SARAH'S DOLLAR

Serial Number

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What's Buried Inside ?

Donald Noss Jr

This is a work of fiction, but not all fiction. The existence and location of Boston Cemetery in the Cuyahoga Valley National Park is accurate. James Brown was a real person. He died in 1865.

Also, Donald and Linda are real people. In fact, my wife has possession of the dollar you see on the cover of this story. She appropriated it from me, but I still consider myself the constructive owner. I just don't know where she's hidden it.

Any other name and or names in this story have been fictionalized.

Bottom Line – Be particularly careful if you hike down Main Street at dusk.

PS. Please let me know what you think of the story. If email links don't work on your portable device, just copy and paste. They work fine on PC. Thank you very much.

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By the way, Hypatia is considered to be the first female mathematician. Born in Alexandria, Egypt around A.D. 365. Her father was a Greek mathematician. She was murdered in Alexandria – A.D. 415.

Call me if you have any questions or comments.

Phone: 216-559-0884

Rocky River, Ohio

SARAH'S DOLLAR

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Chapter 1 – Sarah's Dilemma

June 15, 2013 turned out to be an extraordinary day. It all started when I walked into my local bank Saturday morning to cash a $479 check. I was the only customer. As always, the bank was giving away free candy, cheap pens, and freshly popped popcorn. The place smelled and looked like a movie theatre lobby, complete with a fine selection of irritating advertising posters.

Sarah was there as usual, so I walked up to the counter and handed her my check. It didn't escape her attention I forgot to endorse the thing. So she slid the check and a pen back to me and waited patiently while I executed my signature. We went through this same routine every time I tried to cash a check. She'd have been disappointed in me if I'd thought to endorse it advance.

Sarah Worthington worked for the bank as long as I could remember. She was middle age, thin, average height, had thick silver-white short hair, and loved to talk with everyone. Let's face it, she had a bubbly personality. But she never talked about herself. As far as I knew, she was never married. She wore very little makeup and was always polite and efficient. Her white pearl necklace contrasted nicely with her black blouse and tan jacket. She was always dressed ready for dinner at the White House. Her voice had a pleasing and crisp characteristic. I wondered if she ever thought about a singing career, but I never asked.

Something was different about her mood this Saturday morning. Usually she'd ask how I was and then start to discuss some abstract topics I never thought about. For example: Why couldn't you see through a thin sheet of aluminum foil, but could see through one inch bullet-proof glass? A few weeks before that she asked me how much I thought gold would be worth in fifty thousand years. I told her it'd be worth nothing to a lot more than that depending somewhat upon the value of the dollar, and of course the condition of the human species.

Once she asked if I thought it was possible to determine if time moved forward or backward just by watching the random wanderings of an electron around a hydrogen nucleus. Of course she knew the nucleus of a hydrogen atom consisted of just one proton. I guess she had a point. How would you know? After all, the seasons change, snow melts, flowers grow from little to big and then die and decay. Fires start and burn out. Time appears to go in one direction: Left to right. But Sarah didn't always think left to right.

The application of the word "infinite" to the physical world continually perplexed her. Luckily for me, this morning she didn't dwell upon whether there was a unit of length so small it couldn't be divided further. Perhaps the diameter of an electron could be the limit of smallness. But then again, maybe not. She even speculated about the life expectancy of an electron as though it was a living creature. Sarah always thought deeply. Her world was more than a three-dimensional place to exist.

After talking with her for a minute about her favorite baseball team, the Cleveland Indians, she immediately started to count my money. Everything was fine until she reached the four hundred and seventy-eighth of my $479 dollars.

"Donald, I'm short a dollar bill." She started to straighten up my little pile of cash. I waited for her to add another dollar to the pile, but she closed her cash drawer. And there we stood, each waiting for the other to say something significant. Then like a bolt of lightning, it hit me.

"Well then give me four quarters."

"I can't do that," she said.

"Why not? Is this a joke, Sarah?"

"No. It wouldn't be proper to give you quarters. I have to get you a dollar bill."

"Are you kidding me? The quarters will be fine, Sarah. They're plenty proper enough. Even ten dimes will do." The only other teller behind the counter was Kelly. She was shuffling around some papers to look busy.

"I better not."

"What? Ask Kelly, she's got to have a buck in her drawer."

"No, I'll get one from the vault. I'll be back in a minute."

"Sara, why are we debating this? Just give me the quarters. You've got $50 worth of change within arm's reach. You don't have to go into the vault. I don't need one more dollar bill."

"Yes you do. Wait here, Donald. It won't take long."

"Okay. Grab the first one you see."

"Yes. Be patient for two minutes. I'll be right back."

This was crazy. I never saw Sarah act irrational. It didn't make sense. I left my $478 on the counter and walked across the lobby. I took some chocolates and a handful of popcorn. Some young guy wearing a black suit sat at a desk in one of the back offices. He was hard at work watching two girls jog past the bank. A couple minutes later Sarah walked out of the vault. At least she didn't make an all-day project of scrounging around for one greenback.

"Here's your dollar, Donald." At first I didn't see it. All she had in her hand was a little dirty brown Wells Fargo Bank envelope. She opened it carefully, as though she expected to see a rattlesnake, and pulled out a single dollar. I forgot to ask her why the dollar was in that envelope as she placed it neatly on top of the $478. "Now you're in business. Here's your four hundred and seventy-nine dollars."

"Okay Sarah. Thanks for tracking the buck down for me."

She reached for her coffee and took a sip. She looked happy and smiled. Told me to take some candy for Linda, my wife, who was waiting for me in the Jeep. Said she was looking forward to seeing her one of these days soon. I told her Linda would probably stop in the bank her next Saturday.

Sarah gathered up my $479 and put it in a crisp new bank envelope, even though I told her I didn't need one. She told me to be careful with loose cash or it'd blow away in the wind. I wasn't about to argue with her. Then she wrote the amount on the front of the envelope and put a rubber band around it. I told her goodbye and that I'd see her in a few days. She waved and told me to have a nice day. I finally got out of the bank and back to the Jeep. Linda was busy reading a magazine article.

"What took so long?" she asked.

"Sarah counted out my money, but was a dollar short."

"One dollar?"

"Yep. For some reason she didn't want to give me four quarters instead of a dollar bill. I don't know what she was thinking."

"That doesn't sound like something she'd do."

"I know. It's out of character for her. I didn't want to make a fuss over the buck, so I waited. She hustled into the vault and came out smiling with a dirty brown envelope. I don't want to go into all of it, but I got my dollar and was out of there."

"Good, let's go," she said.

"Want to stop and get a toasted bagel to take with us?"

"No. I've got some snacks in my backpack. While you were wasting daylight in the bank, I read this excellent article about the Higgs Boson."

"Sounds like a hot little quantum physics topic for you on a Saturday morning. I knew you packed some type of educational material. What magazine?"

"Scientific American."

"Of course, I should've known."

"Want me to pull the article for you, Donald? You could read it tonight."

"Might as well. I can barely wait."

We planned to drive to the Cuyahoga Valley and do some hiking and biking. It was a gorgeous sunny day. The royal-blue sky was partially filled with fading crisscrossed jet contrails. I put on my old scratched-up sunglasses. It was time to go.

"Linda, can you count the money Sarah gave me? There should be $479 in the envelope. She counts it so fast I can barely see it fly out of her hands. And I'd feel silly standing there counting it again. Besides, I trust her."

"You got the right amount, Donald. Four hundred and seventy-nine. I doubt Sarah ever made a mistake."

"Yeah. She's the perfect little truthful worker. Not like CEO's that overpay billions of dollars of shareholders' money for acquisitions, just to make busy, and then write off two-thirds of the purchase price a few months later."

"I don't want to hear your dribble talk about that stock market stuff all day."

"But Linda, it's more than that."

"No buts. It's got nothing to do with us. Go complain to the Wall Street Journal. You know they can't get enough of those lovely stories to write about."

"Yeah yeah. Better stick my money in the glove compartment. Sarah put the cash in an envelope because she worried it might blow away in the wind."

"In a second." Linda kept one of the bills out of the envelope.

"What are you looking at?" She didn't answer. "You got some counterfeit?"

"No. But this dollar's got an interesting serial number."

"That's it? A serial number?"

"Yes. The numbers are the same front to back and back to front."

"What are they?"

"88222288."

"Where was that dollar in the envelope?"

"On top of the stack."

"That's the one she got out of the vault. I told her I didn't need another dollar bill. I was going to walk out of there without it."

"It's a good thing you didn't."

"What's the big deal?"

"Consider all the possible ways you can add and multiply some of these numbers together to get sixteen."

"So? You think 16's are special?"

"There might be more lurking beneath the obvious. The entire eight-digit number could be hiding something."

"Like what?"

"I don't know. It's a mystery."

"That's silly. You're imagining something that doesn't exist?"

"I don't think so."

"Well, see if you can figure out the meaning on the way to the Valley."

"I will. And I'm keeping your dollar."

"You can have it. It's not even a Silver Certificate."

Linda studied that serial number all the way to the Cuyahoga Valley. An hour later I pulled into the parking lot across River Road from the Boston Mills Ski Resort and next to the Cuyahoga Valley Railroad. A minute later the historic red and black smoke-belching steam engine lumbered past. That old train was always hard to ignore, but Linda was too busy with some iPAD calculations to notice. She never looked up. I don't know what she thought she'd discover inside that serial number.

We had parked in this lot many times over the years. It was a little more than a quarter mile from Main Street. But I never hiked down that dead-end street with Linda because of what I saw happen years earlier. I always made up an excuse to go somewhere else.

When I was in college I raced my motorcycle down Main Street to the cul-de-sac and back many times. Beyond the cul-de-sac was the entrance gate to the hill leading up to the infamous Boston Cemetery. I heard stories that it was an ancient Indian burial ground. Boston Township people called it "The Hill."

I always got a scary feeling on that narrow street. Maybe it had something to do with the scraggly-looking pumpkins that grew haphazardly around the base of the cemetery and into the front yards of several nearby homes. No matter what time of year it was, some pumpkins always stood guard over the street.

One June day, after my sophomore year in college, I was out racing around the Cuyahoga Valley as usual. It was a nice day so I decided to check out Main Street again. I rounded the cul-de-sac just as dusk fell over the township. That's when I felt a thousand eyes staring at me from every direction.

As I sped away, hellish sounds bombarded me from both sides of the street. Faces of dead people looked at me through the bumpy skin of every pumpkin I passed. Thunder shook the street. Their muffled screams became louder the faster I road. The gravel street seemed soft as quicksand. I tried to concentrate on what I was doing. This was no time to lose control of my motorcycle. "Help me, help me," the faces cried out over and over. The screams didn't stop. I looked straight ahead to Boston Mills Road as I accelerated. Finally, I made it through the pumpkin gauntlet. Quiet at last.

It all happened so fast. What could I've done even if I'd stopped? I mean really, how could I have helped? All of them were already dead. I didn't want to be dead too.

The following week I told a friend of mine about what I saw. He didn't believe me and wanted to check it out for himself. So one late night he drove down Main Street by himself. He told me about it the next morning. Later that day, he disappeared on a fishing trip in Lake Erie. A few weeks later I read in the local newspaper that a fisherman found his body floating near the Canadian side of Lake Erie. I never rode down Main Street again.

Chapter 2 - Pursuit Down Main Street

We brought our bikes and hoped it wouldn't rain. It was time to do some hiking.

"Let's go, Linda. Put your dollar in with the rest of my cash. Better lock the glove compartment."

She opened her door and then the glove compartment. She screamed and I heard my envelope full cash hit the ground. I visualized my money scattering under every car in the lot.

"My dollar," she yelled. "It's blowing away."

"Is the rest of the cash there?"

"Yes."

"Good. Then forget the buck. Some little kid might find it and think he's rich."

"No, no. You got to get it. Hurry up!"

"What? You want me to chase that dollar?"

"Yes. I want it. Forget your backpack. Come on Donald, get it before it blows away."

"Okay. But I'm not chasing it far. If I lose it, it's a gonner."

"Get it! You're wasting time." I ran to her side of the Jeep and saw the bill blow out of the parking lot onto the asphalt bike path. "Hurry up," she yelled again and again.

The chase began. Bikers went out of their way to miss it. "You'll never catch it Mister," some kid yelled to me as he rode by laughing with his friends.

How embarrassing. So there I was, chasing Sarah's dollar like a fool. Linda followed far behind. I felt dumber every step I took. I got close, but the dollar was always out of reach. It blew onto Boston Mills Road and past the historic M.D. Garage, an old 1940's gas station.

The original pancake-shaped porcelain advertising sign perched on top of the twenty-foot pole in front of the station hadn't seen a paying customer for sixty years. The round white sign featured the "PURE" brand of gasoline lettered across its five-foot diameter in big blue capital letters. Around the inner circumference in much smaller capital letters was the logo: BE SURE WITH PURE.

Two old original gas pumps from the 1960's stood at attention on the gravel island in front of the single-bay gas station. Those were the same unused red, white, and blue pumps I passed from my motorcycle days twenty-five years earlier. Both pumps still displayed the frozen-in-time gas price of .269 cents per gallon. The quaint cinder-block garage now housed free art exhibitions sponsored by the Crooked River Gang.

I was in this money chase for keeps. How could I give up? After I chased it a quarter mile, the wind changed direction and blew it onto Main Street. Now I was headed down the street I'd been afraid of for such a long time. My heart rate skyrocketed. Luckily, I didn't see any pumpkins at the beginning of the street.

A few days after my friend disappeared on Lake Erie, an old guy who used to live near Main Street told me about a tragic occurrence that happened there years earlier. He said a large church group tried to eradicate the wild-growing pumpkins along the street one Sunday in 1974, but didn't have much luck. Thirteen churchgoers suffocated right on the spot where they tried to cut the pumpkins out of the ground. The survivors ran for their lives. The victims were buried up on "The Hill" in unmarked graves over the following ten days.

I asked him how he knew about that and he told me two of his aunts were members of that church group. The pumpkins killed one of them and the other ran across a field until she couldn't run any more. She never spoke another word about the killings after the day of the massacre and she never attended another church service as long as she lived. He told me she

didn't want to be buried with the others up on "The Hill". So when she died, he had her buried in some big cemetery near Lake Erie.

Linda's prized dollar blew down the tree-lined street and through some of the front lawns of the seven houses on the east side of the street. The first six were built in the 1950's or earlier. The air was filled with the smell of freshly tilled soil and horse manure.

Two old tired-looking pine trees stood in front of a dilapidated red farm house on the narrow asphalt street. Their droopy limbs looked sad. Uncut grass and weeds added to the property's run-down look. Children's toys, including a few soccer balls, two bikes, a plastic swimming pool, and other household items appeared abandoned in the front yard. To be generous, it was a cluttered-looking place. A bright red plastic pail sat on top of a white picnic table near the front porch. A few horse trailers, pickup trucks, and other machinery could be seen through the open doors of a pole building behind the house.

A three-hundred foot long dirt driveway separated this home from the neighbor's small log cabin. Wood and wire fencing divided the land between the properties into several horse corrals. Two sorrel-colored quarter horses calmly watched me run down their quiet street.

Farther down the road was an imposing two-story camel-brown stone house set back 70 feet from the road. It was obviously built in the 1920's or earlier. This fortress was built to stand far into the next century. The impressive little home had a pitched roof of more than 45 degrees. Two narrow but tall windows on the second floor might have been original. The tiny gravel and grass driveway was hard to notice on the postage-sized lot. Two green leafy trees grew near the street and shaded the entire home.

An old man inched his way up past a few tree branches on a rickety-looking ladder that leaned against the south side of the stone fortress. I assumed he intended to clean the gutters. The skinny ladder bent like a bow, two feet short of where he wanted it to be. He looked at me, but I kept running. He kept climbing.

The bill never got more than fifty feet in front of me. I picked up the pace. I closed in on the end of Main Street. Thank God, no pumpkins in sight. Beyond the cul-de-sac was the gravel hill that led up to Boston Cemetery. The entrance gate was open. I figured that dollar had to get stuck in someone's grass or trapped by a downed branch sooner or later. This couldn't go on much longer.

The last house on the street was a large two-story cedar log cabin. It set back two hundred feet off the street. A circular cement apron made it easy for the owner to maneuver in and out of four unattached garages. An array of solar panels was visible above the two middle garages.

There were no cars in the driveway, but two big dogs were chained to a steel pole near the garages. One was a large Boxer that matched the color of the house and the other was an even a larger German Sheppard.

Of course the dollar changed direction and landed in the middle of their yard. It wasn't that close to the dogs, but still a considerable distance from where I stood in the street. Unbelievable! I wasn't about to battle those dogs over a lousy dollar bill.

I didn't feel like trespassing into the middle of that perfectly manicured lawn, especially with those two alert meat eaters watching my every move. Four red and black "No Trespassing" signs were conspicuously posted along the edge of the yard.

I stopped to catch my breath and figure out what to do next. Linda eventually caught up to me and raised her trendy red-framed Miss Dior sunglasses to the top of her head and took a good look at her dollar bill resting peacefully 80 feet away.

"You ran a long way, Donald."

"I almost got it too." I was out of breath and felt pretty stupid.

"But not quite. You don't have much farther to go."

"That's crazy. I don't have a good feeling about sneaking into that yard for a dollar bill."

"Then get a better feeling. It's not just any dollar. It's the one with my serial number on it."

"I'm sure you can find another one with even a better serial number."

"No. I want this one. Come on, don't stall around."

Just then, a blackbird landed two feet from her precious dollar. I'd be off the hook if it'd fly away with that damn dollar. It looked like good nesting material to me.

Linda shook her long blonde hair over her face and brushed it back in one deft movement. She usually did that right before she intended to make a specific point about something. I was sweaty and hungry. All this for a dollar? The dogs watched me closely. I didn't plan to test the strength of those chains.

"You're not afraid to get it, are you?"

"Do you see those dogs?"

"Yes. I see two friendly puppies. And that's our dollar bill." She fluffed up her hair some more to reinforce the point.

"To be precise, I think it's your dollar bill, Linda. And those little puppies would rip off your arms in a heartbeat if they could get hold of you. If you want that bill so bad, you might have to sweet talk the puppies first."

"I think not. What are you going to do, Mister dollar-bill chaser?"

I knew she wanted that dollar. Linda could focus her attention on many different things at once, but I never would've dreamed this could be one of them. It wasn't a hundred-dollar bill. She cleaned her sunglasses on my red Ohio State t-shirt and took another look at her greenback.

"Don't you think the 'No Trespassing' signs mean what they say?"

"They probably forgot to take them down once they finished landscaping the yard."

"I doubt it. Let's go back to the Jeep and get the bikes. We can ride down to the Valley Café for lunch. You love that place. Forget this dollar."

"No. We'll do that later. Go get the bill. The dogs can't reach you there. I don't think anyone's home."

"I don't know, Linda. What if they start barking like crazy and break loose. That chain may not hold if both take off at full speed."

"It won't break. It'll take you 15 seconds."

"The wind's picking up."

"Hey, the Alexander's are gone," a middle-aged lady in black shorts and tank top yelled to us from the other side of the cul-de-sac.

"We don't know your neighbors," I said. "We're going to the cemetery. Thanks for the information."

"Okay. Have a nice day," she said.

Chapter 3 – Boston Cemetery

A sudden gust of wind lifted the dollar off the front yard and toward the dogs. The 16 square inch piece of US legal tender carried over the dogs and landed on the back of the property, not far from the adjacent cemetery. The wind pushed it up the hill and closer to the cemetery's old wrought iron fence, but it was still on the dog's property.

"Let's go, Linda."

I ran through the open gate and up the gravel hill to the top of the cemetery. Three workers cut grass in different areas of the graveyard. I walked along the perimeter of the cemetery's wrought iron fence looking for the dollar. I looked down the slope and saw the dogs, but no buck.

One guy started up a chainsaw and that got my attention for a second. When I looked back, there was Washington's face staring up at me. The dollar rested ten feet away on the steep hill, but on the other side of the high wrought iron fence. There was no easy way to get it. If I chanced running out of the cemetery and back around to the other side of the fence, it might have blown away for good. There were also the dogs to consider.

Linda walked into the cemetery and I pointed to the dollar through the fence. She motioned for me to get it. But I wasn't about to get impaled on any of those sharp finials by trying to climb over the top of that old wrought iron fence. The bill blew this far. It could blow a little farther through the fence to me. Ten more feet wasn't too much to ask of the wind.

The guys cutting grass on red Wheel Horse riding mowers got closer. They started yelling orders to one another and Linda couldn't hear what I was trying to yell over to her. Music blared from their pimped-out emerald green F-100 pickup truck parked near the maintenance shed. It was a cool looking ride. The custom chromed wheels must have cost $1,000 each. I looked back to the bill and there it rested, so close but so far.

An instant later the wind lifted Linda's dollar over the fence and into the cemetery. I dodged tombstones and trees to keep up with it. It floated twenty feet in the air for about a minute. Eventually, it blew over the east section of the cemetery and landed on the roof of an abandoned barn. Unfortunately, it was several feet beyond the cemetery's iron fence. Now what? It was easy to see, but there was no way we could get up on that pitched roof even if we climbed over the fence.

Two of the workers left in the pickup truck. The third finished cutting grass and gathered dead branches that littered the area near us. Finally, it was quiet. So there we stood, looking at the dollar up on the barn's roof. The young guy waved to us and headed our way.

"Can I help you with anything?" he asked. He had a bottle of water in one hand and the leather glove on the other held a rake and some branch litter. He carefully placed the stack of debris next to one of the illegible tombstones that had fallen over decades ago.

"Well, maybe," I said. "I'm Donald and this is my wife, Linda."

"Nice to meet you two. I'm Grant Anderson." He was very polite and we shook hands.

Grant was tall and slender. He looked like a college basketball player. He wore a sweat-stained maroon University of Chicago t-shirt and a black USA soccer cap. His faded blue jeans were stained with oil and dirt. Some curly brown hair dangled beneath his cap. And his perfect teeth and smile could have highlighted the cover of a dental magazine.

"Tell him, Linda. Tell him why we're looking at the barn's roof." I felt like a fool standing there. The date of death engraved on the tombstone next to me was 1882. The bill we were chasing was full of 8's and 2's.

"He doesn't have time for this."

"I have time. It's almost lunch. The other guys left early. What do you need?"

She told him some of the story about why we were in the cemetery. He appeared interested, or maybe more amused.

"Linda, you didn't tell him why I chased this particular dollar bill." She looked embarrassed, but only for a second.

"This may seem crazy, Grant, but I think the dollar's serial number is disguising something fundamental. Maybe even fundamental to the universe."

"Linda, you're so exaggerating. You couldn't have found anything like that on the iPad."

"Don't be so sure. I can't pin it down, but there's something mysterious about it. I'd like to get it back."

"Now it makes sense. I saw Donald from the tractor. I wondered what that guy was chasing down the street."

"Yeah. I chased it all the way from the parking lot by the railroad tracks. It blew out of Linda's hand when she opened the door of the Jeep."

"Sure. The wind can do that easily. It'll blow loose cash right out of your hand." My God. Was this kid related to Sarah? She told me the same thing less than two hours ago! This cemetery was a spooky place even in the daylight. I sure as hell didn't want to see any pumpkins materialize.

"Yeah. I guess you're right, Grant. The tricky wind."

"What's the serial number," he asked. "Do you remember it, Linda?" She recited it faster than our phone number.

"88222288."

He laughed as soon as he heard it. Of course he thought it was stupid for two adults to chase a wind-blown dollar bill a half mile on a nice summer day because of its serial number. Who wouldn't laugh?

"That's an interesting integer," he said. I couldn't believe this came from the kid cutting grass.

"What do you mean interesting integer?" I asked. "How would you know?"

"I work with large numbers all the time. I'm a math major at The University of Chicago. I study number theory and other related topics in the field of mathematics."

"You've got to be kidding me. Really? You're not joking around?"

"Nope, I'm home for a few days and told my brother I'd fill in for him today since he's home with the flu. He works part-time here for the village in the summer and this is one of his jobs. I'm going back to school next week."

"I'll be damned! So you're a mathematician?"

"Not quite, but that's what I want to be. Number theory is a field of study that's more practical than many people think."

"That's wonderful," Linda said.

"Grant, I wouldn't worry about what most people think. Those are the uninformed. They don't read Scientifc Amereican every day the way Linda does. No wonder they're clueless about most everything of substance."

"I just know I've always been interested in mathematics. Plus it's the foundation of algorithm construction."

"I'm sure it is," I said. "Linda loves anything that has to do with numbers. She'll even try to figure out if there's anything significant in the serial numbers tattooed on railroad cars."

"Donald, stop talking. He doesn't have all day."

"Okay Okay. Didn't mean to interrupt you, Grant. Go on."

"That's alright. Well, number theory is a big field of mathematics."

"It sounds complex to me."

"There are definitely easier subjects. I primarily study subtle and unusual properties of large groups of positive numbers. Advances in number theory can and does make it possible to solve many complex real-world problems. And it includes creating new methods to factor very large numbers into their prime numbers. The quicker the better."

"What do you use the primes for?" Linda asked.

"I don't want to bore you guys with this while you wait for your dollar to blow off the roof."

"You're not boring us. Donald's paying attention. And I'm keeping an eye on my dollar bill."

"Yeah, Grant. I'm listening."

"Okay. You guys know that a prime number is any number that can only be divided evenly by 1 and itself, right? Numbers like 3,5,7,11,13,17 are prime. Two is the only even prime number."

"Yes, we know that. At least I know it. Donald, do you know it?"

"Of course I know what a prime number is. I went to school too. What else, Grant?"

"For your information, the largest prime number discovered so far is over 22 million numbers long. And as time goes by, they'll find longer ones."

"Who figured that thing out?"

"Not me."

"God, that's unbelievable. Grant, is it true that a 'googol' is a number written with a 1 followed by a hundred zeroes? And that's where 'Google' got its name from?"

"You're right, Donald."

"Cool. I bet you didn't know that, Linda."

"I knew it long before you."

"I don't know about that. Maybe you did read about it in one of your science magazines. Even so, that 'googol' is nothing compared to what you're talking about, Grant. It'd take a hell of a long time to write out a 22 million long string of numbers."

"A considerable amount of time," he said.

"Way more than I want to spend in this cemetery today."

"Yeah. Well, back to prime numbers for a second. They're the DNA of positive even numbers. I can explain it easily if I describe one of my school projects. You guys interested?"

"Sure, we'd love to know what you're working on in college," Linda said.

"Don't look at me Grant, spill the beans."

"Okay. Well, a couple hundred years ago a mathematician put forward the conjecture that every even positive integer, excluding the number 2, is the sum of two prime numbers. A conjecture is a statement that appears true, but has not been proved. So for example: 56 is an even number. Everybody knows that. Right?"

"Yep."

"So 19 + 47 = 56. Both 19 and 47 are prime's. 41 + 53 = 84. Both 41 and 53 are primes."

"Apparently I never gave prime numbers the respect they deserved. Right, Grant?"

"Most people don't dwell upon them night and day, Donald. But they're sort of cool. Now we can use larger numbers and come up with similar results. But what if we try to prove this conjecture by adding together two primes with millions of digits?" He looked at us as though we were there to give him the answer.

"I don't know. Come on, Grant. Tell us."

"Okay. It's a tough one. Mathematical conjectures can be exceedingly difficult to prove either true or false. Definitive proofs can be extremely elusive. But we'll save a detailed discussion about "proofs" for another day."

"That's fine with us," Linda said. "Maybe we can cover that topic the next time you come to town." Grant laughed and took a look at Linda's dollar still perched up on the roof.

"Sure. That'd be great. But I better talk a lot faster before your greenback blows off the roof."

"I think we've got time," Linda said. "The wind's dead." Those two didn't know it, but the three of us might end up dead too if the pumpkins showed up while we were busy talking about mathematics. Linda's dollar was the least of my concerns. I kept my eyes open for anything remotely round and orange.

"Okay, Linda. Now back to these even numbers built with two primes. This simply stated conjecture remains an unsolved mystery. However, methods used to attempt a proof can often be useful in other areas of mathematics."

"I see."

"Unfortunately, I haven't had much luck with this project. It could take me an infinite number of more weekends to get a handle on it."

"I'm sure you'll figure it out one of these days," I said.

"I wouldn't bet on it. I don't want to get too complicated here, but there's another fascinating mathematical conjecture I heard about in class last Christmas. Do you guys want to know what that one's about too? It's nothing like the first one."

"Grant, me and Linda don't mind going to school in this cemetery around lunchtime today if you want to teach."

"Yes, I want to hear all about it. I'm interested in anything you want to tell us about what you're studying in school."

"Yeah. Carry on, Grant. What else would we do in the park on this beautiful day anyways? Our bikes are plenty happy strapped to the back of the Jeep."

Linda couldn't wait to hear about this one. "But if the bill blows off the roof," she said, "we got to get it."

"Sure. This won't take long. One more minute, I promise. I still have to eat lunch."

"You're not the only one," I added. "Okay, teach away, Grant, we're all ears. You've got a captive audience here on 'The Hill'."

"That I do. I'll make it fast. It's pretty straightforward." I never imagined anyone could be so excited about some mathematical concept. But Grant certainly was. This was one smart kid.

He continued his explanation. "Two centuries ago a mathematician postulated there were **no positive integer solutions** to the equation of these fourth powers: $A^4+B^4+C^4 = D^4$. Did you guys follow that?"

"I understand," Linda said. "I know algebra."

"Donald, how about you?" he asked.

"Yes. I'm in on this. I know that if A was five, 5 times 5 times 5 times 5 would equal 5 to the fourth power. And it'd be 625. So what else about your equation?"

"Good, we're all on the same page. Now that conjecture was considered to be true in 1769. And 200 years later it was still thought to be true since no one ever found a positive integer solution to the equation. However, in the late 1980's this conjecture was proved false by another mathematician. And shortly after that, someone else identified the smallest set of integers for proving the conjecture false."

"It must have been a challenging problem, Grant. Two hundred years is pretty long to think you're right about something," I said. "At least he wasn't alive to hear the bad news."

"He was long dead. You know, the development of mathematics has paralleled many of the advances in civilization throughout history."

"Never thought about it that way. Guess you're right. People have believed all kinds of things. Flat earth, sun going around the earth, all that stuff."

"Yeah, they sure have. And that's a good reason to prove conjectures true or false. This one was difficult to prove false. I remember the smallest integers to the solution. They're 95,800 for A, 217,519 for B, 414,560 for C, and 422,481 for D. Of course when you take each of those integers to the fourth power, D ends up a gigantic twenty-three digit number."

"Hard to believe someone could calculate those results," Linda said.

"It really is amazing."

"Grant, are you making those numbers up?" I asked. "Is this for real?"

"I'm not kidding. That's it in a nutshell. So, what do you think?"

"I think it's incredible," Linda said.

"Sounds beyond complicated to me. Why would anyone attempt to disprove an equation some guy claimed was true over 200 years ago? Seems like a useless exercise."

"Good question, Donald. First of all, he may have tried to prove it true, but proved it false instead. Anyways, I think that solution and another were found on an elliptic curve. I won't bore you guys with the mechanics of that, but new and different methods used to attack what seem to be frivolous mathematical conjectures can sometimes lead to advances in solving all kinds of real-world problems. And that includes more elegant factoring algorithms.

"I studied factoring in school," Linda added. "Like 221 can be factored into only two prime numbers, 13 and 17. So the 13 and 17 are uniquely tied to 221 when they're multiplied together."

"Where'd you come up with that?" I asked.

"I remembered it from school. I listened to my teachers. Not like you!"

"You always were the perfect little student, weren't you? Perfect, perfect, perfect."

"Yes I was. You never paid close attention in school like me. All you wanted to do was race around on your motorcycle."

"Didn't everybody? Actually, I paid attention when it counted. I know this stuff too."

"Okay guys. Hold on. Linda's right," Grant said. "We all started factoring small numbers into primes. The fact that prime numbers can only be divided evenly by 1 and itself makes them critically important in mathematics."

"I can't believe we're talking about this stuff in a graveyard," I said. "Grant, why do you care about these calculations one way or the other? What's the purpose?"

"Donald, let him talk. Quit interrupting him."

"I'm just asking questions. Right, Grant?"

"Sure. Ask whatever you want, Donald."

"I got to admit, all these big numbers you fiddle around with is pretty fascinating."

"It really is. I'll keep this brief so you get the basic idea. I'm keeping an eye on your dollar too. We'll end this discussion if it flutters off the roof."

"Yeah, we don't want the world to come to an end if we lose Linda's dollar."

"Donald, he's talking."

"Sorry, Grant."

"Okay. Back to my mini lecture. Anyways, entities that need to encrypt important data for security care a great deal about prime numbers. Consider this: It's easy to multiply two gigantic

primes together and come up with another even larger number. And that larger number can become a public key used in an algorithm to encrypt important data. Like passwords, credit card numbers and other sensitive data."

"That makes sense," Linda said.

"Yes. Now the hard part for any entity trying to break encryption is the going backwards, to find those original primes that were multiplied together. And that's quite a difficult undertaking. Basically, the bottom line is that the successful factoring of the public key is needed to decrypt the data.

"I'm with you. Go on."

"With extremely large numbers, that task is absurdly difficult, expensive, and can take longer than any hacker or team of hackers could live. And that would be true no matter how much computer horsepower was dedicated to the task.

"There's a well-known encryption algorithm that's based upon the assumption that there's **no efficient and fast way to factor extremely large numbers**. Meaning no easy way to decrypt, for example, your credit card number that was encrypted and sent over the Internet. And I mean big long numbers."

"How big?" I asked.

"Well, would a number that had 100 to 150 commas be pretty big?"

"God Almighty! I'd say so. I get your point."

"I understand what you're explanation," Linda said.

"However," Grant continued, "the difficulty of decryption would dissolve in an instant if it ever became possible to factor these huge numbers exceedingly fast. But that day is not on the horizon. At least not yet."

"Grant, you really do all this stuff?"

"Not everything, Donald, but I study a wide range of topics within number theory. It borders and overlaps other areas of mathematics, most of which I'm not familiar with at all. It's fun for me and I'm a curious person."

"Obviously you are." Grant was very business-like and precise with his descriptions. I never expected to run into someone like him here on "The Hill." Linda was more than a little impressed.

"You must study around the clock," she said.

"Not quite that much. But my brain's wired for mathematics. Now getting back to our equation. Here's the sum of the products of that A, B, and C I told you about." He picked up a stick and scratched out $D = 31,858,749,840,007,000,000,000$ in the dirt.

"That's one mindboggling number," I said.

"Yes. That's the twenty-three digit number."

"What do you mean your brain's wired for math?" Linda asked.

"I have a mild form of autism called Asperger's Syndrome. Fortunately, it doesn't interfere with my speech, even though I know I speak slower than most. And it's not been a critical disability for me in other areas. I'm thankful for that."

"Grant, I'm glad it's been kinder to you than some."

"I realize I'm fortunate. Maybe one of these days I'll do some study in that field too. I'd like to add something to the knowledge base of the disorder."

"I'm sure you could. You have first-hand knowledge about everything you've gone through. I'm happy it's helped you in the field of mathematics. You obviously love the subject."

"Yes I do. Thanks. I've often wondered about the mathematicians who lived a couple hundred years ago who had the same affliction. It takes a staggering amount of determination to

attack complex math problems for years at a time. Especially when there were no computers. One of the characteristics of Asperger's is an obsessive interest in obscure scientific subjects. And various categories of mathematics can be quite obscure at times."

"I never heard about that obsessiveness before," I said.

"It's true. Many may have worked their entire adult life on that problem and died with nothing to show for the effort."

"So what's it all mean, Grant?"

"Well, in mathematics, you have to be careful in what you rely upon as truth. A fatal assumption in the development of an algorithm used for encryption can lead to big problems. Remote systems could get compromised and access to highly valuable encrypted data, like medical or banking data, could be stolen or changed. Software to update a heart pacemaker could fail and or critical software updates to electric grid components could wink out."

"Yep, fatal assumptions. I'll bet more than a few people have been on the wrong side of that equation throughout history. Not good to bet your life on flawed assumptions if you can help it. Some that did might be buried in this graveyard."

"Could be, Donald. Survival often depends upon having a reasonable amount of analytical capability. But no guarantees even with that. What might seem like minor errors in judgment can compound themselves and get you buried fast."

"Me and Linda see plenty of those stories on the news."

"Unfortunately, dead people don't have the luxury to reconsider prior decisions."

"Nothing like plain talk to get your point across, Grant. Well, after listening to you, whatever amount of analytical capability I might have, I wish I had more. We better forget the silly damn dollar up on the roof. You've got better things to do with your time and I don't want you getting hurt or in trouble trying to get it down. We'll hang around here a little while and see if the wind blows it toward us."

"I can reach it with a ladder and broom extension. There's one in the maintenance shed."

"That'd be great," Linda said.

Before he took ten steps, the wind lifted the bill off the roof and blew it over Linda's head. It landed on the top edge of a tombstone near us. Lucky Linda. She plucked the dollar off Elizabeth Mills' tall vertical gravestone. Elizabeth was buried in 1817. Linda was all smiles.

"Look, it's still in perfect condition," she said.

"So, that's the dollar you've both been chasing?"

"Grant, not both. I did the chasing. I ran a long ways for that serial number. Linda enjoyed the scenery on her little walk to the cemetery."

"Apparently she knew you'd track it down sooner or later."

"That's right. He loved the chase. Besides, I didn't want to get all sweated up."

"Oh my God. Okay. Let's get to it," I said. "What about this thing?"

"Actually, Donald, it's quite unique."

"How can that be?"

"Yes. First of all, the numbers are in the same sequence forward and backward. You don't see that too often. Currency collectors call numbers like these, 'radar' notes. Notice how radar is spelled the same forward and backward."

"Well, Mr. Donald know-it-all," Linda said. "Grant says it's unique."

"Grant, the same numbers forward and backward isn't that fantastic. What's the big epic revelation in that? Linda recognized it too. There's a zillion of your radar combinations on dollars floating around."

"They're hard to find, but there's lots more to your serial number than that."

"Like what?"

"You guys have a very special number here."

"That's impossible," I mumbled.

"No it's not. There are two extraordinary mysteries hidden in that serial number. And they're both significant. Linda was right."

"That figures. How can it be?"

"I knew it," she said. "I knew it was special."

"What's so special about it?" I asked. "You looked at it for ten seconds." He laughed and took a couple sips of his bottled water.

"I'm going to let you guys figure it out."

"How are we going to do that?" I said. "How do we know there's even something worth spending time to find?"

"You'll have to do some detective work. It'll be fun."

"I don't know about this, Linda. We have no idea where to start."

"You two are smart enough to figure it out. Linda knew something was remarkable in that dollar the first time she saw it. With some analysis, you'll discover what's hidden in that serial number."

I thought the whole thing was silly, but Linda was thrilled with the idea of hunting for some mathematical relevance in her serial number.

"Now that I know there's really something there, I can't wait to find out what it is," she said.

"Don't get too depressed over this, Donald. I told you, my brain's wired for mathematics and abstract reasoning. That's how I know there are two cool properties related to Linda's number. I recognized something pretty fast in the serial number. But the second subtle characteristic is not a direct intuitive leap from the first. It takes some luck too."

"There's no way we can figure it out," I said.

"You'll have to do your homework. Consider it a cosmological search."

"I knew something was hiding in there," Linda said. "I told you, Donald. I was right."

"We'll see. Come on Grant, tell us what you found. Don't make us look for something that's hidden in your brain. You'll drive Linda crazy and she'll drive me crazy looking for some imaginary significance."

"Nope. I want you to solve the mysteries. I'm going home for lunch. Might stop back here for a little while after that. I'll email you from Chicago 45 days from today with the first answer. If you find them sooner, email me. The clock starts today!"

"Grant, at least give us some hints about what we're supposed to be hunting for in her goofy serial number."

"Okay. That's a good idea. I'll give you a fighting chance. Let me think here a second." Grant looked at Linda's dollar again and took another sip of water.

"Linda, listen good to what he says."

"I'm listening." She put on her sunglasses and bent down to tie one of her new salmon-colored Saucony running shoes. One of my shoelaces broke during the chase. I tucked what remained into my old hiking boot.

I hoped Grant wouldn't give us some convoluted hint that would be more impossible to analyze than the serial number itself. He wiped the sweat from his forehead with a dirty yellow golf towel and stuffed it into his back pocket.

"I'll give you guys a few pertinent hints," he said seriously.

"Pertinent, Linda. This has to be good." Grant was all smiles. He smiled a lot.

"Okay. Here goes. Now pay attention."

"Yeah yeah, we're all ears," I said. "Make it something we can understand."

"Squaring the 4th of July might put you on the right track, even though this exercise is an irrational challenge. If you get too tired or hungry working on the problem, go eat a party dessert. After that, go plant a tree. But be careful and don't damage its roots, or it won't survive."

"My God! Those can't be the hints, Grant. Really, that's all?"

"Yes. They're good ones, too. I might have made them too good. You might figure it out tonight. But then again, I realize it'd be a very tough problem to solve without some direction." He looked pleased with his bewildering clues.

"I got no idea where to start."

"Give it time, Donald. Let it sink in. Don't be in a rush."

"I knew it, Linda. He gave us something out of left field."

"No I didn't. Consider them together. You'll come up with the right answers. You've got plenty of time. Six weeks.

"Linda, it's obvious you're more patient than Donald. Analyze the hints in total. You'll see the solution evolve in front of you."

"We'll try hard," she said.

"I'm patient too, you know. I could solve it with better clues."

"Donald, these are the best I can come up with. Believe me, they're good."

"We'll have to evolve smarter brains fast if we're going to figure this out. Just don't forget to send us the answers."

"I won't, but I think after a little thought, you two will solve the mystery. It was fun meeting both of you."

"Grant, we're lucky to have met you," Linda said.

"Let me know if you ever decide to sell that dollar bill."

"I don't think I will, but if I change my mind, you'll be the first to know."

"Thanks."

"It can't be worth more than a dollar?" I said.

"Donald, it's worth what someone's willing to pay for it. I'd pay more than a dollar. You'll have my email address. Let me know. Believe it or not, collectors of US Paper Money pay huge prices for fancy serial numbers."

"I better look closer at my cash from now on."

"Good idea. If you find any bill with all eights in the serial number, email me. I'll buy it from you."

"Grant, I got to look into the value of these things first. But I'll definitely keep you in mind."

"You'll be surprised. Oh, one more thing before I leave. Since we've been talking about currency, you might find what my brother told me about Boston Cemetery pretty interesting."

"What's that?" Linda asked.

"In the first few decades of the 1800's, Ohio chartered many different banks in the state. Others opened that were unchartered. Each one issued their own currency, so people found all the different paper money floating around confusing."

"That makes sense," I said. "What's that got to do with this place?"

"There was a guy named Jim Brown who lived here in Boston Village who decided to counterfeit money. And not just a little of it. They say he was a prolific counterfeiter. When he decided to branch out and cover the whole country, he got caught in Louisiana and put on trial.

Some people say he was convicted and went to jail and others say he was found innocent. Regardless, he ended up back here in Boston Village."

"Then what?" Linda asked.

"He was elected justice of the peace. Hard to believe, but true."

"That's crazy," I said.

"My brother told me he's buried in this cemetery, but I don't know where."

"Right here?" Linda asked. "How can that be?"

"My brother's a serious guy and not one to kid around. Don't forget, he told me about Jim Brown without knowing Donald would chase your dollar all the way to the cemetery today."

"That's funny. So, Donald, you chased my dollar all the way to where a famous counterfeiter is buried. What do you think of that?"

"He'd think we were the silliest people in the world."

"Maybe. Don't worry Grant, we'll find his grave one of these days."

"Good. Send me a picture of it."

"We will," she said. "Good luck in school. But I'm sure you don't need any good-luck wishes from us."

"Sure I do. Thank you. By the way, there's another quick thing I want to tell you."

"What's that, Grant?" I asked. "Should we order dinner before your next lecture?"

"No. We'll all get out of here in another minute. But this is cool to the 100^{th} power."

"Here we go again. Damn, it must be something really special if you're that excited about it. What is it?"

"This is really neat! After you solve the answers to what's hiding in your serial number, I'll tell you something about an unusual association between the serial number on your dollar bill and the integer 69,518,506."

"Where'd you come up with that thing?"

"Donald, you don't have to compute anything. The work's already been done. It's just a fun little thing you'll find amusing. Anyways, you could never discover it on your own."

"I'm sure we couldn't. Everything's been amusing and highly unlikely today. And I doubt we'll find the answer to anything in that serial number."

"Grant, we'll do our best," Linda said. "Thanks again. We've had lots of fun this morning."

"Yeah Grant," I said. "It was great meeting you. We'll get right to work on this serial number thing."

"Better eat lunch first," he said.

"We'll get right on that too."

We waved to each other and Grant left on his riding mower. We watched him ride out of the cemetery. At the base of "The Hill" he turned around and waved to us again.

"Linda, you might be reading about Mr. Anderson one of these days in your Scientific American."

"Wouldn't that be wonderful?"

"Yep. If he's ever interviewed about mathematics, maybe he'll recount the time one summer day he met two people in Boston Cemetery chasing a dollar bill because of its serial number."

"Don't be silly."

"Why? You think what we did wasn't silly?"

"Absolutely not!"

Linda wanted to look for Jim Brown's gravestone, but I wanted to get out of there. I kept praying the pumpkins wouldn't show up early. We checked out a few graves, but couldn't find the big counterfeiter's grave. That would have to wait for another day.

Chapter 4 – Pumpkin Faces?

Linda and I walked down "The Hill" and out of the cemetery to Main Street for the quarter mile walk back to Boston Mills Road. The old guy finally made it up the ladder and was hard at work. He was straining to reach high enough to clean inside the gutters. The ladder swayed considerably when he shifted his weight. I thought to ask him if he wanted us to hold it steady, but I didn't want to divert his concentration from his dangerous task. And I didn't want to give the pumpkins, if they were hiding somewhere, time to assemble. Dusk was still hours away, but there was no point taking chances.

"Wasn't Grant interesting, Donald?"

"Yeah. He certainly was. Let's move a little faster, okay Linda."

"Is something wrong?"

"No, I just want to get back to the Jeep. We've been here long enough."

"Alright, I can go faster. My foot feels better."

We stepped up the pace. A minute later we heard the rumble of thunder from behind. I knew what that meant. Linda looked and was shocked to see some pumpkins had positioned themselves around the cul-de-sac. I didn't have to look. I told her we probably missed them earlier because we were too busy talking about everything Grant told us. But I don't think she believed that lie. I asked her if she could jog on her foot and she said yes. Luckily, we didn't have to go much farther to get off Main Street.

We made it back to the Jeep and ate some snacks she had squirreled away in her backpack. I started talking about Grant to take her mind off any conceivable pumpkin questions. Thank God she never asked. If there were faces, we were too far down the street for her to see them.

Linda changed shoes and pulled out her iPad. We finished eating some almonds and two apples at a picnic table close to where we parked. It was in the middle of a small oval garden full of some purple flowers. Honey bees blanketed them like a glove and Linda took pictures of the busy little workers to send her mother.

A day never passed that I didn't think about the pumpkin faces I saw a few years before we were married. I was glad to get out of that cemetery. We finished our snacks and watched two mounted police ride their thoroughbreds across the railroad tracks.

"I hope Grant keeps us posted about his studies," she said. "Maybe he'll end up working for Google or Apple."

"Yeah. Or maybe he'll start his own company one of these days."

"Yes. That would be terrific."

"But those were lousy hints he gave us, Linda. What's the, if you square the 4th of July thing? I wonder if he was teasing us or really saw something in that serial number."

"I believe him. He wouldn't have talked with us for as long as he did to pass the time of day."

"Maybe. He said he could do a lot of mathematics in his head. Unfortunately we can't."

"We'll try our best," she said. "I think he's right. We can do it."

"I'm not so sure. We got to pull some meaning out of his hints or we're done before we start."

"Well then, start thinking. You better work hard on this. No pretending like you did in school!"

"Okay. We'll do it later. In the mean time, I'm hungry. Let's drive down to the Winking Lizzard and get something to drink. We'll leave the Jeep there and ride our bikes down to the Valley Café. You like that bike ride along the Erie Canal."

"That's good."

"I know they're open til 3:00 pm," I said. "You can get your favorite spinach and fete cheese omelet. I'll get the ham and turkey sub."

We rode our bikes down to Valley Café, ate our lunch outside, and spent several more hours biking around the Cuyahoga Valley National Park. We talked a lot about the serial number. It started to get dark and we headed back to the Jeep and drove home to Rocky River, Ohio.

Chapter 5 – Incredible Discovery

Weeks passed and we hadn't solved anything. It was another Sunday night and time had about run out. Linda wanted to find at least one of the answers before Grant emailed us the solution. After dinner we reviewed the hints for the hundredth time. Linda's mother called to remind her about some party they were supposed to attend a couple weeks later on August 16th.

"Donald, are you analyzing Grant's hints?"

"I don't know where to start this time. I've done everything. And I'm not exactly sure how any of them relate directly to the serial number. Nothing stands out to me. He calculated everything in his head."

"Listen, he said square the 4th of July. Maybe he meant to include the month too. So if we square 704 we get 495,616, right?"

"Yes, if that's what your iPAD says. It's a nice big even number, but it means nothing to me. How about you?"

"No. I don't see anything in it."

"Let's try this one," I said. "Light travels 186,282 miles per second. If we divide that into your 495,616 we get 2.66. So, light travels 495,616 miles in 2.66 seconds. You think that's it? I don't think Grant was going down that road. Do you?"

"No. You're way off on that. We have to think deeper, more universally. We're looking for something of grand importance, not just some meaningless number."

"Well, he found something really fast."

"I know. He whittled the serial number down to a more manageable size. So, what's smaller and significant?"

"I have no idea, Linda. I don't think we're going to find anything. This whole thing is absurd. I'm sick of it."

"Don't be so negative."

"I'm not negative."

"You better turn your attitude around."

"What? Let's give up on this stupid hunt and go do something fun."

"This is fun."

"No, it isn't. It's aggravating and I'm tired of it."

The serial number had become an obsession. We worked on the problem almost every night and put in especially long hours on it over the weekends. Each day was more depressing. We went around in circles a hundred times. Linda worked her iPAD and I played around with an Excel spreadsheet. We found nothing 'significant', but I did calculate how many centimeters tall Mt. Everest was the last time it was officially measured.

"Look at the number again closely," Linda said. "What do you see?"

"The same thing I've always seen. Not much of anything."

"Look deeper this time. I see a lot of 16's that can be made up of the 8's and 2's in the serial number. And I'm going to a party on the 16th."

"So what?"

"Grant said to square the 4th of July. Four squared is 16."

"I know, and it's making me nauseous. Why don't we wait and see if he really sends us the answer? He could have played a big joke on us. We're driving ourselves nuts."

"No, he wouldn't do that. We can find it. We've got time. While you're screwing around with your spreadsheet, try playing with the number 16 and the 88222288."

"I've done that already."

"Do some different things with it. Grant said plant a tree and be careful of its roots. Did he mean square root of the serial number?"

"Couldn't have," I said. "It's a meaningless number. This is the 42nd day. Grant said he'll send us an email on the 45th day with the answer. Time's wasting away."

"Then get going."

"What do you think I've been doing?"

After another hour I thought I exhausted every conceivable manipulation of the serial number. Linda kept throwing out suggestions and I plugged them into Excel.

"Did you calculate all the possible roots?" she asked.

"How can I do all the possible ones? There's a million of them."

"Do those that relate to the numbers on the bill?"

"I've done the 8th root, the 88th root, the square root, the 22nd root, the 222nd root and I don't know how many others."

"Do the 16th root. I told you before to play around with 16."

"Hold on. Maybe I did everything but the 16th."

I reloaded Excel and popped in the expression +(88222288)^(1/16), closed my eyes and hit (Enter). I opened my left eye slowly and thought I saw another oddball number, but there was a point after the three.

"Linda, we got it," I yelled. "I didn't try the 16th root until now. I did everything else. Hot dog! This has to be it. The 16th root of your 88222288 is 3.13760. Round it off and you get 3.14. It's π. Grant would expect us to round off, right?"

"Sure he would."

"Everybody knows Pi as 3.14. And that's what we got. What do you think?"

"You're right," she said. "He also told us to eat a party dessert. And a party dessert is Pi. Didn't Archimedes discover the true Pi? He was a Greek mathematician."

"If you say so. You know history better than me. I guess you're right."

"I know I'm right. So we're one for two. π's also an irrational number. That was one of his hints. You know, it just keeps going forever. 3.14159265 on and on."

"Linda, I know what they are. I learned that in 6th grade."

"Unlikely. The bottom line is this: I told you to do the 16th root and that was the correct approach. Admit it, you found nothing by yourself."

"Yeah yeah. You lucked out."

"I didn't luck out. I knew there was something there. Now we're left with one more mystery."

"We did enough. Let Grant send us the second answer."

"No. Get busy and find it. I did the work on the first. All you did was pop the 16 into your little spreadsheet."

"Not just pop it in."

"Oh, I forgot. You typed +88222288^(1/16), hit the Enter key, and that was that. Think harder dollar-bill chaser. Lots harder. We have to get the second answer tonight."

"I'm tired."

"You're not tired. Get going! Use your brain."

Linda went back to her iPAD and I tried to figure out something. I had no idea what direction to attack next, not that what I had attacked before did any good. I picked up my iPhone and asked Siri if she had any suggestions. She sent me to the NASA site. Terrific! I spent the next hour browsing through NASA's collection of deep space images taken by the Hubble Space

Telescope. The pictures were great, but didn't get me any closer to solving the serial number's second riddle here on earth.

"Linda, what are you doing now?"

"I'm searching. Like you should be."

"I am, more or less. You think you're closing in on something?"

"Be quiet. Go play with your spreadsheets or whatever you're fooling around with."

"I'm tired of this."

"Too bad. Keep looking."

It was 10:00 pm Sunday night and we had been working on our perpetual project for the last several hours. The 3.13760 rounded off perfectly to 3.14. An elegant solution. And to think Grant did this calculation in his head. God Almighty! We were lucky to run into him.

Another half hour passed and Linda asked if I was on the trail of anything 'pertinent'. I told her nothing 'pertinent' enough. Her and Grant loved that word.

"You better be working on this," she said.

"Yeah yeah. I am. What do you think I'm doing?"

"That's a good question." I started to watch a disgusting video on YouTube of an anaconda squeezing the life out of a big crocodile when Linda screamed.

"I found it. Here it is. The second answer, Donald." She acted like she'd just won a dozen lotteries all at once.

"So, what is it? How do you know you're right?"

"Because it's such a perfect fit. And I discovered it more or less by chance."

"What'd you find?"

"No. You guess."

"I can't guess. I'm tired. Where the hell's that dollar bill anyways?"

"I hid it."

"Well go pull it out. It's mine. I want to see it."

"You're not getting it back. So forget it. Sarah knew this bill was special too. She had it hidden in the vault and she picked the right day to give it to you because she knew you'd give it to me. There's no other explanation."

"That's not possible," I said.

"Oh yes it is. She's a lot smarter and wiser than you think. She might be on Grant's level."

"How do you figure? Actually, she does talk about scientific phenomena and stuff like that. Now that I think about it, she probably reads the same obscure science and engineering magazines you do."

"I'll tell you something you don't know, but you better not tell her."

"I won't. What is it?"

"A few years ago she told me her father had an IQ level that was right off the charts. He could speak five or six languages and divorced her mother when she was eleven. They knew he traveled all over the world working for the government, but that was all they knew. Her mother died in 1997."

"I never knew any of that."

"There's more."

"Like what?"

"She was the only child. The father severed contact with Sarah after the divorce. She said they never knew exactly where he was. A few years after her mother died, the government notified her about the father's death. He hanged himself in a hotel room somewhere in Asia. That's all she told me."

"That's awful."

"Don't underestimate her."

"I don't. I always knew she was lots smarter than anyone else in that stuffy bank. I bet she inherited some of his brains."

"She might be smarter than he was."

"But Linda, I don't want to guess what you found on the iPAD. It's late. What's the deal with the answer? I want to know."

"Okay, if you give up."

"Yeah, I give up."

"You know all those 16's we kept stumbling over?"

"Yeah."

"Well, sixteen was the crucial number. Doubly important in this chase. It all tied together."

"What tied together?"

"Grant's hints. A few minutes ago I decided to take a look at the Greek alphabet."

"What for?"

"Because Archimedes discovered Pi and he was Greek. Do you know if the 'π' symbol is in the Greek alphabet?"

"It could be," I said. "I'm not sure. Is it?"

"Yes."

"What's that got to do with the second part of the problem?"

"It's got a lot to do with it. Do you know what letter π is in the Greek alphabet?"

"Nope. Never thought about it. Who'd ever know that off the top of their head?"

"Well, Grant knew. Maybe Sarah too. The 16^{th} letter of the Greek alphabet is'π'. So not only was 'π' hiding inside the serial number once you extracted its 16^{th} root, 'π' is also the 16^{th} letter in the Greek alphabet. How amazing is that? I knew all those 16's meant something."

"God Damn! Send Grant an email. See if he agrees with you."

Finally, with time running out, we apparently solved the two riddles. The whole thing was pretty cool.

I rearranged some of the stacked papers and envelopes I had piled next to my PC and noticed the cash envelope Sara gave me six weeks earlier. I remembered the amount of the check I cashed, but that's not what she wrote on the envelope.

"Linda, you'll never guess what I'm looking at."

"You're right about that. You look at all kinds of weird stuff."

"Not this time. I've still got the envelope Sarah gave me when she cashed that check last month. The one with the dollar bill in it. You remember what the check was for?"

"Four hundred something."

"Close. It was $479. She counted out the $478, but was short the dollar."

"I remember. So what?"

"Well, she went into the vault and brought out an extra dollar and put the $479 into this envelope. Then she wrote the amount on front. Here's her handwriting on the envelope."

"I can't see it from here. What'd she write?"

"She wrote $314. But the check was for $479 dollars. You counted it in the Jeep. I never paid attention to what she wrote on the envelope after she counted out the cash. And you pulled the money out from the opposite side of the envelope from where she wrote $314 in little numbers. Where'd she come up with $314?"

"Donald, I told you she knew. She knew 'Pi" was hiding inside that serial number before Grant came along."

"I don't think so."

"Why not? Out of the universe of numbers she comes up with $314? Where'd she get that from? The only thing she didn't do was put a big obvious point after the three."

"It could be a rare coincidence."

"No. Not at all. She knew exactly what was inside that serial number. That's why she gave the dollar to you with her own little hint on the envelope. She saved it for you."

"Why me? Why that day?"

"Because she knew you'd give the envelope to me that Saturday. And she knew one way or another I'd find her dollar. She was testing us for something, but I don't know what."

"That's impossible."

"You think so? More impossible than what was hiding inside my serial number? I've talked with Sarah a lot of times over the years. In some ways, we think alike."

"That's pretty obvious."

"You know, Grant might want to talk with Sarah one of these days too."

"Not before me," I said.

"You better see if she's still working at the bank on Monday."

"Why?"

"I'm not sure. But that dollar might have been a farewell present."

"Geeee. Okay, I'll check on her."

"I'm going to email Grant. And I'm telling him I was the one who found both answers."

"Go ahead. He'll know I helped."

"I don't think so. He's a smart guy. He knew I was the patient and persistent one."

"Yeah, well."

"Maybe he'd like to have lunch with us at the Valley Café when he comes home again."

"Good idea. He can tell us what he's been doing with some million mile long numbers."

"I can't wait," she said.

"We'll see. By the way, how many places has Pi been calculated to? Did you ever read about that in your Scientific American?"

"They calculated it to a lot of places."

"And how many would that be? Fire up your iPAD. Maybe you can prowl around that string of numbers and see what's hiding there."

"Don't be silly."

"What's silly? It'd be another good hobby for you. How much money do you think Grant would pay for my dollar?"

"Nothing, because it's not your dollar. It's my dollar, and I'm not selling it."

"You might reconsider if he offered a few Benjamin's for it."

"No I wouldn't."

"I think you would."

"Forget it, Donald. We still have to find Mr. Brown's grave. And while we're at it, I want to bring home a few of those pumpkins I saw when we heard the thunder. They looked so cute."

"Linda, they're not that cute. Besides, you couldn't see their faces from where we were."

"I know what pumpkins look like."

"Not those pumpkins. I'm going to make sure the doors are locked."

"You did that already."

"It won't hurt to double-check."

"What's wrong with you?"

"Nothing. I'm just tired after all this math excitement."

It felt creepy thinking about those pumpkins. They were never far from my mind after all these years. I wasn't about to tell Linda anything about them. Those cute pumpkins killed a lot of people. I didn't want us added to their list of victims.

"I think we should hunt for Brown's tombstone next Saturday. It'll be fun. We'll take our bikes and have a picnic in the cemetery too."

"Linda, let's think about that for a while. Mr. Brown's not going anywhere anytime soon. It's late. You got to be tired too. I'm going to bed as soon as I finish the last few sentences to this chronicle."

"Okay, but don't forget, the pumpkins won't be there forever. We might miss them if we don't get back there next weekend."

"No, Linda. They'll be there. They've never left."

"Didn't you used to ride your motorcycle around Boston Township before we were married?"

"Yeah, I rode around that town at least a hundred times."

"How about Main Street? Do you remember riding down to Boston Cemetery?"

"I might have once or twice, but I don't want to think about it now or I'll never get to sleep."

"Well, I'll pack us a nice yummy lunch when we go look for Mr. Brown's grave."

"Sure. That'll be great. Just be sure to pack your running shoes too!"

THE END - ALMOST

Linda emailed Grant and sure enough, she was right. So what's new about that? She discovered both mysteries inside her dollar. Unfortunately, I wasn't much help. Don't laugh. You think you could've found both of them? How about without any hints?

A few days later, Grant let us know how that 69,518,506 he told us about was associated with Linda's serial number. We'd have never figured that one out in a trillion and one years.

He wrote the following: The exact eight digit serial number on Linda's dollar bill (88222288) begins to appear in full at the 69,518,506th digit of Pi. In other words, you have to calculate Pi out to that many positions past the decimal point to reach the first '8' in the complete serial number. The next 7 places in Pi follow with the 8222288 to complete the serial number. How could he have possibly known that?

Since π has been calculated to over one trillion places past the decimal point, who knows how many other times it may appear farther along that string of numbers. However, according to Grant, that's the position after the decimal point (3.14159..) where it ***first*** begins to show itself.

But, there's even a tiny bit more. Notice Linda's serial number and that 69,518,506 both contain 8 digits. And the sum of the digits in each number is 40. I don't know what significance there is in that fact, but after everything else, it seems quite remarkable.

8+8+2+2+2+2+8+8=40
6+9+5+1+8+5+0+6=40

So, is the number 40 special? Who knows? Although I do remember Linda telling me once that -40 Fahrenheit equaled -40 Centigrade. I don't know where the hell she came up with that. Hard to believe it could be true. Check it out if you want. I'm too tired to think about it.

And yes, Linda hid her dollar bill. I haven't seen it since the day Sarah handed it to me. If you want to buy it, email an offer and I'll see what I can do. Who knows, if your offer is righteous enough, I might be able to convince her to sell it. But don't hold your breath.

"Donald, are you done writing?"

"I'm at the last few sentences."

"Then you're not finished. I've got something I want you to include."

"Linda, I don't think I can add it here at the end."

"Sure you can."

"Nope I maybe can't. What's so important anyways? This better be good."

"Well, I've been playing around with the serial number and discovered if I use each of its 8 integers only once, in a simple calculation, I end up with the 314 Sarah wrote on your envelope."

"I don't believe it. Okay, go on, how'd you do it?"

"You'll never believe this. Sarah's a genius, Donald. A real genius to the 10th power."

"We'll see about that. So what's this new revelation of yours at midnight?"

"Okay, here goes. If I take 222 and add 88 plus another 8, I get a subtotal of 318. There's only an 8 and a 2 left. So, if you subtract (8/2), which is 4, you get exactly 314. Just what Sarah wrote on your envelope. Imagine that, Donald. What do you think?"

"I think you're right. I barely believe it. You'll have to tell Grant and Sarah what you found. All three of you must be communicating on the same extraterrestrial wavelength."

"We could be. This was fun. I loved this number project, didn't you?"

"Yep. But I've had enough fun for tonight. Maybe I can dream about some of your gigantic numbers instead of your cute deadly pumpkins."

"What do you mean by that?"

"I meant your cute dear pumpkins."

"That's better. You know I love pumpkins."

"Yeah. Today you love them, tomorrow we'll see."

"What are you talking about? Here, concentrate on this little bit of additional information. And I want you to make a note of it in your scrapbook or whatever you're writing."

"Oh no. Linda, it's done. And it's no scrapbook. It's a chronicle. Anyways, the last period's been affixed to the last sentence. Period, done. No more number stuff. I mean it!"

"I don't care about your silly period. Besides, you never found anything in the serial number like me. I want this included. So pay attention. Something you never did in school."

"Don't be so sure of that. I'll determine what gets included. So, let's have it."

"Okay. I know you added the serial numbers together and they added up to 40 and the sum of the position where Pi first begins to show itself also added up to 40 (6+9+5+1+8+5+0+6)."

"Yeah. That's not new. I've got that. Guess it looks like I'm done, Linda."

"No way! I did a little more homework and discovered another surprising fact for you."

"Now what's the Homework Princess found? This better be more than fantastic!"

"Donald, I'm proud I always finished my homework on time. You should've put more effort into yours. Now pay attention. If you add both of those forties together, you get 80, right?"

"Of course. Is this a trick question? I can still add 40 and 40 together at midnight."

"So, what about that 80? Do you know what's special about it in relation to the serial number."

"No. Just that it's the sum of the two 40's. So what's the deal with all this crazy figuring?"

"Bet you didn't know that my serial number has exactly 80 divisors. That means, in case you didn't know, there are only 80 numbers you can divide evenly into 88222288."

"Well, if it's true, I'd say only you, Grant, and Sarah would know it. So, is it true?"

"I don't want to disappoint you, but yes it is. I just printed out the list of them for you. Take a look."

1, 2, 4, 7, 8, 11, 14, 16, 22, 28, 44, 56, 77, 88, 101, 112, 154, 176, 202, 308, 404,
616, 707, 709, 808, 1111, 1232, 1414, 1418, 1616, 2222, 2828, 2836, 4444, 4963,
5656, 5672, 7777, 7799, 8888, 9926, 11312, 11344, 15554, 15598, 17776, 19852,
31108, 31196, 39704, 54593, 62216, 62392, 71609, 79408, 109186, 124432,
124784, 143218, 218372, 286436, 436744, 501263, 572872, 787699, 873488,
1002526, 1145744, 1575398, 2005052, 3150796, 4010104, 5513893, 6301592,
8020208, 11027786, 12603184, 22055572, 44111144, 88222288

I couldn't believe what I saw. My brain was already a scrambled mess of numbers. And now she managed to deliver a mind-numbing bunch of them in print. Hard to believe, but true.

"Linda, did you ever work for the CIA or NSA?"

"My lips are sealed." She yanked the printout from me and admired the list of her 80 divisors some more, fluffed up her hair, and said, "Very cool, isn't it Donald?"

"You're right about that, Linda. Words have vanished from my brain. I'm going to bed."

"Yeah, I'm tired too. I'll leave the list of divisors on the kitchen table. If you get up in the middle of the night, you might want to take another peek at them. Maybe you can discover some peculiar numerical relationships among those 80 numbers. You might get lucky!"

"Good thinking, Linda. You have such good ideas late at night. You read my mind like a flashing billboard. Can't wait to jump out of bed at 3:00 am and get right on it."

If you're curious about how this story came about, email me.

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Here's The Old Conjecture Put Forward In 1769

The conjecture was that the following equation has NO solution in Positive integers:

$$A^4+B^4+C^4 = D^4$$

Well, that conjecture was wrong! It did have positive integer solutions. But it took over 200 to find them. The following solution is the one Grant remembered. It was discovered shortly after the first solution in 1988.

Note - There are no solutions to this equation with smaller integers. But there are other solutions with phenomenally larger and longer numbers. Thought you might find the following somewhat interesting.

$A = 95{,}800^4$	=	84,229,075,969,600,000,000
$B = 217{,}519^4$	=	2,238,663,363,846,300,000,000
$C = 414{,}560^4$	=	29,535,857,400,192,000,000,000
Total		31,858,749,840,007,900,000,000
$D = 422{,}560^4$	=	31,858,749,840,007,900,000,000


James Brown
American Counterfeiter
Died December 9, 1865
Boston Cemetery
Summit County, Ohio


THE UNITED STATES OF AMERICA
ONE DOLLAR