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A Quantified Relationship

“Uno, Dos, Tres, Cuatro, Cinco...” I began.

It was almost noon on a Saturday morning; most of the boys in the neighborhood were probably kicking a soccer ball, scraping up coins to buy a piece candy from a local vendor, or picking fights with kids in other neighborhood. I was almost four years old, and my family was living in my grandmother’s house in Aguililla, Michocan—my mother’s hometown in Mexico. Her home consisted of one large kitchen with a small wooden table, and one bedroom that held two queen-sized beds. There was only one faint light bulb in the house, since mainly her candles kept the room bright when the sky got dark. My mother always enjoyed relaxing on the hammock that was nestled in between two pillars in my grandmother’s patio, especially during the dry hot days of the summer.

I was counting the number of red stripes on my mother’s sleeve. While she sat relaxing under a shade, I just wanted to keep counting over and over, trying to get the numbers’ order perfect. She told me to go run and play with the chickens in my grandmother’s backyard but I couldn’t get up to do it, not today. The sensation I felt of being able to understand the world of numbers thrilled me. My mother had just taught me the first nine numbers in Spanish, and I felt like it was the beginning of my understanding of an entire new language.

I had asked her what came next, since I naturally understood that there had to be more. But she said that I would need to grow up to understand more. But weeks passed,

and I only grew more and more curious about numbers and mathematics to the point where my mother could not answer my curiosity. She was familiar with basic addition and subtraction— some multiplication—but anything deeper into the world of mathematics was out of her reach because she had never learned it properly. My mother had decided to quit school at the age of 11, right after finishing elementary school. She had given up on her education. Though she could have continued to middle school, which would cost her family money, she felt compelled to stay at home and help her mother who was still housing six other sons that were all older than my mother.

But contrary to how she sees herself, I have always believed that my mother is one of the hardest working people I have met in my life. She is the second youngest daughter of 13 children, with her oldest brother being 17 years older than her. In Mexican families, the younger daughters are typically the ones most expected to help the family by serving the parents and older siblings. She grew up in a rural Mexican *rancho*, where the everyday lives of women revolve around housekeeping, cooking, and taking care of the male workers. Though my mother was not necessarily fond of these responsibilities, she had decided to accept this position instead of pursuing an education.

When she came of age, however, my mother had decided that this was not the life she wanted to lead, and certainly not the place where she wanted to raise her children. She had met my father, who was already highly involved in drug trafficking and was slowly gaining more and more respect as an authority in the business. Aware of the “good life” that America had to offer, my father convinced my mother to flee with him to the United States where they could start a family together. Knowing only a life of misery in this rural Mexico, my mother was willing to start a new life and pursue the American

dream that she so faithfully believed now. She abandoned her family in Mexico at the age of 23, and gave birth to her firstborn daughter Jenny Torres in Houghson, California soon after. Five years later, my father was still highly involved with the drug cartel business in Mexico. But broken agreements, misled deeds, and malicious business ultimately led to the assassination of my father, leaving my mother with a 5 year-old daughter and a newborn child in her arms while living in California. Subsequently, my mother was forced to make her return to Mexico, because she could not afford a living for herself and her two kids in the United States. We went to go live in my grandmother's house in Mexico, where my mother could recuperate and eventually learn how to support her two kids all on her own. We had been here for over three years now and here I was, almost four years old, just learning how to count.

“Six, Seven, Eight, Nine, Ten...”

My eyes stayed fixated on the moonlight that was creeping through the blinds, carrying what appeared to be a celestial glimmer into our bedroom. Cradled in between my mother's lower back and my sister's thick golden brown hair, I always had trouble sleeping at night when I was a child. I remember always turning side to side, sometimes sweaty, kicking the air, shoving the covers over my sister's legs so as to find the place where sleep was hiding.

We were now staying in my aunt's house in East Palo Alto, CA. We left Mexico when I was almost five years old, and my mother could only afford to pay rent for one bedroom. One queen-sized bed, a long wooden night stand, a television with an antenna wrapped in aluminum foil, and a small closet in which one could easily decipher my

mother's life story; our shared small bedroom contained enough to keep me company in the nighttime.

This was the time for me to think. I was a fairly quiet child at my school Brentwood Oaks in East Palo Alto, and I always blushed when teachers called on me. But when trying to fall asleep my mind would just keep racing, thinking of the right words that I should have communicated better that day. By the time I was eight years old I already spoke English and Spanish fluently—I had a vocabulary that was twice as larger than most kids my age, and yet I was never willing to speak either language much. The only time I spoke up was during my mathematics classes. I was never too shy about sharing my answers with the class, or asking questions to the teacher. I enjoyed learning, so I had no problem with communicating if it helped me understand mathematics more.

The more that I became fluent with number manipulation, the more intense grew my curiosity for the nature of such a language. Multiplication and division came easy to me, and fractions and long division eventually became like puzzles that were fun to solve. In any situation, there was one right answer, and one right way of thinking; I began to form a confidence like no other. I could speak mathematics, maybe even better than I could speak English or Spanish at the time. I had first learned to count in Spanish, and I was communicating the mathematical terms at school in English now, but the very numbers themselves were their own words that I successfully comprehended; this was when I learned that mathematics was universal—it could be spoken in any language. It became the bridge between my two acquired tongues.

The problem, however, was that this newly realized inclination towards mathematics forced me to compartmentalize the way in which I communicated with

people. I was confident in the way that I spoke to my math teachers, but I kept from speaking to my peers because I did not know how to. My Black peers only spoke English, so that was my only way to communicate with them. But with my Mexican peers, I naturally wanted to speak Spanish to them since that is the language that I was taught to speak by my own Mexican family. This was the source of confusion, and the reason why I couldn't sleep at night sometimes. I was trying to speak three different languages at the same time without even realizing it.

But with my mother, I am only allowed to speak Spanish because that is the only language she can speak. It was in Spanish that I learned so much about my mother's history, about her love for my father who was murdered only months after my birth, and even the stories of her hope to pursue the American dream. Countless times, I asked my mother to tell me the story of her journey to the United States as an illegal immigrant. But she always refuses to reveal many details of her trips—she hates recalling the days that she had to endure the thirst while walking miles and miles through the Arizona desert. I cannot even imagine what it was like when her legs were cramping up while curling under the seat of a car for three hours in case they were pulled over by border patrol. In any case, she always ensures to remind us that every single time she crossed the border, she was doing it for my sister and me, to provide us with the opportunities that she had not been privileged to have as a young girl. To this day, she still tells me that the last thing she wants to see is us working a job that involves backbreaking labor like her jobs have been. She has never been ashamed of her occupations, but she faithfully believes that all her sacrifices will ultimately bring my sister and I many opportunities that will get us far in life.

This was evident in the way that she was always curious to know about everything I had learned in school every day. I really enjoyed learning in elementary school, so I had no problem communicating my excitement about school to my mother. Additionally, I had no problem with having my mother taking a break from her apparently busy schedule around the house to relax while she talked to me. I would tell her about my geography, earth science, and arithmetic classes and she would attentively sit down and listen to me. From state capitals, to learning about cold blooded animals, I could tell that my mother was fascinated with my desire to learn by the way that she looked at me as I spoke. Her eyes were squinted, her lips were fastened, and she gently caressed her knees with her tired hands. Perhaps it was a grateful fascination, in which she could revel in my positive educational experience—it was an opportunity that she had not been blessed with herself.

When I was in elementary school, she was working as a housekeeper at a nearby Quality Inn. Her inability to learn English eliminated many potential jobs, but she did not mind a janitorial job because she had been used to physical labor all her life. Even at home, before taking us to school and heading for work she would always make sure that the bed covers had been perfectly set and that all of our clothes had been placed in the right location. I would even come home every day from school to my mother mopping the living room or scraping the grease from the stove in the kitchen, soon after she had just gotten home from work. We were still living in my aunt's house, so my mother felt compelled to help around the house wherever she could to express her gratitude for my aunt who let us live in her home.

I was about nine years old when I discovered how very little money my mother actually made at her job. I would always walk with her to the nearby grocery store to cash her check on Fridays. She would hold my hand cautiously and always forced me to walk next to her on the side away from the street. I had never asked how much actual money she had been handed by the grocery clerk who cashed her check, but I just knew that she would always use a couple of those dollars to buy me an ice cream cup or a bag of hot Cheetos to take home with me.

We had just walked out of the store with a chocolate bar in my pocket when it finally occurred to me that I should ask. But soon after, I almost could not believe it when she told me that her job earned her only \$6.50 an hour. For the next 5 minutes of our walk back home, I was highly tempted to run back inside the store and exchange the candy for the money back. Somehow in my head I could not piece together why somebody who works so hard to carry out such arduous tasks would make so little money. After that, I began to see everything in terms of wages—every \$5 that I asked my mother to spend on me would equate to about one hour of her life that she had was at her job picking up heavy objects, scrubbing sinks clean, cleaning up after careless individuals. I learned to never ask for more from my mother at such an early age. My mathematical approach to my mother's situation allowed me to realize that everything I had taken for granted actually had a price that my mother had to pay for herself, and I did not want to let that keep happening.

“Eleven, Doce, 13, Fourteen, Quince...”

I was sitting by myself at our small square table that stood right next to the refrigerator and the stove, trying to eat a dinner plate that I had microwaved myself. We were now living in the garage of one of my mother's friends in East Palo Alto, which consisted of only one bedroom and a living-dining room combo that was equipped with a small sink and a stove. I had my own twin-sized bed now, but my mother and sister still shared the same queen sized bed that we previously had in our old room. I liked this place a lot better than our old room, especially because we had our own bathroom, and even our own space to grow our own plants just outside of our door on the side of the house. The only thing that would have made this place even better would have been a desk to do all my homework assignments. But I never asked for one—the small dinner table was enough space for me.

My sister had just gotten home from her after-school program, and she was on the couch trying to finish her homework early so as to have time later that night to talk on the phone with her friends. She was a junior in high school, so she was always complaining about how much work made junior year unbearable. The old television was on and I was watching the same cartoons that I was accustomed to watching every day after middle school. Normally my mom would have dinner prepared around this time, but today was different. The wooden gate banged outside, and soon our mother's large dark hair was visible at the doorway. She was carrying a manila folder in one hand, and her black purse in the other. She was still wearing her uniform shirt from work, with the "Nancy's Specialty Foods" emblem on the front. She was more quiet than usual, and she just sat down calmly. Within two seconds, the tears began to stream down her cheeks as she sat on the couch silently. In a few more seconds, the silent tears became incessant cries.

I quickly turned my head away from my dinner, and my sister immediately pushed her books aside hastily. Through her sobbing, my mother tried to explain to us that her application for affordable housing in a nearby apartment complex had been rejected to her face. This was not the first time that we had been denied since most places had lotteries for acceptance, so I did not understand why she was so frustrated. It was then that my mother yelled the word “*discriminación!*” in agony. She had tried to go in with all the necessary documents, old utility bills and bank statements to demonstrate good credit, even a recommendation letter in Spanish. And still, the fact that she could not verbally communicate with the manager due to her lack of English skills, the opportunity was denied to her face. I cannot even imagine the kind of response she received—it was enough to bring my mother to tears.

Powerless. That is how she felt, and that is how she described it. America had let her down. In her eyes, the American dream which she so desperately pursued would not be a reality until she had a place to call her own. To her, an apartment for herself and her two kids meant that she would finally have an establishment—a foundation for her own family. Ever since we had moved to the United States, we had always lived inside of a home that was not our own. My mother still felt like a guest in this country. To be an American, she needed to have a home that was her private property. But today, she realized how much more it would take. We would need to remain guests in America for a few more years, and she would need to start making attempts to learn English soon.

The only rare chance that I had to hear my mother speak English was during phone calls with my teachers. There were many occasions in which my middle school teachers felt compelled to call my mother and ask her why there had been such a drastic

change in my behavior in school, and I would witness her struggling with her English trying to communicate how sorry she was to my teachers. I had gone from being one of the best-behaved outstanding students, to a misbehaved poor-performing delinquent at school in sixth grade. During my sixth grade year, we were told that the males at our school had acquired some of the lowest standardized test scores in the entire state of California, and I was performing no better than the rest of my male counterparts. At the time, I was so afraid of being different from the other boys around me because I feared that I would be classified an outsider. I was in school with the same people who I gone to kindergarten with, but as we kept growing older it felt more and more like we wanted to buy into the wider negative stereotypes that plagued our community. Ever since East Palo Alto had been US Murder Capital in 1992, all of the wealthy surrounding cities in the Silicon Valley had since labeled East Palo Alto as a dangerous, criminal city. We had been marginalized.

On my walk home from middle school, I had become accustomed to seeing a pack of boys running down Camellia Drive, chasing down a car from which they could purchase their weed. I saw young boys running through our back yard to escape the police. I fell asleep to the sound of bullet shots and police sirens right outside my window, hoping that a bullet would not come flying into my home. Gang violence was starting to become common among my friends and even older family members. It was not the life I wanted to live, but at the time it felt like it would be my only option. My negative surroundings had taught me to silence my mathematically-oriented nature, like it did not belong. As teachers grew more frustrated with me, the harder I tried to upset them. I knew I had potential, but I did not know why I did not want to realize it. Afraid

of being different from the rest of the kids in school and afraid of being labeled, I hid my intellectual ability, pretended that I hated school, and forced myself to fail miserably in homework and tests. This was always so frustrating, because I would listen so attentively in my math classes in middle school, even while all my peers were getting distracted and not focusing on learning the material. And still, I felt nervous about demonstrating my skills on paper, so I would always show the right steps on exam problems but would intentionally make small mistakes so as to make my answers completely wrong.

The Latinos around me were beginning to speak their own language—Spanglish. It was a very unique language that naturally eased the frustration of being forced to speak two languages in and out of the home for Latinos. I naturally became a fluent speaker of it. It felt so good being able to communicate the idea I had in mind in whatever language felt appropriate at the time, even in between sentences and phrases. I spoke this to my sister, my cousins, and my Latino peers who were all doing so poorly academically. The two languages I had been taught at such a young age were beautifully combining into one eclectic tongue that took the best of both worlds—a hybrid. The sad part was that I was beginning to feel like it left no room to speak mathematics, which had been such a big part of my life until then. If English and Spanish were blending so well together, why wasn't mathematics so easy to incorporate into my lifestyle? I did not know where to place it—in other words, I was not sure if my mathematical talent made me more of an English-speaking American than it did a Spanish-speaking Mexican, or vice-versa. It had served so well as a bridge before, but now I was beginning to believe that it served more as a barrier to my speech freedom.

I envied my mother so much at the time; I believed that she could not relate to the struggle I was facing. She only knew one language, and her life had been centralized in that one dimension. I felt like I was dealing with three dimensions, looking for the best way to bring balance to it. But it was not until my sister's high school graduation that many things started to make more sense to me. My sister had overcome so many social barriers. She had been expected to get pregnant and drop out of high school, like many girls her age had done. But she had grown an affinity for politics, social change, and economic reform and was admitted to UC Berkeley. My sister had utilized her education to achieve more than I had ever dreamed possible for her, or even for me. A powerful writer, my sister had learned Spanglish as well, but it was her mastery of both the English and Spanish languages that allowed her to excel. This was when I learned that I was in a better position than most people because I actually had the ability to think in terms of three different languages. This could work to my advantage, and I realized that I too could make it to college as well, someday.

“16, 17, 18, 19, 20”

My heart was racing. We never had carpet in our house— my mother seemed to always prefer tile floors. But this just made the floor feel even colder today. I was wearing my slippers and pajamas, as I raced to connect my computer to our 50-day trial dial-up internet connection with AOL. It was nine in the morning on a Saturday, and my mother was at work. She had left me breakfast on the stove, but I was too excited to eat it. I opened the old lap top that my sister handed me down, and as I waited for my desktop

screen to load, I looked around our new house. It was very sunny outside, and the dining room looked too clean. I could see the greenery of the spring season through the glass of our front door. This day was almost too perfect. When I finally logged on to the MIT admissions website, I nervously clicked on the link that would reveal my destiny. I had been admitted. I swung my hands in the air, clapped my hands to redness, and unleashed a real cry of joy.

I was seventeen years old, and I had just moved into my new room in our new house. I had never had a space to call my own since we had always lived in such small spaces. But after years of determination, my mother somehow managed to save up enough money to put down money for a down-payment on a home in East Palo Alto. She was still working as an assembly worker in a quiche factory, but she had asked my uncle to cosign with her on this house and he happily agreed. His great credit was enough for them to get a loan approved. And here I was, sitting in our own living room reading an admission letter from the Massachusetts Institute of Technology on my computer screen. I always look back at this day as one of the best days of my life. My mother had a place to call her own, and I was on a great path to college.

I am currently a junior at MIT, and I can truly say that this is a magical place that transforms people. I firmly believe that I will emerge from MIT a stronger thinker with keep abilities, a passionate leader with a global perspective, and overall a more compassionate human being. Having such a strong mathematical background in high school ultimately led me to choose engineering as my main focus of study in college, and I believed that MIT would be the best place to do that. The reason that I believe that MIT is such an outstanding institution is because it has allowed me redefine my

numerical/computational ability to something even greater. Before MIT, I had a very linear approach to mathematics—the belief that there was always one way of thinking and one right answer. While studying engineering, I have discovered that the beauty of mathematics and problem-solving lies in its ability to get manipulated itself to create something even more advanced. For example, many famous scientists have reduced some of the world's most complex problems into a simple equation. Once these constitutive mathematical relationships have been defined, they have allowed us to explore even deeper levels of nature solely on the basis of mathematical manipulation and interpretation. MIT has allowed me to share this perspective, and that is why I believe this place produces such amazing engineers.

In addition, being at MIT has allowed me to view mathematics for what it really is—another language. My sophomore year I took a class called “Mechanical waves and vibrations” and on the first day of class, our Polish professor named Wit Busza told us: “You cannot describe nature with English, or German, or Chinese, or any other spoken language for that matter—that of course, can only be done with mathematics.” Numbers are their own entities, and they appear all throughout history written in their own way, being held constant. I think that there is a great deal that can be learned from thinking of mathematics and life in this respect. The fundamentals have never changed, and yet humans have progressed so much because of it. My dream is to someday make a technological contribution to mankind that my mother can be proud of. Perhaps the scientific properties of this contribution will be highly complex, but I believe that my mother will simply sit back and simply listen to me explain as she always does. Maybe I will be speaking Spanish, or maybe even English. My story has served to teach her that

there are countless benefits to having multiple ways to communicate. She has been taking English classes, and is hoping to earn her citizenship in the next few years for her to finally be recognized a citizen of this country. I am happy to know that I was able to teach her something, because she taught me so much. And it all started with her teaching me the number line.