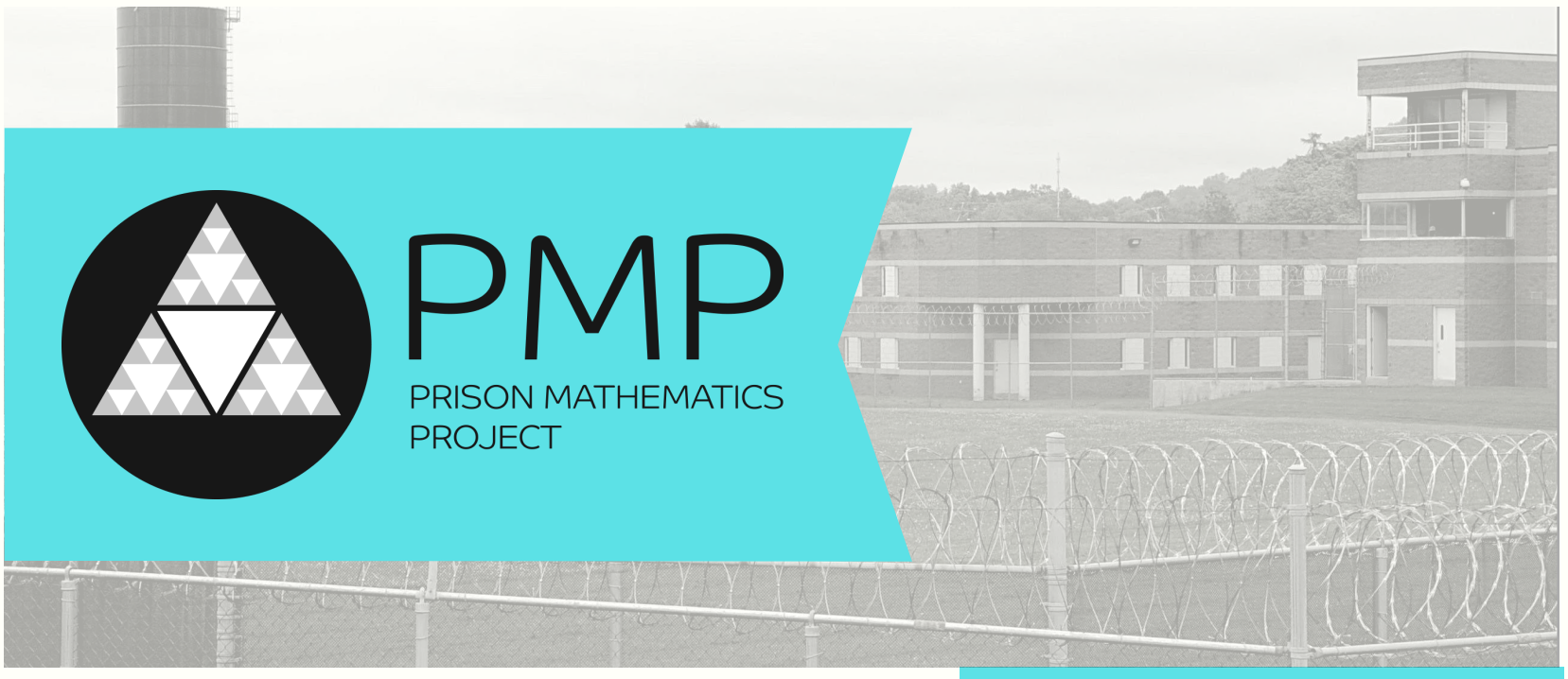
2021 VOL. 1

The Prison Mathematics Project NEWSLETTER

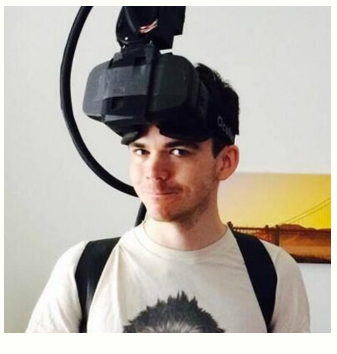


THE NEW PMP NEWSLETTER

I am really happy to welcome you to the PMP's brand new newsletter! My name is Jack and I'm currently acting as the PMP's Executive Director; I'm filling in until we can find a top class person to take things to the next level.

No one helping with the PMP currently gets any salary or compensation. Claire Finlayson conceptualized and spearheaded creation of this newsletter, putting in a huge amount of work and care - and she doesn't even like math! She and others are helping because they are inspired by Christopher's vision and want to help the PMP make a difference for our participants.

The most fulfilling things we receive are your letters giving us feedback & appreciation. So keep them coming, and let us know what you like and don't like about our first newsletter. We're listening!



JACK SMITH

(Acting) Executive Director
The Prison Mathematics Project

IN THIS ISSUE

VaneSSa

Do numbers freak you out? Does math send you into meltdown-mode? Are you wondering why we need to learn this stuff ANYways?! Don't worry, The Math Guru is here to help you work through your math trauma, one problem at a time. Ask for advice, guidance, or just a good ol' pep talk! You got this!

ASK THE MATH GURU

by VaneSSa Vakharia

Hellllllo math lovers, math haters, and EVERYone in between! I'm excited to be a part of the first ever PMP newsletter. I wanted to take a sec to introduce my column, Ask The Math Guru, which will appear in every edition of the newsletter.

So wait, what is it and who even am I?! My name is VaneSSa, I'm known as "The Math Guru." When I was in high school I wanted to be a rockstar & didn't give a sh*t about math. As a result, I failed Grade 11 math TWICE before I had an amazing teacher who convinced me that there was NO such thing as a "math person," and that even rockstars could be good at math! I ended up kicking butt in math from that moment onward, and made it my mission to spread the mathlove far and wide. I want to help everyone on the planet realize that they are capable of ANYTHING - even math:) Oh, and I'm actually IN a rock band now...which I started myself!

This column is a space for YOU, the reader, to write in and ask me questions to help you along your math journey. Maybe you want to know how you can get over your math-phobia. Or maybe you want to know why we even need math in real life. Or MAYBE you're wondering whether or not math geniuses actually exist! ☺

Got questions? I've got answers!

PS Always remember: there is NO such thing as a stupid question!!!

Incarcerated people can direct questions for me to:
Prison Mathematics Project (VaneSSa)
10810 N. Tatum Blvd Ste 102-998,
Phoenix, AZ 85028

Until next time,
peace, love & pi
VaneSSa

CLAIRE FINLAYSON

Well, *someone* has to keep these math geeks in line and jump on every little spelling mistake...

I'm a writer from BC, Canada, so don't try to bust me for using British spelling, like "cheque" and "colour," okay? Although my math skills are rudimentary, I am a huge fan of the PMP and I want to help. I'm a storyteller at heart, and it's the people behind the project that interest me. So I'll be writing profiles of participants and volunteers and others involved in this program. If there's someone you'd like me to spotlight, here's how you can contact me:

- Via my website: www.clairefinlayson.com
- Via email: claire@finlaysons.ca
- Via snail-mail: *Prison Mathematics Project, 10810 N. Tatum Blvd Ste 102-998 Phoenix, AZ 85028*

SPOTLIGHT ON PARTICIPANTS

by Claire Finlayson

For the first edition of the Prison Mathematics Project newsletter, I'm interviewing Marshall Byers, an inmate at Monroe Correctional Complex in Washington State and a volunteer dog trainer with Summit Assistance Dogs.

CF: Marshall, can you introduce yourself to our readers? Tell us a bit about the essential Marshall-Heck-Yeah-Byers.

MB: I have a sunny disposition. I absolutely love collaborating with highly effective people with unwavering belief in translating their dreams into reality, and helping others find their purpose. I live memorably, studying content that feeds my soul, following my heart's desire. I enjoy training service dogs for people with mobility issues. Seeing my efforts translated into added value in another person's life is beyond fulfilling and meaningful. I've overcome significant self-destructive behaviors. Hard work and self-development have yielded extraordinary results in my life.

CF: Whoa! Talking to you is like staring into the sun! The PMP must have played a part in all this. I'm interested in how you got involved.

MB: I became involved with the PMP after I ran out of excuses. Just hearing the word "MATH" caused distress, anger, hot flashes, and extreme tension. I've strenuously avoided math for as long as I can remember, until I met Christopher Havens. Once I surrendered to a new life full of beautiful possibilities, I became open to learning —but I realized I needed help. Since then I've earned a business degree, willingly attended math classes, overcome math anxiety and gained some much-needed confidence. Now I'm even

able to help others, which still causes me to pause at the wonder of it all.

CF: That's incredibly inspiring, Marshall. Christopher says you were the worst case of math anxiety he's ever seen! 😵 So you've come a long way…

MB: Yes, embracing education has been very nourishing and freeing, but more importantly, it's created hope for my future and success for living a life beyond the ordinary—even now.

CF: I understand that the PMP process pairs an inmate on a "math path" with an outside mentor. How do you choose your mentor?

MB: You complete a short bio about yourself, say what your math goals are, where you are in your math maturity/skill level, personal interest, and life goals.

CF: Ah, so the mentor reads the bios and makes a request to work with a specific inmate if they think the two of you will be a good fit?

MB: Exactly. PMP participants have no access to the internet, so communication can be slow at times; however, while you're waiting for your next letter to come in from your mentor, you're working on self-guided homework. For example: my mentor, Luke, sends me math that he finds interesting, and he shares the peaks and valleys of his life, along with anything I've asked to learn or problems I'm currently stuck on. More importantly, the outside connection/pro-social environment creates a sense of belonging, hope, and community.

CF: I see. So it's really about so much more than the math, isn't it! Can I ask, when will you be released, and what are your aspirations for life on the outside?

MB: My official release date is June 24th, 2021. I've been accepted into Bellevue College—I start this fall. The goals I've set for myself: Complete my Associate Degree, then move on to the University of Washington to earn a BA in sociology, while becoming an entrepreneur in the business of life coaching and motivational speaking. At the same time, I will building a positive reputation as a productive citizen in my community and set a healthy example for others getting out of prison that success is possible. More importantly, I will be involved with my kids, adding value to their lives.

CF: Sounds like you've got a clear path mapped out. Do you think your participation in the PMP has helped you? In what ways?

MB: Yes, yes, yes, my association with PMP has helped me tremendously. I'm like a puppy that can't stop wagging its tail! I have the courage, resilience, and confidence now to face any challenge, along with a rich and beautiful life. I've acquired skills like critical thinking, self-discipline, strategic goal setting, and leadership. My greatest success isn't what I've accomplished, it's who I've become.

CF: What would you like to see for the future of programs like the PMP in prisons?

MB: I would like to see much more academic immersion with future programs like the PMP—a more comprehensive look into the possibilities where one can go in life and what one can achieve during and after prison because of programs like the PMP.

CF: Noted. Thank you so much, Marshall.

MB: What a life I get to live! It's not one day that changes your life—it's EVERY DAY.

CF: Ha! You're a motivational speaker already! I'd say "best of luck on your release," but I don't think luck has anything to do with it. More like hard work, perseverance and a positive attitude.

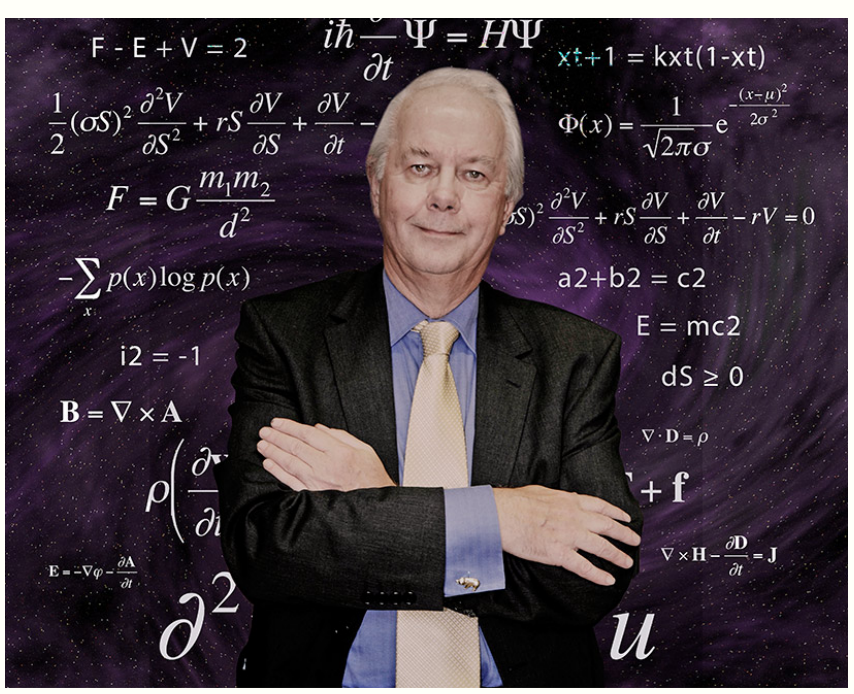
😎

CHRISTOPHER HAVENS

A MISCREANT'S MISCELLANY

by Christopher Havens

CH: Greetings readers! Today we get to pick the brain of a very special guest, Ian Stewart. Ian, it was certainly a pleasure having you with us for Pi Day 2021! Why don't we just start with your reflections on the day. Can you tell us a bit about your experience?



Prof Ian Stewart FRSH
Mathematics Institute
University of Warwick
Coventry CV4 7AL
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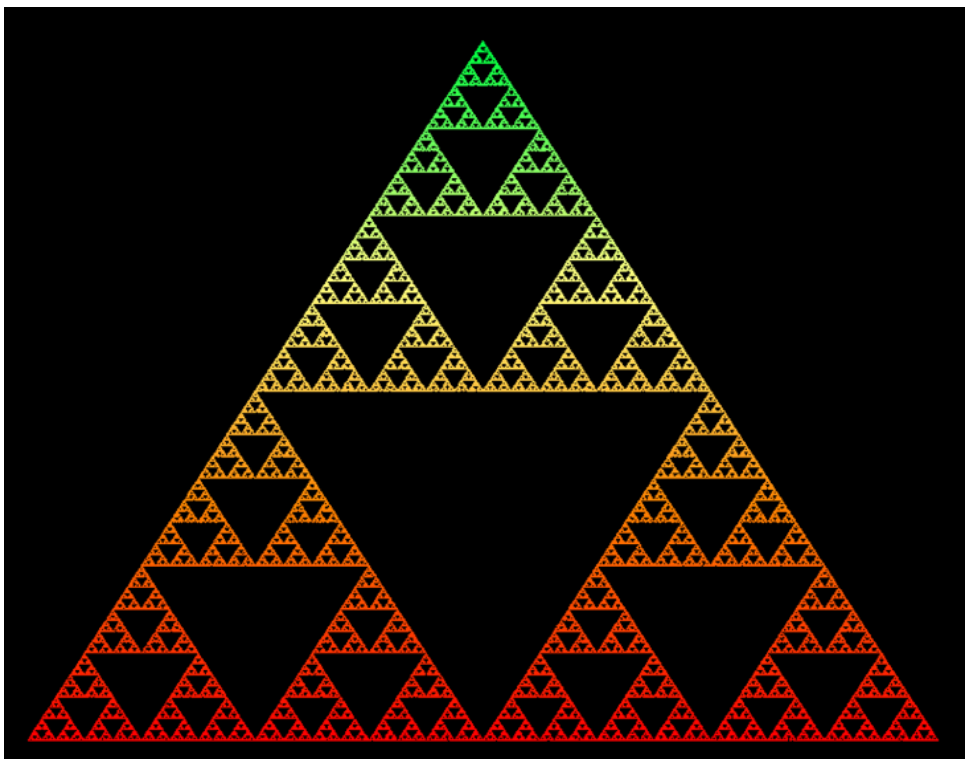
IS: This Pi Day event was special for me in several ways. The most important was the audience you're primarily aiming at--people in prisons. In the past I've had letters from two people in prisons one to ask for mathematical advice, and one to send me his work. But I've never before had the opportunity to address that particular audience in larger numbers. It gave me a chance to do something positive to help people in difficult circumstances who are trying to rebuild their lives. That has to be good. And, of course, anyone can view the event on the web, now, so I've been able to reach people who would probably not have read my books or watched previous videos. Anyone popularising anything always likes to reach a new audience.

I enjoyed the opening presentations and the quiz. Very lively and ingenious. I got a few questions right, but some were beyond my ability to do instant mental arithmetic, and my guesses were often wrong.

It was fun putting my presentation together. It was based on an article I wrote many years ago, but while I was putting it into PowerPoint I had some new thoughts. Whenever you try to explain math to others, you start to think more clearly about it yourself. In fact, a great way to understand something you're a bit unsure of is to try to explain it to someone else. Well, it often works for me, anyway. And what a marvellous surprise when Andreas Hinz showed up! I've not seen him since 1990, at the International Congress of Mathematicians in Kyoto, Japan. He's a very clever guy, and good company.

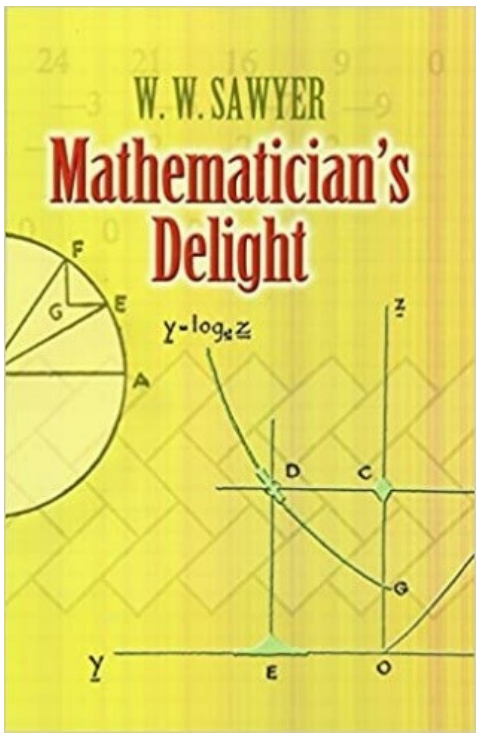
CH: I wholeheartedly agree that the act of explaining math can open up beautiful personal learning experiences. I often find that when I'm writing about a topic, I'll find new insights through researching and articulating it properly. Coincidentally, my last writing project was on the Sierpinski triangle, and if I'm not mistaken, your presentation was based on your article, "Four Encounters with Sierpinski's Gasket." I took a lot of inspiration from that piece. I spent close to two years on a writing project where I became obsessed with the gasket due to the fact that its simplicity is beautiful, yet the more you explore, the more you'll find, as it is a seemingly endless well of hidden facts. Can you tell us about the first encounter you had with the Sierpinski triangle and what it was about it that grabbed your interest?



IS: I first came across Sierpinski's gasket in a wonderful book called Riddles in Mathematics by Eugene P. Northrop. But in a way the story goes back slightly further. My dad worked in a bank, and one day, when I was about 12 or 13, he came home with a book he had found in the bank's basement. It was Mathematician's Delight by W. W. Sawyer, published by Pelican, the nonfiction imprint of Penguin Books. The Pelican books were a series of cheap paperbacks on a huge variety of topics. I enjoyed the Sawyer book and kept an eye open for other Pelican math books. I still own six or seven of them. The Northrop book was the second one. It's about mathematical paradoxes, fallacies and curiosities. One chapter is about infinity, and it includes Georg Cantor's discovery that some infinities are bigger than others, which still fascinates me.

The same chapter discusses some finitely complicated curves that we now refer to as fractals, such as the snowflake curve, which has infinite length but encloses a finite area, the space-filling curve, which passes through every point inside a square, and of course the gasket (though not referred to by that name), presented as a curve that crosses itself at every point. These, too, fascinated me. In fact, a couple of years ago I invented my own space-filling curve, which I would argue is simpler and more natural than any of the others-though not as pretty.

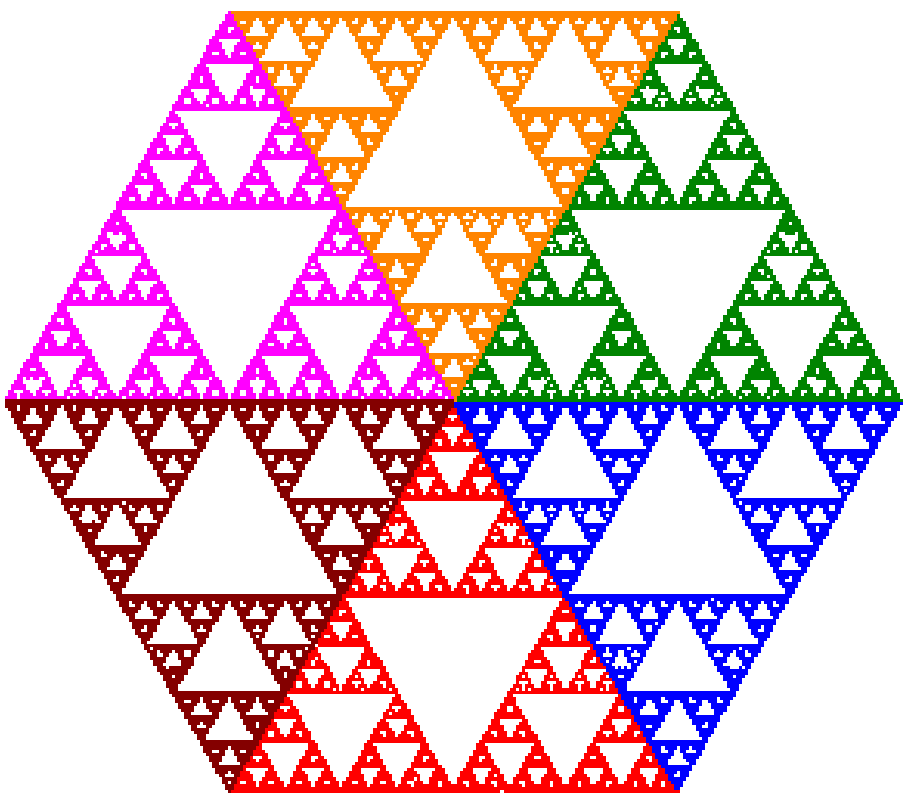
Incidentally, Northrop and Sierpinski both mention one feature of the gasket that I skated past, for lack of time. There are actually three points where the curve does not cross itself: the corners of the triangle. Northrop was astute enough to pay attention to this slightly pedantic, but necessary, point. He dealt with this by bending the triangle out of the plane to bring the three corners together. Another method is to distort the triangle, without overlapping itself, to achieve the same result — anyone reading this might like to work out how for themselves.



Sierpinski's ingenious way round this obstacle was different from both of these... but I'll leave it to you to tell us what he did…

CH: Aha! One plane Sierpinski pretzel, coming right up! Sounds tasty, but not very space-filling. Bad jokes aside, this brings back a fond memory the first time I read Sierpinski's 1915 paper on the curve for which every point is a point of ramification. Reading that paper constituted my first lesson in French, as I had to painstakingly translate every single word in its proper context. Sierpinski had used the gasket to achieve such a curve that crosses itself at every point, but back then he presented this using a hexagonal shape made using six gaskets. The Sierpinski triangle has always been a great source of aesthetic appeal.

Indeed, one of the things that draws me to mathematics is that I see it as the source of some of the purest forms of beauty. In what other subject can we capture this beauty so effectively and then express it in the form of human knowledge? To me, mathematics is about finding something not previously known to exist and making it mean something to others. Whether in the context of research or human connectivity, it's all the same to me. That's one of the reasons I've always loved the work you do, because you always find meaningful ways to present people with glimpses into a world that is so full of this beauty that I see.



I think we would all love to know what you see through the lens of mathematics. Can you comment on this?

IS: That's a very sweeping question! Quite a lot of my research involves making connections between 'pure' math and the real world. Probably the most accessible examples are the patterns with which 4-legged animals move their legs. We all know that horses walk, trot, canter, and gallop. But in fact there are at least 20 different gaits for quadrupeds. Some of them are very symmetric, others less so. When an animal trots, for example, diagonally opposite legs move in sync, but one pair is half a gait out of sync with the other.

I got involved with this because back in 1992 I made contact with Jim Collins, who was a biophysicist in those days, and we found a connection between gait patterns and rings of oscillators (things that can repeat the same behavior over and over again). After a while, several other mathematicians joined in, and we wrote quite a few papers, one in the journal Nature, which is hard to get into.

I find that this work has given me a different perspective on animal movement. Now, when I'm out for a walk, I watch how dogs move: "Walking.. now broken into a trot... Hmm, sniffing at something, not really moving in any regular way..." When I'm watching TV programs about elephants or lions or whatever, I often focus on how they're moving. So the math acts as kind of a mental lens through which I see the world.

This might sound a bit nerdy, but it doesn't make me any less sensitive to all the things most of us love about nature. It just adds one extra dimension to the experience--for me, at least.

There are lots of fascinating and beautiful things in the world. Many of them have deep links to math, and understanding those links can also add to the experience. Why do sand dunes take up such remarkable shapes? How do cats land on their feet if they start falling upside down? Why do tigers have stripes but leopards have spots? How does a rainbow form? (Forget the colors: the real puzzle is the shape!) Why are soap bubbles round? (Not always, of course, but if not, why not?)

I could go on, but that's the basic message. And of course even pure math has its own inner beauty. A clever logical proof, a neat connection between apparently unrelated ideas ... this is what drive most mathematicians to work in the subject. Many people think math is sterile and dull. If so, they've been looking at the wrong kind of math.

I promised you I'd say something about a new idea. So here's an apparently weird idea that connects up to some big research areas of pure math and dynamics. It's something anyone could think about, something I don't know the answer to. Some of the world's top mathematicians have thought about simpler but related questions and found deep results. However, it's easy to state and you can have a lot of fun messing around with it.
It's related to an old puzzle about a fly crawling around in a room shaped like a shoe box. What's the shortest path from the fly to a speck on the ceiling near a corner? With the right start and end points it crawls over five of the six flat faces - walls, floor, ceiling. You might like to dig that up on the web:
https://en.wikipedia.org/wiki/The_spider_and_the_fly_problem

This will at least make it clear what I'm talking about.
Imagine a cube - and mark its faces from 1 to 6, like a dice. Now consider a 'geodesic' on the cube. This is a line that runs straight across a face until it hits an edge. Then it continues on the other face, past the edge, as if you folded those two faces flat and just drew a straight line across the join. Keep going ... forever.

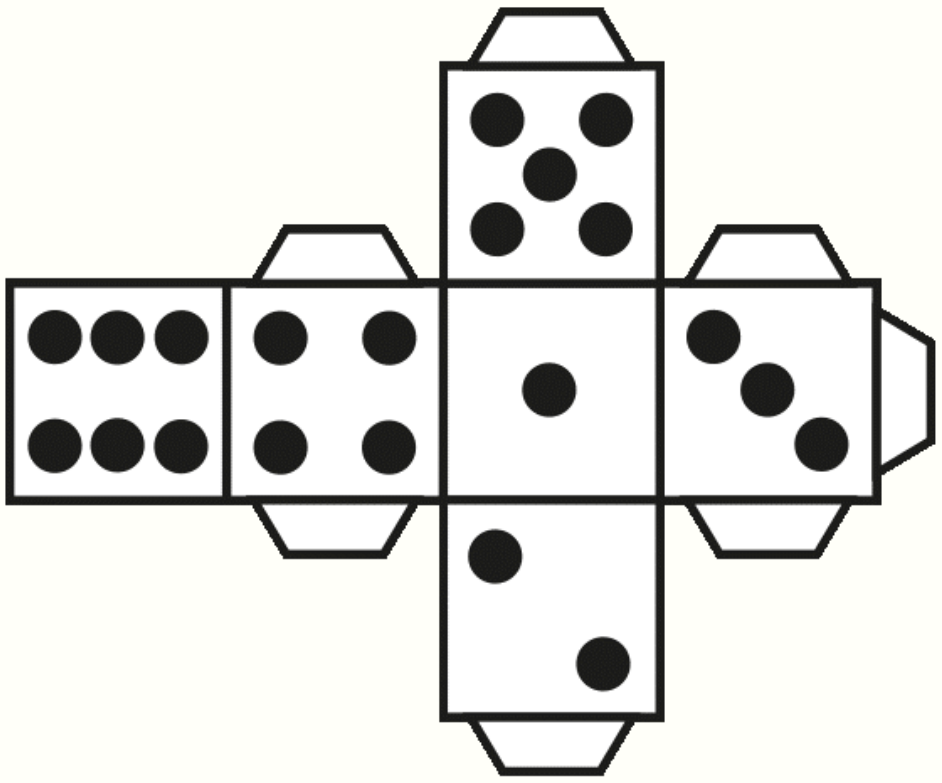
If you hit a corner, it's not clear how to continue. In that case, stop. There are infinitely many geodesics like this, depending on where you start the line and in which direction it goes. As long as you travel along such a geodesic, list the numbers on the faces you meet. With the usual numbering of faces of dice, where the opposite faces add to 7, some lists can't occur. The list 1,6 is already impossible because faces 1 and 6 don't have a common edge. In fact, you can repeat that sequence over and over again: 1, 2, 6, 5, 1, 2, 6, 5, 1, 2, 6, 5 ... Can you see how?

My big question is:
Precisely which sequences are possible?
Other questions are perhaps easier to answer:

Which starting points and directions cause the geodesic to hit a corner and stop?

** Which periodic sequences can occur - ones that repeat the same sequence over and over again?** (Those will occur if the geodesic is closed: it gets back to the starting point and is heading in the same direction as it was at the start, so it forms a closed polygon.)

** Does every periodic sequence come from a closed geodesic?**
When thinking about this, it may help to imagine the cube folded out flat, like this:



However, you'll need to imagine cutting a face off and joining it somewhere else when the point goes over the edges that have been cut apart to fold the cube flat. Or let the point hop across the gap. Have Fun!

CH: We most certainly will. Ian, thank you so much for a most wonderful conversation! It has truly been a pleasure!

For all our readers, tune in to the next issue of the PMP newsletter for another piece of A Miscreant's Miscellany. Until next time ...

THE PRISONER'S DILEMMA

Here's your bonus math riddle!

One interesting thing about continued fractions is that every infinite continued fraction represents an irrational number. But in this puzzle, we ask what happens when you have an infinite sequence of finite continued fractions with more and more terms?
Recall that the binomial coefficient $\binom{a}{b} = \frac{a!}{a!(a-b)!}$. Let $k = \lfloor \frac{n}{2} \rfloor$. Then, define

$$C_{n+1} = \binom{n}{0} + \cfrac{1}{\binom{n-1}{1} + \cfrac{1}{\binom{n-2}{2} + \cdots + \cfrac{1}{\binom{n-k}{k}}}}$$

For example, we have

$$C_6 = \binom{5}{0} + \cfrac{1}{\binom{4}{1} + \cfrac{1}{\binom{3}{2}}}$$

As n becomes infinitely large, that is, as $n \to \infty$, the continued fraction C_n has more and more terms. Does that mean that C_n approaches an irrational number as $n \to \infty$? What is $\lim_{n\to\infty} C_n$

CLOSING NOTES

To our participants:

Don't be shy about writing to us; we would love to hear from you (and not only about math).

One of our participants told us that a cellmate of his had advised him not to be too personal in letters to the PMP. To paraphrase, he told him: "corporate non-profit types only care about the facts, they don't want to hear your life story."

But the PMP is *not* a typical corporate non-profit! How many other nonprofits are founded by a guy still in prison!

We LOVE hearing your personal stories and so do our mentors. Christopher's vision for the PMP is not just to teach math, but to help integrate you into the math community and support you in creating a change in your life, the same as he has experienced.

To our mentors & potential mentors:

Mentoring somebody on their math journey can have a dramatic effect on thier life, and all of your work is really appreciated.

One of our participants (take a bow, Marshall!) is due to be released from prison in a few weeks and has been so touched by the impact that the PMP has had on his life that he wants to volunteer for us upon his release.

We are ALWAYS looking for new mentors and regularly have a backlog of people waiting to be paired. PLEASE refer any friends who might also be interested in mentoring with us.

PMP

PRISON MATHEMATICS PROJECT

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