career-action/further-education-fair>

Centre for Career Action

## ISSN 0705-0410

UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

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## \*INSERT SARCASTIC TITLE HERE\*

### gridCOMMENT 141.2

Oh joyous day, for I have been met with an outpouring of submissions to last issue's grid, all vying for the prize. Or maybe I just made the grid too easy, but given the number of mistakes received, probably not. Yet, there are some who stand above the masses who hadn't even bothered to have flooded **mathNEWS** with a stream of submissions showing support for the publication. For shame, [ ]].

Six submissions received were completely correct, from the following people listed with their answer to last issue's **gridQUESTION**, "If you were stranded on a deserted island for a week and you could bring one thing, what would it be and why?":

- Mel, who responded "If i were stranded on a deserted island for a week i would bring that weeks mathnews, of course."
- Angela Wang, who responded "I would bring the winner selector to convince the selector that I should win the prize!!". (That's be me, and I'm not sure if I would appreciate being stranded on a deserted island for a week. Nice try, though.)
- "Nickname", who responded "I'd bring a lighter so I don't freeze to death overnight! ... that's my practical answer but probably just my book."
- broccoli, who responded "The Google CEO so I can convince them to give me a job."
- Mary Chen, who responded "I'd bring my MathNEWS collection — to redo all the crosswords, of course."
- Marauder, who responded "DJao's 'post-quantum cryptography on FPGA based on isogenies on

elliptic curves' so I won't be bored, at least... and sound smart when (if) I'm rescued".

I can respect Marauder's detailed answer so I shall name you the winner of the first issue's prize. Please drop by MC 3030 when the editors are around so you may badger them for your prize. Special mention goes to the other submitters, AlphaTangoMango, lafayeet (Good choice on bringing your DSi), "With a little help", and Carol Chen for submitting. Better luck next time!

I'm not going to repeat the full rules for the **gridWORD** this issue, which I'm sure one can easily find the previous issue on campus (or at least if you drop by MC 3030), but in brief, submissions can be made physically to the **BLACK BOX** on the 3<sup>rd</sup> floor of MC outside the Math C&D or electronically to [mathnews@gmail.com](mailto:mathnews@gmail.com), and should include a name (and optionally a moniker), the grid, and optionally the answer to this issue's **gridQUESTION**, of which my favourite answer shall be used as a tiebreaker in the event of a tie for most correct submission. Submissions shall be made before 18:00 on October 21<sup>st</sup>, 2019 (or so I'm told, because there's this thing called "Fall Reading Week" now?)

This issue's **gridQUESTION** is "What is the most outlandish excuse you can give to avoid visiting people over Thanksgiving?"

Happy Feast-Consumption (and Solving),

Zethar



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

A PERPETUALLY BORED mathNEWS EDITOR

## ACROSS

- 1. Neck features?
- 6. Swiss peaks
- 10. Joke
- 14. Surrounding glows
- 15. Expert
- 16. Hip bones
- 17. Modern calculator [2]
- 20. White coat
- 21. Spot
- 22. Diploma declarations
- 23. Dismounted
- 25. Supermarket section
- 26. Red gemstone
- 29. Cone producer
- 30. Balsam tree
- 34. It's stranded
- 35. Parish priest
- 37. Pack animals
- 38. You're reading in it! [2]
- 41. Started
- 42. Unicode precursor
- 43. White wine aperitif
- 44. What awaits you at the end of the term (for most classes)
- 45. Eggs
- 46. Studs
- 48. Midmonth date
- 50. Barely managed

- 51. Act divisions
- 54. Blvd.
- 55. Prefix with European
- 59. What you might have to deal with if your variables aren't iid
- 62. Berlin senora
- 63. Shower
- 64. Sweetly
- 65. Seals' meals
- 66. Idiot
- 67. Clothe

- 24. The other name for Cook's Theorem
  - 25. This delta "function" is the "derivative" of the Heaviside function
  - 26. Cousin of a loon
  - 27. Take over
  - 28. Jamacian music genre
  - 29. ⊥
  - 31. KIX city
  - 32. Kosher
  - 33. Consumers
  - 36. Pandemonium
  - 37. Software development philosophy
  - 39. Shining
  - 40. [Ar] 3d8 4s2
  - 45. Fall back on
  - 47. e.g. Terry Chen
  - 49. When 44A is
  - 50. News subject
  - 51. Coffer
  - 52. Fix
  - 53. Paper abbr.
  - 54. Solo
  - 56. h'pi
  - 57. Text files, in short
  - 58. Snake eyes
  - 60. Unprocessed
  - 61. Contribute
- \* Technically exists, but you won't find it on the calendar*

## DOWN

- 1. They pass
- 2. Destroy
- 3. Therefore
- 4. Formerly Formosa
- 5. Contains elements
- 6. Lace tip
- 7. Time founder
- 8. Paid player
- 9. Not a season here\*?
- 10. Japanese martial art (historical spelling)
- 11. Kind of clef
- 12. Dock
- 13. Listening devices
- 18. Already [3]
- 19. Bud

1	2	3	4	5		6	7	8	9		10	11	12	13	
14						15					16				
17						18					19				
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51	52	53						54				55	56	57	58
59							60					61			
62						63						64			
65						66						67			

# lookAHEAD

SUN OCT 6

MON OCT 7

TUE OCT 8

WED OCT 9

THU OCT 10

FRI OCT 11

SAT OCT 12

Course selection period ends

Reading week begins

SUN OCT 13

MON OCT 14

TUE OCT 15

WED OCT 16

THU OCT 17

FRI OCT 18

SAT OCT 19

Reading week!

Thanksgiving! 🍂 🦃 🦃

Reading week!

Reading week!

Reading...week?

Adjust online course examination location period ends

READING WEEK!!!!!!

omgosh it's actually happening...

Have something you want to publish in mathNEWS? Drop it off in the mathNEWS blackBOX by the Math C&D or send it to mathNEWS@gmail.com!

A mathNEWS EDITOR WHO WANTS MORE WORK FOR THEMSELVES

## LAST WEEK'S gridSOLUTION

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

Have a penchant for dry wit and self-deprecating humour? A mathNEWS Editorship is the ideal way to waste that talent! Apply today!

AN OVERLY-JADED mathNEWS EDITOR