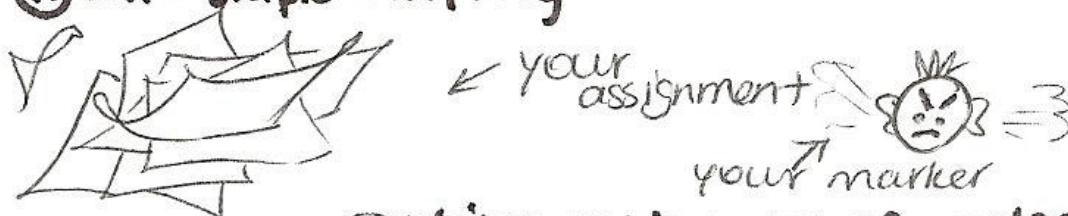


# math NEWS

## HOW TO ANNOY YOUR MARKER

### ① Don't staple Anything



### ② Write questions out of order

1.(c) for all  $x \in X$   
2.(a) hence, QED  
3.(b) ~~As~~ there exists.  
1.(d)  $\Rightarrow$  by above

### ③ Don't organize solutions



### ④ Label Theorems by Numbers

$\Rightarrow$  it holds by (1.7.3(b))

### ⑤ Use "academic" terms

Clearly we see that...  
It is trivial to conclude that...  
The following results are obvious...

### ⑥ Include "witty" comments

The proof was too small for the margin...  
... the rest is left to the reader as an exercise.

**lookAHEAD****mathNEWS**

June 12	Issue 3 attacks the life points of its readers directly.
June 22	The editors are awakened from their induced comas for Production Night 4.

**MathSoc**

Tuesdays	Movie Nights 7:00 in comfy
Thursdays	Games Nights 7:00 in comfy

**Math Faculty**

Questions about these?	See an Academic Advisor
Ongoing	Math faculty declares mathNEWS totally awesome

**CECS**

June 2-18	First round of Interviews
June 19	Rankings open
Ongoing	Many many workshops, see them all at <a href="http://www.cecs.uwaterloo.ca/students/">http://www.cecs.uwaterloo.ca/students/</a>

**Miscellaneous**

June 14	On this day in 1940 France Surrendered (to the Germans)
June 15	UW Senate Meeting

**CSC Flash***Now With Shameless Plugs From Our Subsidiaries...*

Ever wondered what a real CS research paper reads like? That's what Paper Club is for. At Paper Club, you'll be able to sip tea and discuss a current paper with your peers. Come and get a feel for what's out there, outside (and possibly inside) of Waterloo. Or maybe find out what kind of research could interest you if you're considering graduate school. No in-depth knowledge is required. You're allowed and encouraged to ask questions about the topic paper during the Club meeting, which will take place Monday June 15, 4:30 on the 4th floor of the MC. The topic paper is about a system for automatically generating high-coverage tests for C code. Meeting time, place, topic, and more details on the website (<http://csclub.uwaterloo.ca/~paper/>).

kspaans, on behalf of ctdalek,  
who had nothing to say this week.

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The editor(s): Larry, Curly, and Moe: John Stevenson, John Baxter, Rami Finkelshtein

**mastHEAD**

To Whom This May Concern,

It was the best of times. It was the worst of times. It was mid-term season. Wait, those were just bad times! The worst of times! Why am I using past tense?

I'm actually looking forward to midterms. I can't wait. I seriously love them. Love them like I love gouging out my eyes in public. With a spoon. A rusty spoon. I love midterms.

After consulting RamED, I discovered that he doesn't enjoy gouging out his own eyes with rusty spoons in public with the same passion that I do. After consulting the left part of my brain, I also discovered that I didn't like it much either. It sort of hurt the last time...

Midterm season is upon us, and we're all feeling just a little crazy down here at *mathNEWS*, especially since two of the three editors showed up late only to discover that our normal lab, where this waste of paper is tenderly nurtured, is closed for maintenance. Oh joy. The mind-numbingly annoying buzz of people typing isn't peeving me at all. Not one eye-twitching bit. And it especially doesn't annoy me that less than half the people in this room are writing for *mathNEWS* too. I'm clenching my teeth and tugging at my hair for fun.

We have a serious shortage of writers this issue. Due to blame being transitive, it's midterms' fault. (I blamed StaticED who blamed one of our previous writers, who blamed midterms. God bless transitivity.) I started thinking that *mathNEWS* should create a blame semantic network in order to take full advantage of the spreading activation.

**Question: The midterm's worth 0%, what do you write? What do you want your TAs to know?**

"I cry myself to sleep because of you"(RamED),"Why am I here? And why are you bother"(monkeyspodn5),"I'll be in Tijuana with the senioritas and margaritas, have fun!"(Tamek),"I'm going to do all the math in base 13, have fun!"(StaticED),"My dick is huge."(inXSE) [*We investigated this and have found it to be false, we apologize to anyone reading that got a little excited — the editors.*],"Certainly NOT my plan for world domination MWAHAHAHAHA!!!"(InsideR),"I wouldn't waste time writing anything, instead i'd go to kickoffs and drink"(unja),"Realize that you're writing an arts exam, and get a real degree"(Tbor)

ImpulsED

*"The intimate details of my sex life."*

**Mathematics Endowment Fund has Openings!**

*Sign up for the funding council, board or directorship*

The Mathematics Endowment Fund takes your money, you should help us decide where it goes! Sign up to be a member of the funding council by picking up an application available on the outside of the MEF office door at MC3028! From there the possibilities are endless including being a board member or even MEF director! Sign up today and get involved with a multi-million dollar endowment fund.

Michaelangelo Finistauri  
MEF Director, S09

## VPAS Sez

*Hello, Mathies!*

As you may know, Engineering SCUNT was scheduled to be run one week ago, but when the Engineers saw that MathSoc had signed up a team, they cancelled the event to avoid yet another humiliating defeat like last term. That is to say, MathSoc has won by default! Of course, to help spare the Engineers some of their dignity, we told them to say that the reason for canceling the event was a lack of teams signed up, so this is the 'official' story.

Every Spring term, MathSoc helps out with the Canada Day celebrations held by the University, and we need volunteers! Not only do you get free food and a free shirt for volunteering, you also get a chance to win a lifetime supply of sauerkraut! (The sauerkraut is, of course, optional.) Go to <http://www.canadaday.uwaterloo.ca/volunteerForm.htm> to sign up, and check the box that says you signed up through MathSoc. MathSoc traditionally runs the Children's Activities, but feel free to indicate a preference to help out elsewhere, in case we have too many people.

Ian Charlesworth  
VPAS Spring '09

## Your Dean is Changing

Hello, student body. My name is Michaelangelo Finistauri (if you read *mathNEWS* then you've definitely seen my name floating around a lot). I am your representative for the Dean of Math Reappointment Committee. Your current Dean, Tom Coleman, will no longer be continuing his deanship after his term ends in Spring 2010. As your representative on the committee I need to represent you. To do that, you need to tell me what you want to see in your Dean. Drop me a line at [mfinista@student.math.uwaterloo.ca](mailto:mfinista@student.math.uwaterloo.ca)! Make your voice heard. Through my voice! Cheers!

Michaelangelo Finistauri

## Gaming Nights

*I'd like to play a game*

Hi everyone, It's your good ol' gaming director here. I'm here to tell you about the great joys of board gaming. It's not just Monopoly or Connect 4 every week. We actually have fun and challenging games. Don't believe me? Well then maybe you should come out to a games night on any Thursday at 7:00PM and I'll prove it to you!

Rami Finkelshtein  
Games Director

## Your Yearbook isn't Going to Make Itself...

*Join the Math Grad Committee!*

Hello, fellow graduating students! Your MGC Chair here, telling YOU that if you don't help out then you won't have an awesome grad ball! You won't have a yearbook to show your family and kids! You won't even have Pizza Wednesdays! Come help out! You can help out by contacting us at [mathgrad.2010@gmail.com](mailto:mathgrad.2010@gmail.com)

Michaelangelo Finistauri,  
Math Grad Chari, 2010

## Senator Asks

*Would you be OK with Saturday midterms?*

A motion to amend the existing Exam Regulations is being brought to Senate in the upcoming meeting, which is to be held in a few days from today. The motion essentially moves to include Saturday as a day when instructors could schedule midterms and tests. This is an issue that concerns every undergraduate student - so, voice your opinion either by sending me an email or by directly visiting the Federation of Students' home page to participate in a poll that would reflect the student opinion regarding the issue. A direct link to the poll is <http://pulse.feds.ca/node/1988>

Additionally, if you would be interested in sitting in during the upcoming Senate meeting, feel free to do so. The meeting is to be held on June 15th at 4:30pm in Needles Hall, Room 3001. The agenda for which is available on the secretariat's webpage <http://www.secretariat.uwaterloo.ca/governance/senate.htm>

Ajnu Jacob  
[ajacob@uwaterloo.ca](mailto:ajacob@uwaterloo.ca)  
Undergraduate Senator  
Faculty of Mathematics

## We Want YOU

*to volunteer for Student Life 101*

Eager to meet the finest group of incoming UW students? Look no further!

We are looking for enthusiastic students to volunteer for Student Life 101 on Saturday July 25th. Not only will you get to meet hundreds of new students, but you'll get free food and a swanky yellow t-shirt... Awesome, right?

To sign up, visit:

<http://www.studentlife101.uwaterloo.ca/volunteers> and click on the Sign Up link.

We can't wait to see you there!

From the (super excited) Student Life 101 directors,  
Joe Collins, Keriece Harris, Josh Layton,  
Nilani Logeswaran, Cassie Piroutz, and Abeer Rahman

## Pamper Yourself

*Were all stressed out at this point anyway*

Hey there guys and gals of the math faculty. Are you tense? Do exams have you down? Do you just need to relax for a little while?

Well if you answered yes to any of those questions (and even if you didn't) then you should totally come out to Women in Math (WIM) Spa and Dessert Night.

When: June 17, 2009 @6PM

Where? The comfy lounge (most likely)

Why? Because Desert is awesome.

We will be waiting for you!

WIM

**And now back to your regularly scheduled *mathNEWS***



## Top 10 Things To Do/KNOW before You Go On 4chan

So maybe you're heard of stuff on the internet, heard of a dark and scary place called 4chan. People may have told you not to go. You didn't listen though, you went anyways, perhaps in search of lulz and/or things to fap to. This is to help you, to save your sanity.

1. **Don't do it.** Seriously, it's a bad idea to go to 4chan. You don't know what you're getting yourself into. There should be a sign saying "Abandon hope all ye who enter here". I've warned you.
2. **Find the site.** If you're too dumb to use google, you're perfect recruiting material for /b/. If not, then this step should be trivial.
3. **Read the FAQ.** Once you're there, please don't just jump in and ask stupid questions. There is a link on the front page that leads to the FAQ, which will unsurprisingly tell you all you need to know. It will also tell you the rules for the site. Most denizens don't know them. It makes me cry.
4. **Know what you want.** There is a front page. Topics are listed on said page. They will link you to a forum based on that topic. If you want pornography, go to the 18+ boards. If you are there for randomness, there is a board for you. I am of the opinion that the users of said board need to be sealed inside the Wicket Gate.
5. **Use a virtual machine.** This is an image board yes, and you can download things from images. Be careful. Use protection. Safe surfing is happy surfing. Some people spout hatred and want to harm you. Don't be dumb about it. Alternatively you can believe in virus protection software, but that is your choice.
6. **People will call you a fag.** Regardless of your gender or orientation, you will be called a fag. If you are offended by this, leave. Note that there are homosexuals who do peruse the site. Clearly they aren't offended, so why should you be?
7. **DO A BARREL ROLL! TO DO A BARREL ROLL, PRESS Z OR R TWICE!**
8. **Anonymous may raid.** The above provides an example of dumb things anonymous may do on the rest of the internet thanks to 4chan. Please don't be a part of this.
9. **Run away if you're a furry.** You will likely not be welcomed with open arms. You may even be attacked by people who believe you are a complete imbecile, who can't fathom their own stupidity.
10. **Don't do it!** I can't emphasize this enough, so I will repeat it. You're making a bad choice. The entrance to the cesspool of the internet, it is a murky bog that should not be traversed.

An addict who needs help  
monkeyspoon5

## The Mathematics of Zombie Survival

### *Because They Might Be*

Because the zombie attack could happen at any time, it is best to be prepared. Many mathies believe they are missing essential zombie survival skills, but a mathie is a perfect addition to any zombie surviving team. Many problems can be solved using advanced mathematical techniques, and zombie fighting is no different.

The essential zombie problem is where and when the zombies will attack. Luckily for our computer science student, zombies work very simply. So simply in fact, their movement should be predictable and programmable. Using this knowledge, we can use the classic two dimensional automaton, Conway's Game of Life, except this will be Tbor's Game of Death. Based on the boundaries of land mass, and the initial locations of the zombie attacks, we can calculate an approximate location of the zombies at any given time. Then we can conceive how many generations of zombies will pass before the zombies reach Waterloo. Once the generation length of a zombie is calculated, we can calculate the length of time we have to stock up on supplies and ammunition. Without this knowledge, we could be caught unaware by zombies, the worst possible scenario.

The next problem that occurs is the initial attack of the zombies. If initial defenses are not deployed in time, the zombies will have an advantage. Luckily, zombie speeds will be constant, as either they are super-fast or super-slow. With a constant speed, the location of a zombie in a room will be easily calculated. The zombie location after time  $t$  will be in the graph of  $x^2 + y^2 = (tv)^2$  where  $v$  is the velocity of the zombie. There may be many ways to tackle this circular nightmare, landmines being the best option, but trip wires, are also effective.

A classic usage of mathematics in survival situations is that of rationing. As there is only a certain supply of food and ammunition, and it is constantly decreasing over time. Unfortunately, there are multiple factors at play, not just time. One factor is that people slowly die off. Once again, mathematics is useful. If you are including an actuary on the team, you can confidently say which people are risky, and control their risky behaviour through managing rations to them. Once the teams risk of dying has been taken into account, we have an inversely exponential function. Another factor in rationing is the spoiling of the food, an inversely exponential function. Lastly, there is the noise factor of human visitors bringing and taking food. Therefore, the final function of food will instead of being linear, be inversely exponential summed with a wave function. What artsie is going to bother calculating that?

As you can see, a team of mathies is useful for any zombie survival scenario. Given access to the UNIX labs, a pile of past *mathNEWS* survival tips, and Imprint to start a fire, I'm confident the MC will be an impenetrable fortress of calculations. Just remember, save room for the engineers, as their flight from E5 will bring much alcohol, and MacGyver weapons to the armies of math.

Tbor

## Math is like being Sisyphus!

## Left 4 Drunk

*Since Zombies and Drunk People are Indistinguishable*

### The Premise:

You and three of your friends wake up to find yourself stranded in some house party about 200km away from your own home. You must fight through the horde of drunkards to get to the escape vehicle of your choice.

To make things even more difficult everyone at this party seems to be extremely friendly...to the point that it hurts. They will attempt to hug grab and even claw at you to make sure that you do not get past them and be able to go back to your home sweet home. You and your friends must take upon yourselves to escape armed with only your brains, brawn and 9mm hand guns.

However, as we all know, not all drunks are created equal. Some have excelled and evolved to be superior to the rest. These "special drunks" will pose greater challenges for your escape.

### The Puker:

The puker has never been able to hold his liquor. Well not in his stomach at least. Through all the years of drinking experience he has learned to project his vomit great distances. This great ability has won the puker quite a few bar bets over the years. His fellow drunkards are quite impressed by this feat and end up crowding the recipient of the puker's "magic bullet" in a giant swarming fashion while offering you drinks to bathe off the embarrassment. Pukers can be spotted by their paleish skin tone and the extremely loud noises emitting from their stomachs as they prepare to hurl.

### The Tongue Freak:

This particular specimen is fascinating for two particular reasons. Firstly, for his freakishly long tongue. But more importantly for his overbearing tendency to lick everyone around him. Some believe the Tongue Freak incapacitates his victims with only the acid from the alcohol, others believe he also uses rohypnol.

### The Party Animal:

This drunkard is just a complete freak. Their ability to leap over gigantic distances is frightening. They can smell the sober individuals and attempt to pin them to the ground and pour beers down their unsuspecting victims throat. The Party Animal is easily spotted as they make a great amount of noise as they move around the party and usually let out horrid screams as they pounce on their sober prey. Luckily it is easy to knock the Party Animal away as they are usually oblivious to their surroundings once they have acquired a sober target.

### The Jock (with a keg):

This drunkard is a force to be reckoned with. He runs around the party with carrying a giant keg smashing his way through all the drunks splashing beer everywhere. Once he has turned his attention onto an individual the jock possesses the ability to send them flying half way across the room with a mighty swing of his keg. The Jock has only a few known weaknesses. Two of them being fire and bullets.

### The Manic-Depressive Psycho Bitch:

This is a particular special drunk. At first she sits in the corner sobbing loudly. You may feel pity for her but be warned simply walking up to her and startelling her will send her into a flying rage and she will begin clawing at your eyes and assulting you in ways you never imagined a female could. Honestly avoid her whenever you can, and when you can't, bullets work just as well.

With a lot of skill and a little luck you will make it out through the house, backyard, pool, park, beach and many other locations where drunk people gather.

Staying Alive, but not always sober  
RamED

## *mathNEWS!*

*Now with 60% less writers!*

Ok, so it is *mathNEWS* production night here in the MC and I am sitting here alone in the Unix lab. Well I am not exactly alone, ImpulsED is here sitting hunched over his computer shooting me evil looks in between bouts of tears, RamED has left the room on errand again, and lets not forget Angelo. He has been here since the turn of the century. I blame the poor turn out on ImpulsED's new habbit of sacrificing writers to his dark god, or it could be the fact that our regular room was closed for repairs and no one knew where to find us. It's kind of a toss up.

Never the less, the *mathNEWS* production staff will do their best to create your Friday morning escape from class. Even if it means sharing a lab with CS students, who are loudly cursing their segfaults. Even if it means reading the Imprint, to look for things to make fun of. Even if it means we make Angelo write the entire issue ... again. I promise you that will that we will continue to provide you the high quality entertainment that is *mathNEWS*.\*

\*Not an actual promise. Degree of quality based on direct comparison with an Arts degree. By reading this you are legally bound to write a 500 word article to be submitted to the **BLACK BOX** by next production night.\*\*

\*\*Not actually legally binding.

## Unnatural History

### *Lichen*

In the bashful days of yore, rocks roamed the earth.

The gods were mostly pleased with this state of being.

*Mostly* pleased.

The rocks on the other hand were ecstatic.

They could roam and roll as much as they pleased.

Back and forth, to and fro, they made their way across the earth And that, to the gods, was precisely the problem.

They like the rocks well enough, and the rolling well enough.

But they were dead set against the rocks and rolls being together.

The gods wished that the rocks would just settle down.

Perhaps take up a sensible activity.

Like Polka.

The gods attempted to introduce it to the rocks.

But they kept on rolling.

This carried on for quite awhile.

The gods became fed up and cursed the rocks.

To stay still, and pay attention to the gods.

The rocks, having no choice, listened

and ended up Lichen the Polka.

The Unnatural Historian

StaticED

## Horrorscopes

*Now with 50% more “fibre” (“death references”)*

**ACCOUNTING:** You have come to realize that Accounting involves a lot more than just Counting. You discard your abacus in favour of a computer and switch into CS. You become a gnarled old code monkey and create software that makes all manual accounting obsolete.

Your lucky number: 0 accounts receivable.

**ACTSCI:** You embark upon a quest to become the first Actuarial Science student in the history of the universe to get laid. After dozens of attempts, you realize the horrible truth: no girl in math will date you because there are so many guys to pick from, and no one else will date you because they have higher standards.

Your lucky number: 90%

**AHS:** You went into Kinesiology because your dad is a gym teacher and you thought it would be cool. Now you realize that there are 3,000 applicants for each gym teacher opening. You go into massage therapy instead and spend your career touching fat rich people.

Your lucky number: \$50/session, \$60 if you sweat a lot.

**AMATH:** You apply your maths to the application of math, thinking that there must be some way to mathematically determine just how much math to apply in a given situation. A friend points out that you also need to determine how much math to apply in the application of maths to the application of math, etc. You go insane and die.

Your lucky number: ¥

**ARTS:** Unlike most of your fellows, you realized before taking Arts that you either had to become a teacher, be poor and live in a box, or both. The nights you don't spend drinking, you scrounge for building materials. Upon graduation you build the biggest, shiniest box any Artsie could wish for.

Your lucky number: Only 20 rats.

**BBA/BMATH:** You learn that knowing any math at all makes you highly overqualified for an upper-management position, and trying to climb the corporate ladder would be futile. You climb a stepladder instead — to hang yourself — but realize you've dressed “business casual” and don't have a tie on.

Your lucky number: \$20/hr.

**C&O:** You discover a cubic-time solution to the travelling salesman problem and become incredibly famous (for a mathematician). However, NP-hard gremlins take over the world and make everyone their slaves. All your dreams have come true, you twisted freak.

Your lucky number:  $e^x$ .

**CS:** After a night of hardcore drinking, you wake up in the Comfy. You can't tell whether you had an accident because everything smells like urine in there anyways. You stumble into the C&D, where you are mistaken for a zombie. You get into a linguistic/philosophical argument with another customer, who insists it should be spelled “zomby”. You manage to order a coffee but pass out and drown in it.

Your lucky number: 22 AA-12 rounds.

**ENG:** You complain to *mathNEWS* that ENG is far too broad. You want an ECE horrorscope so that we can write about how happy you are that SE won't be in your OS class anymore. We respond that you suck and the only “math” you do is figuring out significant digits. You cry.

Your lucky number:  $30. ? 10^6$ .

**ES:** The environment sucks, so you chain yourself to a tree. You wonder vaguely if this was a rational idea but quickly dismiss the notion. Future paleontologists label you “Homo borealis” and put your bones in a museum.

Your lucky number: 700 views/day.

**MATHBUS:** Confused about your program, you push one of your math professors in front of a bus. While in prison you start a Ponzi scheme for cigarettes. When your fellow inmates discover your ploy they kill you with a spoon.

Your lucky numbers: 1, 3, 6, 10, 15, 21, ...

**MATHSCI:** Your father said “Math and Science in the same head? Good God man! Who can live at that speed?”, and you're starting to suspect that he was right. For the sake of your sanity (but at the expense of being poor and living in a box), you drop into English.

Your lucky number: Two times the speed of life.

**PMATH:** You break up with your “math” (“girlfriend”) after realizing she wasn't so “pure” (“pure”). Your standards become higher and higher until no one can possibly meet them. You are alone for the rest of your life.

Your lucky number:  $\pi$ . Just because.

**SCI:** You somehow manage to major in both Biology and Physics, and conceive of a toad that evolves into a black hole. You realize that the idea is ridiculous and sell the movie rights to Dreamworks. They make it into an animated musical with singing rats, and you are ashamed.

Your lucky number: #2 animated movie this summer.

**SOFTENG:** Despite the recent changes to your Operating Systems course, you are still terrified by it. Reducing your sleep time even further makes you feel like dying. You drop into CS, and are dismayed to learn that you can't take 490 without OS.

Your lucky number: 350.

**STAT:** You estimate that the probability of having a streak of 154 in craps is about 1 in  $1.6 \times 10^{12}$ . You know that a woman in New Jersey just had such a streak, and conclude that impossible odds don't mean something is actually impossible. You drop out and blow your student loan at a craps table.

Your lucky number: Let me roll a couple dice here . . . looks like a 7. Too bad.

**UNDECLARED:** You go to your academic advisor for help figuring out what you want to do. She tells you you're yes, then you're no; you're in, then you're out; you're wrong when it's right; you don't really want to stay, but you don't really want to go. You leave her office dazed and confused, get lost, wake up in Vegas and later find out that she's been fired for telling another student to kiss a girl.

Your lucky number: 1 of the boys.

inXSE

*Holy crap, you weren't lying!*

**WARNING: If rash or irritation occurs, discontinue Horoscope use immediately.**



## Interesting Math

### *Who needs fingerprints when you have dimension prints?*

I'd like to apologize for the weird typesetting that appeared in my article last issue; it looked fine when we compiled it electronically, but things messed up when we printed. Anyways, I suppose I should start with Hausdorff dimension for this issue. Some of you may already know what this is, for those of you who don't: Suppose  $U$  is a non-empty subset of  $n$ -dimensional Euclidean space; we define the *diameter* of  $U$ , denoted  $|U|$ , by taking the supremum of  $|x - y|$  over  $x, y$  in  $U$ . We say that  $\{U_i\}$  is a  $\delta$ -cover of a set  $F$  if  $\{U_i\}$  is a countable collection of sets of diameter at most  $\delta$ , whose union contains  $F$ . For a set  $F$  and a non-negative  $s$ , we define

$$H_s^s(F) = \inf\{\sum_i |U_i|^s : \{U_i\} \text{ is a } \delta\text{-cover of } F\}.$$

That is, we look at all covers of  $F$  by sets of diameter at most  $\delta$  and attempt to minimize the sum of the  $s^{\text{th}}$  powers of the diameters. Notice as  $\delta$  decreases, the set of allowable covers is reduced, so that the infimum increases, and hence approaches a limit as  $\delta$  goes to 0. We define

$$H^s(F) = \lim_{\delta \rightarrow 0} H_s^s(F).$$

For those of you who know what a measure is, this is indeed a measure, called the *s-Hausdorff measure*. In addition, the special case of  $s = 1$  gives the Lebesgue measure. It turns out by a relatively easy proof that for a fixed  $F$ , there exists a special value  $s$  such that  $H^t(F) = 0$  for  $t > s$ , and  $H^t(F) = \text{infinity}$  for  $t < s$ . At this special value of  $s$ , which we call the *Hausdorff dimension*, the  $s$ -Hausdorff measure of  $F$  may be 0, infinity, or some positive finite value.

Hausdorff dimension is extremely useful for examining sets of “weird” size, like the Cantor set. The Lebesgue measure of this uncountable set is 0, which in a way tells us that there are a lot of points, yet not a lot of points. In this case, the Hausdorff dimension corresponds to the “dimension” I described in my article “The (approx.) 1.585<sup>th</sup> Dimension”, so that the Hausdorff dimension of the Cantor set is  $\log 2 / \log 3$ , approximately 0.631. This corresponds to the notion that it's “more than” isolated points, with dimension 0, and “less than” a whole line, with dimension 1.

However, there's a problem with Hausdorff dimension — Two sets may have differing characteristics which we may want to distinguish, even though the Hausdorff dimensions are equal. We thus introduce a variant on this notion of dimension, known as dimension print. We now restrict our  $\delta$ -covers to be rectangles (sides not necessarily parallel to the axes). For a rectangle  $U$ , with side lengths  $a(U)$  and  $b(U)$ . Without loss of generality, we will require  $a(U)$  to be the larger of the two (or the same, if  $U$  is a square). For  $F$  a set and  $s, t$  non-negative numbers, we define

$$H^{s,t}_\delta(F) = \inf\{\sum_i a(U_i)^s b(U_i)^t : \{U_i\} \text{ is a } \delta\text{-cover of } F\}.$$

As before, we can get a measure, call it the  $s, t$ -Hausdorff measure by letting  $\delta$  go to 0:

$$H^{s,t}(F) = \lim_{\delta \rightarrow 0} H^{s,t}_\delta(F).$$

In the special case  $t = 0$ , this is just the variant of  $s$ -Hausdorff

measure where only rectangles are allowed, which turns out to be equal to the usual  $s$ -Hausdorff measure. We get a notion of “dimension” the same way we did for  $s$ -Hausdorff measures, to get the dimension print, except we get a region of points instead of a single point. You may notice that its intersection with the  $s$ -axis yields the Hausdorff dimension.

The Cantor set, which is formed by removing a proportion  $1/3$  from the middle of each interval on each step, will have Hausdorff dimension  $\log 2 / \log 3$ , as mentioned. It is not too difficult to show that the middle- $\lambda$  Cantor set (obtained by removing a proportion  $0 < \lambda < 1$  from the middle of intervals) will have Hausdorff dimension  $\log 2 / \log(2/(1 - \lambda))$ , so that conceivably we may construct Cantor-like sets of dimension  $3/4$  and  $1/2$ . You can also show, after some work, that the Hausdorff dimension of the product of two Cantor sets of dimension  $3/4$  is  $3/2$  (this set is dust-like), and the Hausdorff dimension of the product of a line segment (dimension 1) and a Cantor set of dimension  $1/2$  is  $3/2$  (this set is stratified). (In general, the Hausdorff dimension of a product is at least as large of the sum of the Hausdorff dimensions, but this is not always the case). Now comes the cool part: the dimension prints are different for these sets. I'll invite you to try it out yourself, since a rigorous proof here will waste too much time and space.

**Vince's problem of the issue:** For a straight line, solid square, circle, dust-like Cantor set, or stratified Cantor set, the dimension prints are convex. Find a set whose dimension print is *not* convex.

Vince Chan

v2chan@student.math.uwaterloo.ca

## Software is NOT a Cult

My friends in Arts keep telling me that Software Engineering, as well as most other types of engineering, are cults. I tell them that Religious Studies is a waste of paper.

See, SoftEng is far from being a cult. We don't even chant the following hymn, based on the hymn Jerusalem, at each and every one of our class seminars:

And did those keys, in ancient times,  
Strive to make code so bountif'ly  
And did that code of which I made,  
Always did compile so readily?

And were the docs well specified?  
And were our tasks well understood?  
Then why is my new code failing here  
Where all my programs once withstood?

Bring up a shell, so I may code!  
Bring me some coffee! I may tire!  
Bring not a mouse to my text-based home!  
Show me the code that I desire!

I will not cease, due to my fright,  
From fiddling with my old Makefiles,  
And I will comment out large blocks of stuff,  
Until this code again compiles.

ImpulsED

# Ask the Panda

*Not-actually-certified life advice*

It's been a long time since this panda has written anything for *mathNEWS*, but he blames it on the difficulty that is life in a different city, and what is supposedly a job. With so little time to cook, mathCook is going on hiatus until he starts making food again. (To the one person out there who actually cares: Don't cry, talk to me instead!) Instead, Dr. Panda is going to offer your life advice. What kind of advice? Pretty much anything you can think of. I can't guarantee my answers will be the best you can get, but I will guarantee that they are the best I can give. That being said, here's the first batch:

*My parents have been nagging me over what I'm not interested in. I tried my best to tell them that I don't appreciate them telling me what I should and shouldn't do, but they don't listen. What should I do?*

*-concerned child*

The woes of being caught in between being your parent's child and your own (wo)man. I can't say from experience since I am not a parent myself (Though, does being a much older brother count?), but your parents nag you because they care about you. In most cases, they want you to grow up without making the same mistakes they did at your age. (Most of us will anyway) This is especially difficult if you are of immigrant culture, as your parents may simply just "not understand" your plight. No matter what the reason, though, the nagging will only really stop if your parents are able to see you as being mature enough for them to no longer have to worry about you. (or, for you to make your own mistakes) That means, and is not limited to, you're going to want to respond to your parents like adults. No screaming at them when they nag. If you live with them, help out around the house. Show them through your actions that you are perfectly capable of taking care of yourself. And if you so wish, sit them down and calmly explain that to them. Then take a breather, because you'd want to hear their side as well, why they nag you and such. There is no way you can get out of the nagging successfully until you've at least heard their reasons for doing so. (And I'll bet you dollars to doughnuts that it's one of the ones I outlined) Acknowledge their reasons, share yours and perhaps come to an understanding that you are an independent adult, and you do want to try your own paths and take the growing pains with it. They'll understand.

*How do I get the very good-looking oblivious guy to make a move and show me that he is actually interested?*

*-some girl*

See, here's what I don't get in this social paradigm of dating. Why is it the onus is always on the guy to express his interest, even if the feeling is mutual? (I'm not assuming it is, I'm just generalizing) As the Globe's columnist Russel Smith notes, there is no bad way to ask a guy out. In fact, I think it's stupid that a guy's supposed to be the one doing the asking, especially if the girl's interested. If the fool is too oblivious (or uncertain if he should ask), by all means make the first move. Perhaps that kind of guy needs a girl to play alpha to his beta. You go, girl!

*"How do you get over someone who is gone forever?"*

*- In mourning*

That really depends, doesn't it? Depending on how close you were to the person, I'd estimate the time taken to be anywhere from a week to never. The initial shock of losing someone is truly a depressing moment, and you have my condolences. That said, the best way that I have found of getting over the past is just that, recognize that it is in the past. It'll take time, but try to distract yourself by partaking in activities that you enjoy(ed) so you won't wallow in your own tears as often. That's not to say crying is counterproductive: I still believe that you should let it all go at some point, either privately or with someone you feel comfortable with. However, once you're all cried out, pick yourself up and move on. Think about it this way: Whoever it is would not want you to be miserable because of him(her). While their passing probably has shaken your foundations and made you recognize mortality, you also need to realize that you are still living, so do just that. Live! Make the most of the rest of your life. Honour their memories, their lessons and their lives lived, but don't let it drag you into the mud. It's all a mentality issue.

*My boyfriend and I have been becoming distant from each other. I feel that he's losing interest in me, and I'm not sure what I should do. I still like him very much, so it's really hard for me to actually break up with him. What should I do?*

*-confused girlfriend*

I think first and foremost, I must insert the disclaimer that I am in fact not an expert on relationships. It's not to say that I'm a stranger to them, but just remember any advice dispensed is just one Panda's take on the world. That being said, you have a few questions you have to sort out for yourself in this pickle. Firstly, do you actually like your boyfriend? It's a serious question. There is a distinct difference in liking your boyfriend as who he is, versus liking the idea of being in a relationship with him, versus liking the idea of being in a relationship, period. Make sure you can dissociate the three before proceeding. Next, why are you becoming distant? Work? School? Just general disinterest? It's unavoidable that interests will wane over time, but what matters is whether or not the parties are willing to rekindle that interest or just call it quits. Find out. Talk to him about it. Communication is key, after all. If he confirms or avoids your questions, then take that as a sign as it's over. End it and move on, it's no use pining for someone like that. Plenty of other bamboo shoots in the forest, so my mother used to say\*. On the other hand, if the guy was truly oblivious to what he was doing to you, talking will wake him up. Win-win situation!

If you have any questions or just want to rant or a different view on things, somehow magically get your concerns to me and I'll try to answer them to the best of my abilities. This not cooking thing is kinda neat, actually.

\*Mother never actually said that

Dr. Panda



## profQUOTES

One of the dangers of C++ is that you can get arbitrarily silly in your abstractions.

McCool, CS 488

It's all about the pretty pictures.

McCool, CS 488

We're going to put your pictures in our gallery. Maybe. If your project doesn't suck.

McCool, CS 488

My office is DC... uh... something. Well, it's some combination of these digits.

Ben-David, CS 489

The more you slow me down, the less material there will be on the final.

Ben-David, CS 489

I'd better stop ppunning.

Hoffman, PMATH 360

Every papaya inside this amoeba is tasty, and every papaya outside this amoeba is not tasty.

Ben-David, CS 489

We don't know what the distribution of pretty girls is in the universe.

Ben-David, CS 489

We talked about that last time. At least that's what I thought I was talking about.

Ben-David, CS 489

After 50, no pickup line will help you.

Ben-David, CS 489

Those of you that hate stats already dropped the course. And now I'll make the rest of you drop the course.

Ben-David, CS 489

I don't walk towards you and say "Oh my god! You're getting bigger and bigger!"

Greenaway, PSYCH 101

I'm sorry, the number you have dialed is imaginary. Please rotate your phone 90 degrees and try your call again.

Orchard, CS 370

You have Google. Why spend \$150 on a textbook?

Shen, ECE 418

Now this looks wronger...

Lopez-Ortiz, CS 240

Generally speaking, the block decomposition is more general.

Haxell, MATH 239

How many people think yes? [a few hands go up]

How many people think no? [no hands go up]

The rest of you are not thinking.

Haxell, MATH 239

Your Profs

## You can Know Big Words and Still be an Idiot.

So in the most recent issue of *Imprint* (Vol. 32, Issue 2) Ted Fleming's article entitled *Vernacular Stimulation* once again was an inefficient attempt to make fun of *mathNEWS*. Not that I'm terribly impressed with the quality of *Imprint* these days, but you know there's something arrogant about the title especially when a simple search in a thesaurus can come up with the title. Mr. Fleming decided to take a shot at *mathNEWS* stating that the word 'scienced' is "... typically directed towards MathNews wirters who have one again gotten their facts wrong, backwards, or negative, if that is even possible." I find the best way to call someone out for making mistakes is not to make one in the fucking process. It's *mathNEWS* not MathNews. It's a proper noun, capitals matter.

I find it also very strange that *Imprint* of all publications complains about getting their facts wrong as I have found *Imprint* to be a publication which not only gets facts wrong, but doesn't generally have the decency to admit to it afterward. Correcting mistakes from a newspaper is typically a good source of credibility. Which is why I usually regard *Imprint* from underneath my ass as toilet paper. On several occasions *Imprint* has reported incorrect facts, been called out on them and nary an apology nor correction was printed. *mathNEWS* at least tries to correct mistakes. Guess we've one up'd you, *Imprint*. Which has to hurt considering that you're a fucking newspaper and we're not.

In Vol. 31, Issue 28 in the article *After the Math*, writer Ryan Webb referred to current Math Senator Ajnu Clare as a male despite being very much a female. She received an e-mail apology; however, no written apology or even correction appeared in *Imprint*. In Vol. 30, Issue 26 Adrienne Raw wrote an article entitled *Infusion Centre offers Backstage Pass* where in one Julian Spillane was called an alumni. This isn't true as he discontinued his studies to dedicate his time to his company. I'm not even going to go into detail about ridiculous article in Vol. 30, Issue 31 written by Sherif Soliman called *This... is your Mac on Windows*.

In conclusion: *Imprint*, you are the pot calling the kettle "cow" and expecting a fucking response. Mr. Fleming, the next time you want to call out *mathNEWS* for being incorrect, get your facts straight and you may seem less like an idiot. If I wore lipstick, I'd slather some on my ass, sit on a copy of this *mathNEWS* and hand a copy over to you proclaiming "My ass just kissed YOU!" Lastly, if you are going to insult *mathNEWS* do it well! This is the third person whose weak arguments have been torn to hell because they think that they have something intelligent to say against *mathNEWS*. *mathNEWS*! Not even a real newspaper. We rip into people for fun!

Angelo

## CONVERSATIONS WITH MATHSOC



## A Week Late from the Apple Keynote

*The true purpose revealed!*

This is intrepid *mathNEWS* reporter 42, reporting Slightly-After-The-Fact from San Francisco! Who says volunteering for *mathNEWS* only pays in pizza? The editors, that's who. I had to slog myself all the way to the Bay Area and I don't even have an expense account to show for it. The only reason I'm here is ... [long self promoting diatribe cut for length]... and that's why giraffes have spots. Anyway, enough about me, on to the keynote!

In svelt Apple style, absolutely nothing went wrong at the keynote. Every detail was planed and executed to perfection. Sure, the balloon didn't inflate for that one demo, but in reality, they didn't have a gas cannister connected to that tube. Just like they planned.

But why would they plan such a nefarious happening? The reason is simple my dear reader. To distract you from the true purpose of the whole conference. To bring Steve Jobs back to proper health!

Prior to the keynote, they had all attendees stand around the building under the pretense of lining up to enter the keynote

chamber. However, This *mathNEWS* reporter would not be fooled! The line of 5000+ devs wrapped around the building in it's entirety. Naturally, we were talking about Apple and it's products. The formation of the devs and the low malevolent hum of "Apple" in the air were clearly the main channeling ingredients for a ritual!

Working under this hypothesis, I set out to explore after the keynote. I found a hidden passage in Moscone West that led directly under the room of developers. Clearly this was the entrance to the main ritual chamber where Jobs was being healed.

We may not know for some time if Jobs is back to perfect health, but this writer beleives that the attempt would have been spoiled by those not pure of heart. Which may or may not include me.

Oh no, I shouldn't have been writing this while still so close to the location of the ritual, they're coming after me, must send in article before it's too late!

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may not be pure, but thinks the new features are rather nifty!

## Several Lessons Learned from my First Co-op

*Some good, some bad, mostly pointless*

So, I've been on Coop for the past month, largely explaining my lack of any writing since last term ... but now I've decided that it's four in the morning and *mathNEWS* needs me! And so I decided I'd create a record of the pointless things co-op has taught me that Waterloo tends not to mention

### *I use more self taught skills than class taught*

Seriously, the first thing I did on the job was get handed a book on perl and told to parse some files. Maybe it was a bit more clearly specified than that, But either way, all the CS I did in first year has amounted to about half as useful as one article on Regular Expressions posted in *mathNEWS* last fall (Thanks Thor!) So for any of you looking for an excuse to read *mathNEWS* and slack off, go for it! (Sector\_Corrupt can not be held responsible for any sudden increases to your failure count) Oh, also had I not spent several months getting extremely comfortable with Linux, I'd also have been fairly screwed, so if you are still using the monstrosity that has the gall to call itself an "operating system", Windows, take some time to learn a command line that doesn't suck.

### *Money is Awesome!*

Having lived off the Student Budget (attending coop sessions and presentations that offer free food) I forgot exactly how awesome a wallet with those paper things with people and numbers on it are simultaneously sexier and less heavy than those shiny metal things. There really isn't anything I can teach you here, I'm just reminding you that money is awesome and doesn't it suck to be a poor student again?

### *Cooking for yourself is hard*

Seriously if one more chicken breast fires flaming oil in my

eyes, I'm going on a worldwide chicken massacre and I won't stop until the Zombie Apocalypse (scheduled sometime next Thursday). If anyone asks, I'm preemptively ending any new epidemics of avian flu, since we're sick of flus from animals

### *Cambridge is really boring*

If you needed an excuse to feel sorry for the Architecture students, take a fun-filled trip down to Cambridge. It's almost as fun as PDENG! (... yes I'm a Softie.)

### *PDEng Sucks*

For those that don't understand how much PDEng sucks, just imagine a flaming hot multibladed instrument shoved into your eyeballs. Now imagine what kind of experience would make that seem like a decent alternative. Whatever experience you thought of? That's the one you'd STILL choose over PDEng.

### *I miss Waterloo*

Seriously, for a school that haunts my dreams with calculus classes from hell and a general "We will spit you out like the feeble peon you are" attitude they have towards that whole "giving me marks and letting me pass things" concept, I sort of miss going to class and seeing my friends. Plus, seriously, I miss free pizza from *mathNEWS*, I'm writing this right now for no compensation whatsoever (uness an editor would be so kind as to send a poor offstream editor a pizza?) [ *Your pizza is in the mail, please allow 8-10 business for delivery — StaticED.*]

So, in conclusion, co-op is sort of lame but that's why they pay me money instead of taking it all away, I want pizza, and I really don't want to go to work but I have no choice so oh well. C'est la vie.

Sector Corrupt

## Opposition Plans to Topple Government

*Canada could be in an election as early as next week*

Opposition parties in the House of Commons may bring down the government as early as next week, as the government is scheduled to report to Parliament about the Canadian economy.

All parties have made it clear that the campaign issue will not be the economy, Employment Insurance, or the \$50 billion deficit. Instead, the babies who call themselves parliamentarians have said loud and clear that this election will all come down to which party is the better whiner.

Liberal Whiner Michael Ignatieff took some time last week to whine about the state of the economy. He says that the government is not spending enough to pull Canada out of this recession, while at the same time saying that the size of the Canadian deficit is unacceptable. We asked him if he had a plan to deal with the economy, to which he answered, "Harper is incompetent!"

At the same time, secret government documents left in the *mathNEWS* offices last week show that Conservative Head Baby Stephen Harper is going to whine about the opposition not letting him get his way. One passage, written in Harper's own handwriting, reads, "It's not fair that the libsh\*ts can take my job away from me! I want my mommy!" As per usual, all calls to his office went directly to his loud and annoying voicemail.

Jack Layton, Lead Cryer for the NDP, is continuing to make noises that can best be described as an incomprehensible temper tantrum. When asked if he can whine as loud as Ignatieff or Harper, Layton let out a huge shrieking cry that broke yet another window in the House of Commons foyer.

If a federal election is indeed called for the summer, Canadians are expected to spend about \$300 million to tell our MPs to spend less time whining and more time actually doing stuff. However, it is widely expected that they will not listen, and will simply continue making noises that can best be described as a hungry toddler.

InsideR

## It's Okay to Assume

One thing that bothers me is when people have problems with assumptions. Hilariously, they assume that all assumptions are bad, which is an assumption in itself. Assumptions are a way for us to simplify things, especially when we notice a trend. Which brings me to my comment: it is not insensitive to assume that people are heterosexual. Let's assume that I meet a male and have a conversation with him. Then I ask "Do you have a girlfriend?", I argue that it is not insensitive to ask this question.

Assuming that the male I meet is actually homosexual, I would expect some response similar to "I'm gay and have a boyfriend" or just "No" since that would answer the question. By saying anything other than "No" means that the male has assumed that I wanted to know anything other than whether or not he current has a girlfriend. It also doesn't assume that he's a polygamist in which case the answer is also "No" since he doesn't have a single girlfriend, but he has several.

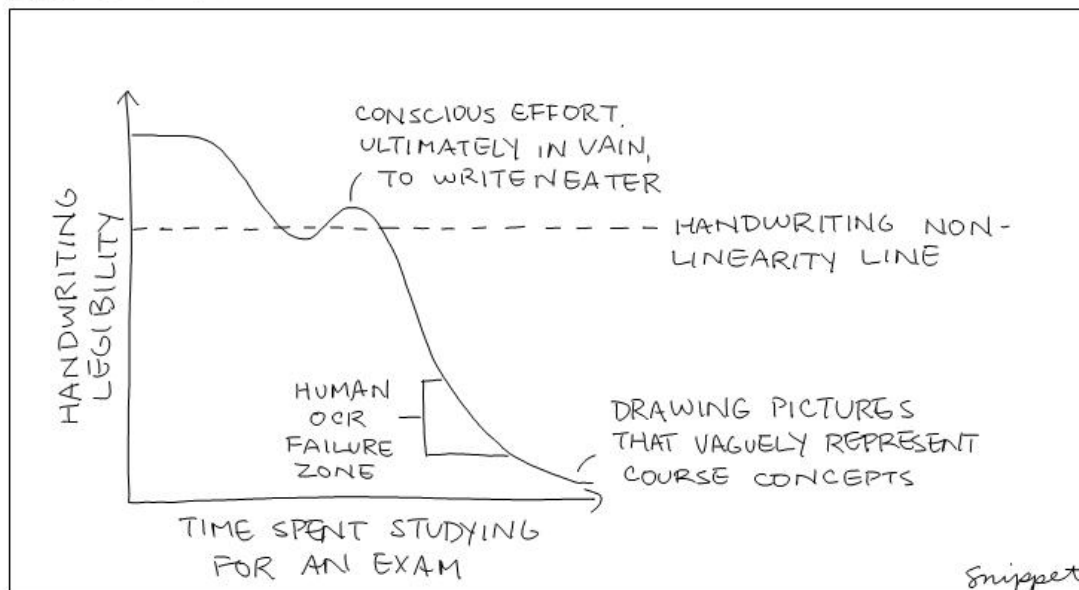
Now, the most generous estimates of non-heterosexuals that I've seen is 12% of the human population. Assume that this is the actual value. Now assume you that have a file which will work on 88% of all computers. If you see a random computer, you will assume that your file will work on that computer since the majority of computers are compatible with your file. It's only logical. You can accept that when the file doesn't work, that this is one of the computers which it doesn't work on, but the expectation is that the file is going to work.

In artificial intelligence, many methods involve a form of participation for classification. In these cases, predicting future cases is done by taking a majority poll of some form. If the majority is heterosexual, then guess what? The prediction will be heterosexual.

Everyone makes assumptions. I find most people say that assumptions are bad. I think assumptions are a great tool to help simplify complex decision making. We make assumptions all the time, but there are only certain ones which are considered acceptable. The trend that I've noticed is if it is an assumption which contradicts something a politically correct zealot would enforce then it's the bad kind of assumption.

Angelo

## LEGIBILITY





## Drywall

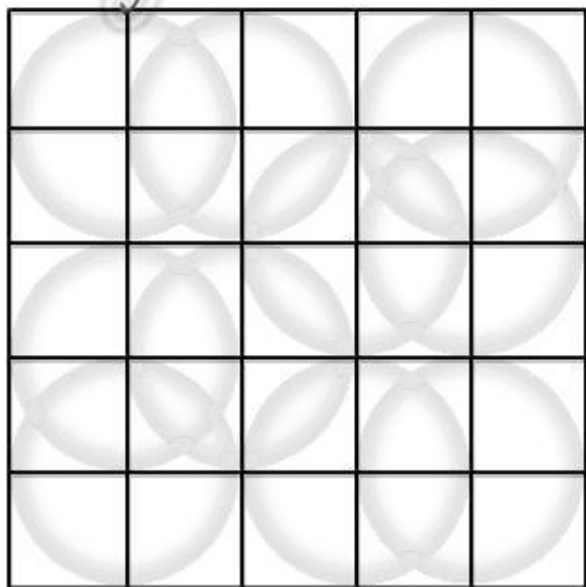
"Listen up. Our client isn't picky, as long as each square has the right number of walls surrounding it. Sounds a little tricky, but we didn't get to be the #3 drywall outfit in town by being lazy."

Also:

- There's a wall around the outside
- They want exactly 18 rooms

4	4	2	2	2	1	1	1	2	4
2	3	2	2	2	1	0	0	1	3
2	2	1	1	1	2	1	0	1	2
2	1	0	0	0	1	1	0	1	3
3	1	0	0	0	1	2	1	2	3
3	1	0	0	0	1	3	3	4	3
2	2	1	1	1	2	4	3	1	2
2	3	2	1	2	2	1	2	1	1
2	2	2	1	2	1	0	1	2	2
3	2	2	2	3	2	1	2	3	3

## Umbrellas



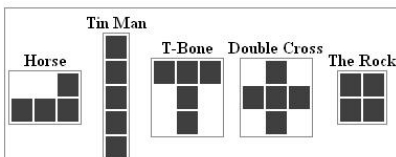
Place the following 10 squares on the 10 circles so that the overlapping numbers match up.

3	1	9	9	2	3	8	4	5	5
5	2	4	8	6	5	4	1	0	3
2	0	4	8	3	9	0	3	0	4
9	5	1	9	0	4	5	9	2	9

## Sight

The precious 10x8 grid that we call home has been infiltrated. Signals intelligence tells us that the following agents are somewhere nearby, all they can tell us about their locations is

- How many squares in a row or column are occupied
- They've been ordered to disperse so they aren't touching, not even diagonally.
- Remember: they can rotate.



									1
									1
									3
									3
									2
									2
									4
									2
									3
									2
5	3	1	3	2	4	3	2		

## Snippets you Missed at E3

*Because the media is socialist*

- A new episode of the Lego franchise: Lego Gears of War.
- A Nethack movie has been announced, with Charlie Sheen playing the role of the Ampersand.
- Microsoft unveils a deal with Kink.com to allow free downloading of porn to Gold Members of Xbox Live.
- George Lucas has unveiled a LOTR-Star Wars Crossover game. "Vader! You shall not pass!"
- Nintendo is planning to kill off all but the 150 original Pokemon.
- Also, to not be outdone by Project Natal has developed mind powered video games. Mind control is on the way.
- Steve Jobs made a guest appearance to unveil games made exclusively for Mac. Unfortunately, nobody cares.
- With Sims 3 flying off the shelves, EA brought up the idea of Sims 4, where each sim is actually a minimum wage employee living in a third world country.
- Ensemble Studios released a gameplay trailer for Age of Empires 4. Two men sitting on opposite sides of the world holding fingers over red buttons.
- Last but not least, we still have yet to see the appearance of a girl at E3 who was not brought there under threat of force.

Tbor

## MCTF is not Happening this Sunday

*Especially not at 11:59pm in Comfy*

Two weekends ago something most certainly did not happen in the MC on a Sunday night and we were fine with that. In fact, we are so fine with it that:

We are once again not affirming that MCTF does not in fact not happen, and this absence of existence is most poignant this Sunday at 11:59pm in front of the Comfy.

We cannot deny that there will not be any kind of Capture the Flag type events played in the MC at the especially specified time shortly before Midnight on Sunday. The mere concept of such a thing is patently silly, and there is absolutely no need to turn up at the Comfy to be certain of their non-existence.

Sincerely,  
Not The Management

Puzzles courtesy  
of euri.ca