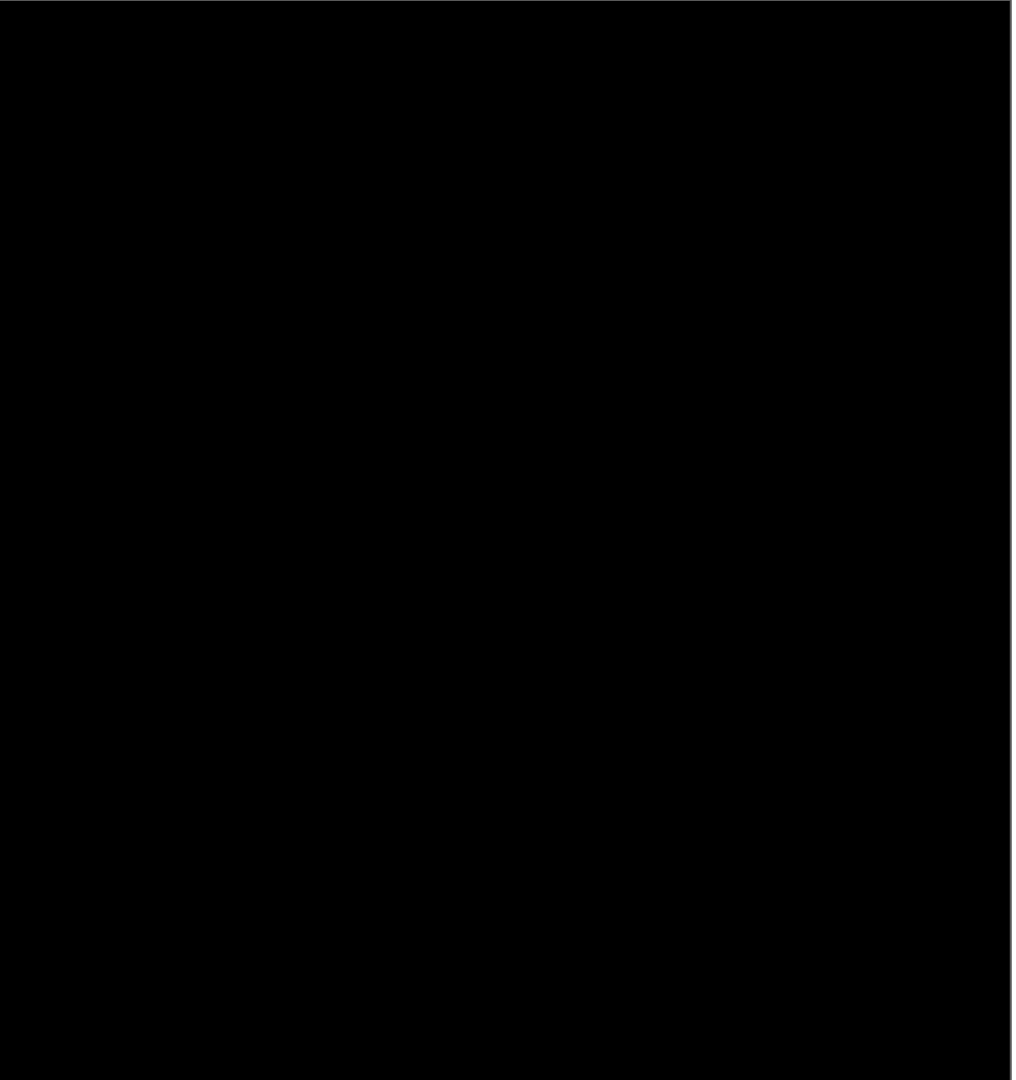


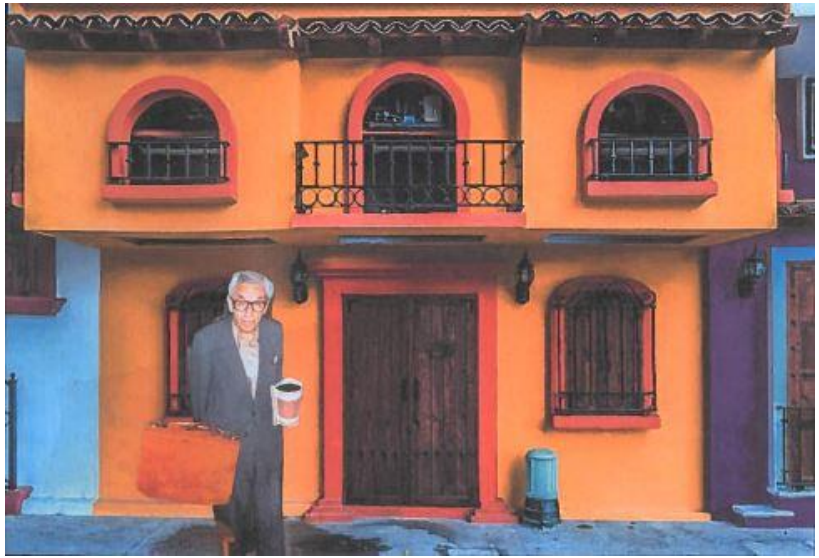
Uncle Paul's Adventure: Saving Abuela's Tiles

Author's Note

This story is made up, but the character of Paul is based on a real mathematician. Paul truly valued the complex and collaborative nature of math and spent his life dedicated to studying and solving math problems with others. This story is meant to be a fun example of and a tribute to the life he lived and all that he did for the math world.

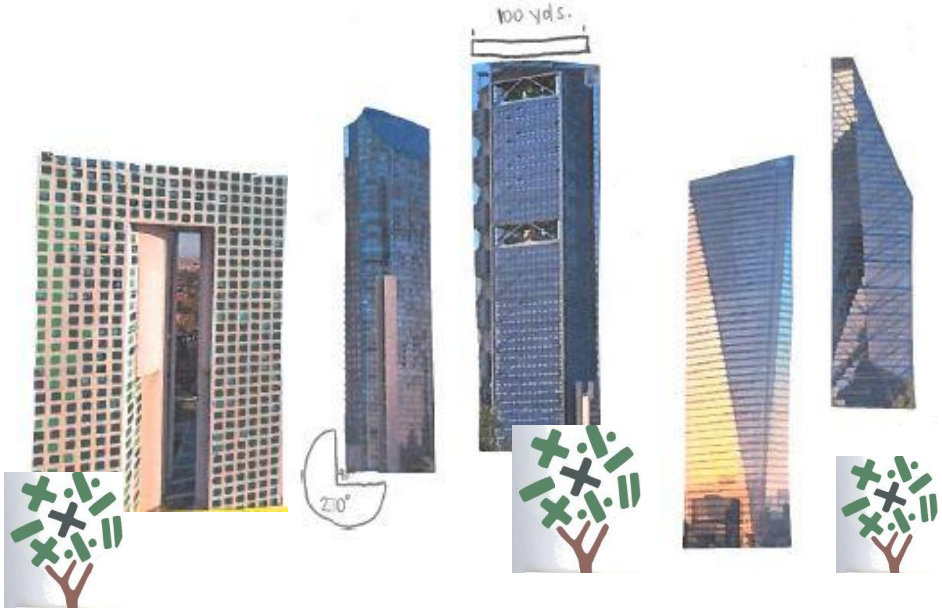
People wonder if I ever get tired of doing math and traveling, but I always say, there will be plenty of time to rest in the grave!

After visiting 3 homes, solving 6 problems, spending countless hours collaborating, and drinking 4 cups of coffee, I'm off to my next destination to turn coffee into math theorems!



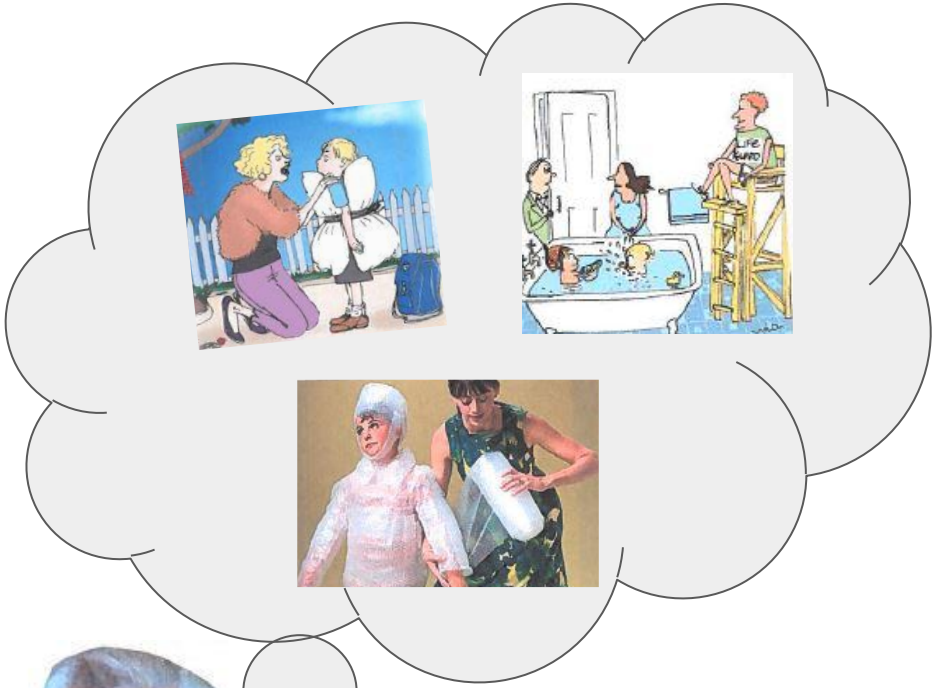
My name is Paul Erdos, but you can call me Uncle Paul!

Ever since I was a small child, I've loved math. I find math in everything I do, see, and hear in the world around me.

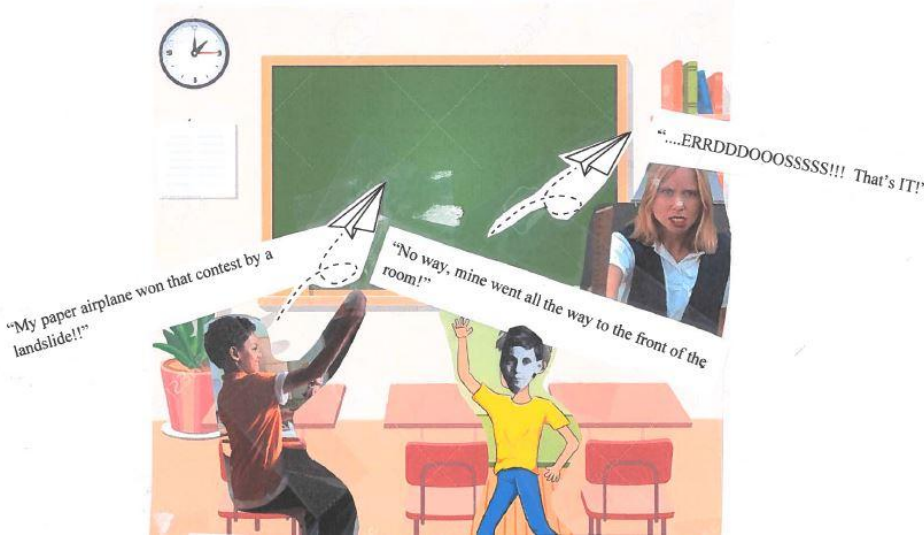


Many people find it hard to believe, but I don't have a home. Instead, I spend my time traveling the world to learn and talk with friends old and new about the thing I love most, math.

Growing up an only child, my mom was really protective of me…



I spent my days at home learning from my mom and tutor partially because my mom wanted to keep an eye on me, and partially because my teachers didn't want to have to keep an eye on me...

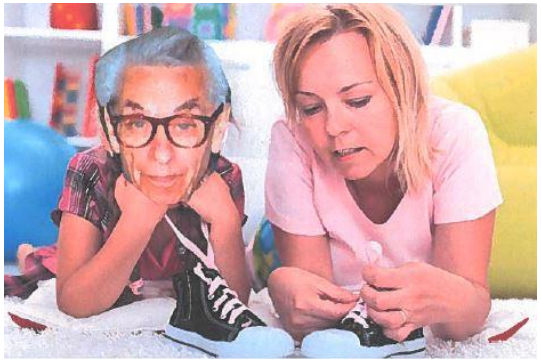


...I could never figure out why!

I still like to cause trouble everywhere I go...never on purpose, of course!

My mom was so overprotective, I never learned to do the normal things people learn when they are children...

Can you tie my shoe? How old are you??

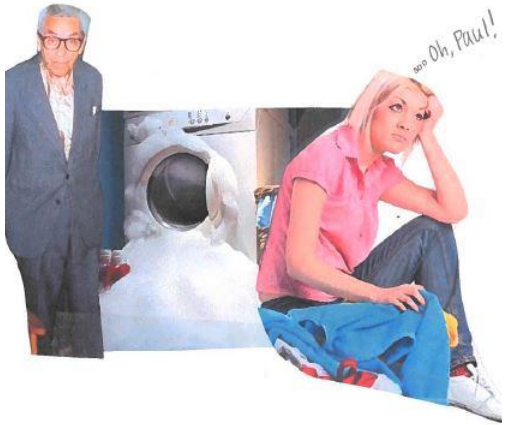


My goodness, your clothes! When was the last time you washed them??

Well...I guess the last time I visited my mom and she washed them!

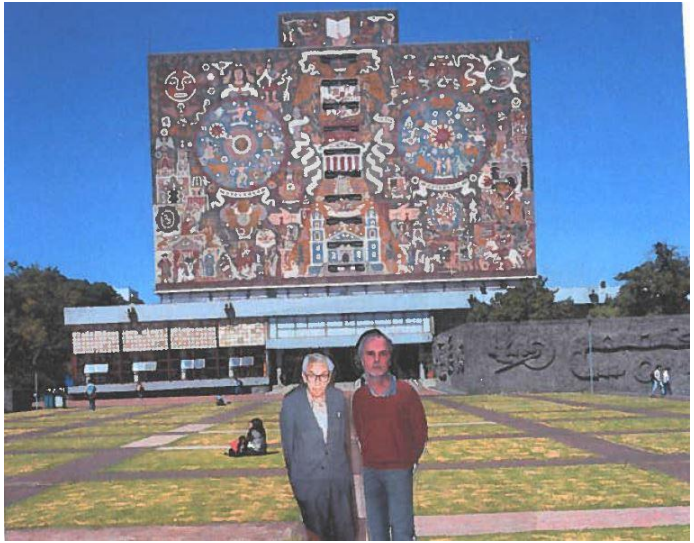
Never having an actual home or family of my own, I get to travel the world and stay with others to work on math with them.

Luckily for me, many of my hosts are quite hospitable and can put up with my lack of knowledge on how to do common things…



I'm not always the best house guest, but each of the places I get to travel to offers me new math problems and new friends.

I'm currently spending the week in Mexico City lecturing at the National Autonomous University in Mexico City, an incredible place rich with history, art, and tradition.



I've been visiting my friend Victor Neumann-Lara, you may have heard of him! He's famous for his work on graph theory and has been an excellent host. After a long day's work, we retire to Victor's home for a nice hot meal and who would've guessed...more MATH!!

While we were eating, I couldn't help but overhear his children talking about some tiles...my curiosity got the best of me!

Those are some beautiful tiles! May I ask what you're doing with them?

Well, *I* think we should use them for a game of baseball, but *Gerver* thinks he has better plans for the tiles...

Gerver is right, Fernando! These are precious tiles our great Abuela made. We need to think of a way to preserve them!

Yeah, not ruin them with your silly games!

I think I might have an idea!!!

Oh boy...this should be good...

Hey! Watch it, Gerver!! What if we made a table out of the tiles?? That would be useful and preserve the tiles!

Hmm...that's actually not a bad idea…23 tiles would make for a nice, big table!

We could make a table long enough for a King, 23 tiles long!

That would look silly! We have a big family, but not THAT big. We would barely have any room for plates! We should make sure there are at least 10 seats, we all know how much mamá loves to have guests over!

Are there any other ways we could arrange the tiles? I like where this is going…

Okay, fine...what if we make 2 rows of tiles, that way there's more room for our plates..then that would mean the table would be..ummm...how many tiles long?

I don't think that would be possible with 23 tiles! What about 3 rows?

That wouldn't work either...you can't divide 23 into 3 groups!

Hmm...so all we can make with 23 tiles is a 23 by 1 table? Aren't those called factoids? Or am I thinking of Altoids?

Erm...I think they're called factors, but if you wanted a mint why didn't you just say so?!

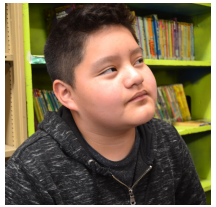
Yeah, maybe it would help with your coffee breath you've had all day after your 10 cups of coffee!!

I think you're right Gerver, they are called factors!

Hmm...

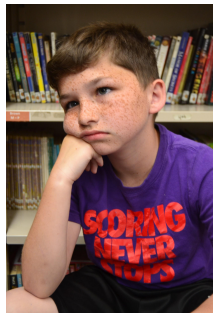
I wonder what number has the most factors?

How many factors does the number 488 have? We'd need a lot of tiles to figure that one out! Is there a way to figure it out without using tiles?



Oh, brother...we're gonna be here all night! Come on guys, let's focus!!

How do we know how many factors a number has?



Where should we even begin?!..Wait a second! What if we just use 19 of the tiles instead of 23? Maybe if we start small, we can start to look for patterns and figure out what size table would be best!

Wow, another good idea Fernando...you're on a roll tonight!

Uncle Paul, you're an odd guy, but I like you! Let's get to work, it's getting late!

OH, this is just SO exciting! I haven't had this much fun since I learned about factoring for the first time!

Hmm...well we could make the King's long table of 19 tiles again, right? So that would mean 1 and 19 are factors!

Hmm...I can't think of any others...that's odd?

Wait...isn't there a special name for numbers that only have 2 factors?...I think I learned this is school last year!

I have no idea...I think I was making paper airplanes during that lesson...oops!

Why am I not surprised...wait! I think I remember! Aren't they called prime numbers?

Oh yeah, that's right! A prime number has only 2 factors, and a number with more than 2 is called a composite number!

Wow, it's getting late...let's sleep on it and get back to work in the morning!

You're right, Estrella and Gerver!

It is WAY past our bedtime! We are lucky papá hasn't caught us still up!

Party pooper!! It's only 10:30 Gerver!

We're supposed to be in bed by 9!

Fine...you win...

If you knew me well enough, you'd know I never sleep...I decided to give it a try, but as soon as my head hit the pillow, my mind was tied up by tiles and filled with dreams of factor rainbows!

I tried and tried to sleep, but just couldn't! So I got back to work, just like I always do...and you wouldn't believe who I found when I went back to the tiles in the middle of the night...

Uh-oh...

After hushed talks, Estrella and Fernando decided it would be best to keep finding factors for the different number of tiles we could use to make the table.

Okay, so 1 has only 1 factor, right? All we can make with 1 tile is a tiny table!

We definitely don't want a 1 tile table, I get way too hungry for that! If we used 2 tiles, all we could make is a 2 by 1 table because 2 is a prime number, right?

1	1x1
2	2x1
3	3x1
4	4x1, 2x2
5	5x1
6	6x1, 2x3

We were making great progress and worked late into the night until we could see the sun coming up in the distance...

Before we knew it, Gerver came into the room looking like he had gotten a good night's rest...

Uncle Paul! Have you guys been up ALL night?!

We might be onto something! We started with 1 and have been finding all the factors for each number up to 23, since we have 23 tiles! That's when Miguel realized a way to narrow down the number of tiles we might want to use for our table!

When we had 23 tiles, we noticed the only size table we could make would be a 23 by 1 table. We knew 23 was a prime number since it only had two factors...and then I realized, no prime number will work because they all have only 2 factors and would make unreasonably long and narrow tables!

Wow, I'm impressed, Fernando! So which numbers did that take out?

We crossed out all the prime numbers, so now we know 1, 2, 3, 5, 7, 11, 13, 17, 19, and 23 tiles won't work for our table!

We also realized a table made with 4, 6, 8, 9, 10, 12, 14, or 15 tiles wouldn't save very many of Abuela's tiles!

Precisely! So now we are looking at making a table with either 16, 18, 20, 21, or 22 tiles!

~~1~~-~~1~~x1	~~2~~-~~2~~x1	~~3~~-~~3~~x1	4-4x1, 2x2	~~5~~-~~5~~x1
~~6~~-~~6~~x1	~~7~~-~~7~~x1	~~8~~	~~9~~	~~10~~
~~11~~	~~12~~	~~13~~	~~14~~	~~15~~
(16)	~~17~~	(18)	~~19~~	(20)
(21)	(22)	~~23~~		

Wow, Abuela would be proud! You guys have been working hard!

Thanks, Gerver! Sooo, what's our next move?

I think I'm ready for a nap!

Well, it might be nice to have Fernando look at our list and see if he sees anything new, he's been on a roll lately!

A nap?! No way! I have to give a lecture with you Papi today so we have to figure this out quickly!

Good idea!

Hmm...wouldn't it be best to save as many of Abuela's tiles as possible? So shouldn't we use 22 tiles?

I hadn't thought of that!

Well, 22 has only 4 factors, are we sure that's the best option?

16	1x16, 2x8, 4x4
18	1x18, 2x9, 3x6
20	1x20, 2x10, 4x5
21	1x21, 3x7
22	1x22, 2x11

I think the best option would be saving the most tiles!

We have to think practically too Gerver! We couldn't have a 22x1 table and an 11x2 table would be weird!

Well, then what do we do now?

I give up!!

Can you help solve the questions left unsolved by Gerver, Estrella, Fernando, and Uncle Paul? Work with your peers, classmates, and teacher to figure out the best amount of tiles to use to make a table that is practical, but also that saves Abuela's tiles!

As Uncle Paul used to say, "Every human activity, good or bad, except mathematics, must come to an end." At the age of 83, Paul passed away. While his life ended, his legacy still lives on. The unsolved problems he left behind and worked with others on are still being solved today!

Prime numbers fascinated Uncle Paul and have left us with many unanswered questions...it's up to you to find the answer to this one!

A Picture of Paul Erdos…

Paul started doing multiplying 3 digit numbers when he was 3 and could understand negative numbers by the age of 4.

He was known for showing up to people's homes and saying "My brain is open".

He was generous in sharing mathematical ideas because his goal was not to be the one to prove it, but to be sure that somebody proved it.

At dinner in guests homes, he would randomly jump up, run to the phone, and call someone in the middle of dinner to talk about a problem they had talked about earlier.

Had so few clothes his hosts would have to do his laundry for him because if it wasn't mathematical, he didn't want to waste his time doing it (such as learning to do his own laundry).

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