

RANDOM HOUSE  BOOKS



The Housekeeper and the Professor

Yoko Ogawa

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The Housekeeper and the Professor



Harvill Secker
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We called him the Professor. And he called my son Root, because, he said, the flat top of his head reminded him of the square root sign.

"There's a fine brain in there," the Professor said, mussing my son's hair. Root, who wore a cap to avoid being teased by his friends, gave a wary shrug. "With this one little sign we can come to know an infinite range of numbers, even those we can't see." He traced the symbol in the thick layer of dust on his desk.



Of all the countless things my son and I learned from the Professor, the meaning of the square root was among the most important. No doubt he would have been bothered by my use of the word *countless*—too sloppy, for he believed that the very origins of the universe could be explained in the exact language of numbers—but I don't know how else to put it. He taught us about enormous prime numbers with more than a hundred thousand places, and the largest number of all, which was used in mathematical proofs and was in the *Guinness Book of Records*, and about the idea of something beyond infinity. As interesting as all this was, it could never match the experience of simply spending time with the Professor. I remember when he taught us about the spell cast by placing numbers under this square root sign. It was a rainy evening in early April. My son's schoolbag lay abandoned on the rug. The light in the Professor's study was dim. Outside the window, the blossoms on the apricot tree were heavy with rain.

The Professor never really seemed to care whether we figured out the right answer to a problem. He preferred our wild, desperate guesses to silence, and he was even more delighted when those guesses led to new problems that took us beyond the original one. He had a special feeling for what he called the "correct miscalculation," for he believed that mistakes were often as revealing as the right answers. This gave us confidence even when our best efforts came to nothing.

"Then what happens if you take the square root of negative one?" he asked.

"So you'd need to get -1 by multiplying a number by itself?" Root asked. He had just learned fractions at school, and it had taken a half-hour lecture from the Professor to convince him that numbers less than zero even existed, so this was quite a leap. We tried picturing the square root of negative one in our heads: $\sqrt{-1}$. The square root of 100 is 10; the square root of 16 is 4; the square root of 1 is 1. So the square root of -1 is ...

He didn't press us. On the contrary, he fondly studied our expressions as we mulled over the problem.

"There is no such number," I said at last, sounding rather tentative.

"Yes, there is," he said, pointing at his chest. "It's in here. It's the most discreet sort of number, so it never comes out where it can be seen. But it's here." We fell silent for a moment, trying to picture the

square root of minus one in some distant, unknown place. The only sound was the rain falling outside the window. My son ran his hand over his head, as if to confirm the shape of the square root symbol.

But the Professor didn't always insist on being the teacher. He had enormous respect for matters about which he had no knowledge, and he was as humble in such cases as the square root of negative one itself. Whenever he needed my help, he would interrupt me in the most polite way. Even the simplest request—that I help him set the timer on the toaster, for example—always began with "I'm terribly sorry to bother you, but ..." Once I'd set the dial, he would sit peering in as the toast browned. He was as fascinated by the toast as he was by the mathematical proofs we did together, as if the truth of the toaster were no different from that of the Pythagorean theorem.

It was March of 1992 when the Akebono Housekeeping Agency first sent me to work for the Professor. At the time, I was the youngest woman registered with the agency, which served a small city on the Inland Sea, although I already had more than ten years of experience. I managed to get along with all sorts of employers, and even when I cleaned for the most difficult clients, the ones no other housekeeper would touch, I never complained. I prided myself on being a true professional.

In the Professor's case, it only took a glance at his client card to know that he might be trouble. A blue star was stamped on the back of the card each time a housekeeper had to be replaced, and there were already nine stars on the Professor's card, a record during my years with the agency.

When I went for my interview, I was greeted by a slender, elegant old woman with dyed brown hair swept up in a bun. She wore a knit dress and walked with a cane.

"You will be taking care of my brother-in-law," she said. I tried to imagine why she would be responsible for her husband's brother. "None of the others have lasted long," she continued. "Which has been a terrible inconvenience for me and for my brother-in-law. We have to start again every time a new housekeeper comes.... The job isn't complicated. You would come Monday through Friday at 11:00 A.M., fix him lunch, clean the house, do the shopping, make dinner, and leave at 7:00 P.M. That's the extent of it."

There was something hesitant about the way she said the words *brother-in-law*. Her tone was polite enough, but her left hand nervously fingered her cane. Her eyes avoided mine, but occasionally I caught her casting a wary glance in my direction.

"The details are in the contract I signed with the agency. I'm simply looking for someone who can help him live a normal life, like anyone else."

"Is your brother-in-law here?" I asked. She pointed with the cane to a cottage at the back of the garden behind the house. A red slate roof rose above a neatly pruned hedge of scarlet hawthorn.

"I must ask you not to come and go between the main house and the cottage. Your job is to care for my brother-in-law, and the cottage has a separate entrance on the north side of the property. I would prefer that you resolve any difficulties without consulting me. That's the one rule I ask you to respect. She gave a little tap with her cane.

I was used to absurd demands from my employers—that I wear a different color ribbon in my hair

every day; that the water for tea be precisely 165 degrees; that I recite a little prayer every evening when Venus rose in the night sky—so the old woman's request struck me as relatively straightforward.

"Could I meet your brother-in-law now?" I asked.

"That won't be necessary." She refused so flatly that I thought I had offended her. "If you met him today, he wouldn't remember you tomorrow."

"I'm sorry, I don't understand."

"He has difficulties with his memory," she said. "He's not senile; his brain works well, but about seventeen years ago he hit his head in an automobile accident. Since then, he has been unable to remember anything new. His memory stops in 1975. He can remember a theorem he developed thirty years ago, but he has no idea what he ate for dinner last night. In the simplest terms, it's as if he has a single, eighty-minute videotape inside his head, and when he records anything new, he has to record over the existing memories. His memory lasts precisely eighty minutes—no more and no less." Perhaps because she had repeated this explanation so many times in the past, the old woman ran through it without pause, and with almost no sign of emotion.

How exactly does a man live with only eighty minutes of memory? I had cared for ailing clients on more than one occasion in the past, but none of that experience would be useful here. I could just picture a tenth blue star on the Professor's card.

From the main house, the cottage appeared deserted. An old-fashioned garden door was set into the hawthorn hedge, but it was secured by a rusty lock that was covered in bird droppings.

"Well then, I'll expect you to start on Monday," the old woman said, putting an end to the conversation. And that's how I came to work for the Professor.

Compared to the impressive main house, the cottage was modest to the point of being shabby: a small bungalow that seemed to have been built hastily. Trees and shrubs had grown wild around it, and the doorway was deep in shadows. When I tried the doorbell on Monday, it seemed to be broken.

"What's your shoe size?"

This was the Professor's first question, once I had announced myself as the new housekeeper. No bow, no greeting. If there is one ironclad rule in my profession, it's that you always give the employee what he wants; and so I told him.

"Twenty-four centimeters."

"There's a sturdy number," he said. "It's the factorial of four." He folded his arms, closed his eyes, and was silent for a moment.

"What's a 'factorial'?" I asked at last. I felt I should try to find out a bit more, since it seemed to be connected to his interest in my shoe size.

"The product of all the natural numbers from one to four is twenty-four," he said, without opening

his eyes. "What's your telephone number?"

He nodded, as if deeply impressed. "That's the total number of primes between one and one hundred million."

It wasn't immediately clear to me why my phone number was so interesting, but his enthusiasm seemed genuine. And he wasn't showing off; he struck me as straightforward and modest. It nearly convinced me that there *was* something special about my phone number, and that I was somehow special for having it.

Soon after I began working for the Professor, I realized that he talked about numbers whenever he was unsure of what to say or do. Numbers were also his way of reaching out to the world. They were safe, a source of comfort.

Every morning, during the entire time I worked for the Professor, we repeated this numerical q and a at the front door. To the Professor, whose memory lasted only eighty minutes, I was always a new housekeeper he was meeting for the first time, and so every morning he was appropriately shy and reserved. He would ask my shoe size or telephone number, or perhaps my zip code, the registration number on my bicycle, or the number of brushstrokes in the characters of my name; and whatever the number, he invariably found some significance in it. Talk of factorials and primes flowed effortlessly seeming completely natural, never forced.

Later, even after I had learned the meanings of some of these terms, there was still something pleasant about our daily introductions at the door. I found it reassuring to be reminded that my telephone number had some significance (beyond its usual purpose), and the simple sound of the numbers helped me to start the day's work with a positive attitude.

He had once been an expert in number theory at a university. He was sixty-four, but he looked older and somewhat haggard, as though he did not eat properly. He was barely more than five feet tall, and his back was so badly hunched that he seemed even shorter. The wrinkles on his bony neck looked a little grimy, and his wispy, snow-white hair fell in all directions, half-concealing his plump, Buddhalike ears. His voice was feeble and his movements were slow. If you looked closely, though, you could see traces of a face that had once been handsome. There was something in the sharp line of his jaw and his deeply carved features that was still attractive.

Whether he was at home or going out—which he did very rarely—the Professor always wore a suit and tie. His closet held three suits, one for winter, one for summer, and one that could be worn in spring or fall, three neckties, six shirts, and an overcoat. He did not own a sweater or a pair of casual pants. From a housekeeper's point of view, it was the ideal closet.

I suspect that the Professor had no idea there were clothes other than suits. He had no interest in what people wore, and even less in his own appearance. For him it was enough to get up in the morning, open the closet, and put on whichever suit wasn't wrapped in plastic from the cleaners. All three suits were dark and well-worn, much like the Professor himself, and clung to him like a second skin.

But by far the most curious thing about the Professor's appearance was the fact that his suit was covered with innumerable scraps of notepaper, each one attached to him by a tiny binder clip. Every

conceivable surface—the collar, cuffs, pockets, hems, belt loops, and buttonholes—was covered with notes, and the binder clips gathered the fabric of his clothing in awkward bunches. The notes were simply scraps of torn paper, some yellowing or crumbling. In order to read them, you had to get close and squint, but it soon became clear that he was compensating for his lack of memory by writing down the things he absolutely had to remember and pinning them where he couldn't lose them—on his body. His odd appearance was as distracting as his questions about my shoe size.

"Come in then," he said. "I have to work, but you just do whatever it is you have to do." And with that he disappeared into his study. As he turned and walked away, the notes made a dry, rustling sound.

From the bits and pieces of information I gleaned from the nine housekeepers who had come before me, it seemed that the old woman in the main house was a widow, and that her husband had been the Professor's older brother. When their parents had died, his brother had taken over the family textile business, had enlarged it considerably, and willingly assumed the cost of educating a brother who was a dozen years younger. In this way, the Professor had been able to pursue his study of mathematics at Cambridge University. But soon after he had received his doctorate and had found a position at a research institute, his brother had died suddenly of acute hepatitis. The widow, who had no children, decided to close down the factory, put up an apartment building on the land, and live off the rents she collected.

In the years that followed, the Professor and his sister-in-law had settled peacefully into their respective lives—until the accident. A truck driver had dozed off and struck the Professor's car head-on. He had suffered irreversible brain damage and had eventually lost his position at the university. He was forty-seven at the time, and since then he'd had no income except the prize money he earned from solving contest problems in the mathematics journals. For seventeen years he had been completely dependent on the widow's charity.

"You have to feel sorry for the old woman," one of the former housekeepers had said. "Having that strange brother-in-law eat through what her husband left her like some parasite." She'd been sent packing after she complained about the Professor's incessant jabbering about numbers.

The inside of the cottage was as cold and uninviting as the outside. There were just two rooms, an eat-in kitchen and a study that doubled as the Professor's bedroom. It was small, and the wretched condition of the place was striking. The furniture was cheap, the wallpaper was discolored, and the floor in the hall creaked miserably. The doorbell wasn't the only thing that didn't work: just about everything in the house was either broken or on its last legs. The little window in the bathroom was cracked, the knob on the kitchen door was falling off, and the radio that sat on top of the dish cupboard made no sound when I tried to turn it on.

The first two weeks were exhausting, since I had no idea what I was supposed to be doing. The work wasn't physically demanding, and yet at the end of each day my muscles were stiff and my whole body felt heavy. It was always a struggle at each new assignment until I adapted to the rhythm of the work, but the adjustment was especially difficult with the Professor. In most cases, I figured out what sort of person I was dealing with from the things they told me to do, or not to do. I determined where to focus my efforts, how to avoid getting into trouble—how to read the demands of the job. But the Professor

never gave me instruction of any kind, as though he did not mind what I did.

On that first day, it occurred to me that I should simply follow what the old woman had said, and start by fixing the Professor's lunch. I checked the refrigerator and the kitchen cupboards, but I found nothing edible except for a box of damp oatmeal and some macaroni and cheese that was four years past its expiration date.

I knocked at the study door. There was no answer, so I knocked again. Still no answer. I knew I shouldn't, but I opened the door and spoke to the Professor's back as he sat at his desk.

"I'm sorry to disturb you," I said.

He gave no sign of having heard me. Perhaps he's hard of hearing, or wearing earplugs, I thought. "What would you like for lunch?" I continued. "Are there ... things you like or dislike? Do you have any food allergies?"

The study smelled of books. Half the windows were covered by bookshelves, and piles of books drifted up the walls. A bed with a worn-out mattress was pressed against one wall. There was a single notebook lying open on the desk, but no computer, and the Professor wasn't holding a pen or pencil. He simply stared at a fixed point off in space.

"If there's nothing particular you want, I'll just make something. But please don't hesitate if there's anything I can get for you."

I happened to glance at some of the notes pinned to his suit: "... the failure of the analytic method ...", "... Hilbert's thirteenth ...", "... the function of the elliptical curve...." Shuffled in among the fragments of obscure numbers and symbols and words was one scrap that even I could understand. From the stains and bent corners of the paper and the rusted edges of the binder clip, I could tell that this one had been attached to the Professor for a long time: "My memory lasts only eighty minutes," read.

"I have nothing to say," he said, turning suddenly and speaking in a loud voice. "I'm thinking at the moment. *Thinking*. And to have my thoughts interrupted is like being strangled. Don't you know that barging in here when I'm with my numbers is as rude as interrupting someone in the bathroom?"

I bowed and apologized repeatedly, but I doubt he heard a word of what I said. He had already returned to his fixed point somewhere off in space.

To be shouted at like that on the first day could be a serious problem, and I worried that I might become the tenth star on his file card before I'd even started. I promised myself that I would never disturb him again while he was "thinking."

But the Professor was always thinking. When he came out of the study and sat at the table, when he was gargling in the bathroom, or even when he did his strange stretching exercises, he continued thinking. He ate whatever was set in front of him, mechanically shoveling the food in his mouth and swallowing almost without chewing. He had a distracted, unsteady way of walking. I managed to find the right moment to ask him about things I needed to know—where he kept the wash bucket or how to use the water heater. And I avoided making any unnecessary noise, even breathing too loudly, as I moved about that unfamiliar house, waiting for him to take even a short break from his thinking.

I made a cream stew for dinner, something with vegetables and protein that he could eat with just a spoon—and that he could eat without removing bones or shells. Perhaps it was because he'd lost his parents at such a young age, but he had less than perfect table manners. He never said a word of thank before he started eating, and he spilled food with almost every bite. I even caught him cleaning his ears with his dirty napkin at the table. He did not complain about my cooking, and he remained silent as he ate. Each time he plunged the spoon into the stew, he looked as if he might lose it in the bowl.

"Would you like some more? I've made plenty." It was careless of me to speak up suddenly like that to take such a familiar tone, and all I got by way of an answer was a burp. Without so much as a glance in my direction, he got up and disappeared into his study. There was a small pile of carrots at the bottom of his bowl.

At the end of my first day, I noticed a new note on the cuff of his jacket. "The new housekeeper," it said. The words were written in tiny, delicate characters, and above them was a sketch of a woman's face. It looked like the work of a small child—short hair, round cheeks, and a mole next to the mouth—but I knew instantly that it was a portrait of me. I imagined the Professor hurrying to draw this likeness before the memory had vanished. The note was proof of something, that he had interrupted his thinking for my sake.

Over the next few days, I introduced myself by pointing to the note on his cuff. The Professor would be silent for a moment, comparing my face with the picture on his sleeve, trying to recall what the note had meant. At last he would make a little huffing sound and ask me my shoe size and telephone number. But I realized that something dramatic had changed when, at the end of my first week, he came to me with a bundle of papers covered with formulas and numbers, and asked me to send it off to the *Journal of Mathematics*.

"I'm terribly sorry to bother you, but ..."

His tone was polite, and completely unexpected after the way he had scolded me in his study on my first day. It was the first request he had made of me, and he was no longer "thinking," for the moment.

"It's no trouble at all," I told him. I carefully copied the mysterious foreign address onto the envelope and ran off happily to the post office.

When I returned, the Professor wasn't thinking anymore. He was stretched out in the easy chair by the kitchen window, and as he rested I was finally able to clean the study. I opened the windows and took his quilt and pillow out into the garden to air. And then I ran the vacuum cleaner at full throttle. The room was cluttered and chaotic, but comfortable.

I was not surprised to find balls of hair and moldy Popsicle sticks behind the desk, or a chicken bone resting on top of one of his bookshelves. And yet, the room was filled by a kind of stillness. Not simply an absence of noise, but an accumulation of layers of silence, untouched by fallen hair or mold, silence that the Professor left behind as he wandered through the numbers, silence like a clear lake hidden in the depths of the forest.

But despite its relative comfort, if you had asked me whether it was an interesting room, I would

have had to say no. There was not a single object to spark the imagination, no trinkets from the Professor's past, ~~no mysterious photographs or decorations that might have amused a housekeeper.~~

I attacked the bookshelves with the duster. *Group Theory. Algebraic Number Theory. Studies in Number Theory...* Chevalley, Hamilton, Turing, Hardy, Baker.... So many books and not one I wanted to read. Half of them were in foreign languages, and I couldn't even make out the titles on the spines. A few notebooks were stacked on the desk, along with a scattering of pencil stubs and binder clips. How could he *think* at such a characterless desk? The residue from an eraser was the only evidence of the work that he had done here.

As I wiped away the dust, arranged the notebooks, and gathered up the clips, it occurred to me that a mathematician ought to have some sort of expensive compass you couldn't find in an ordinary stationery shop, or an elaborate slide rule. The seat of the chair was worn down where the Professor sat.

"When is your birthday?"

That evening after dinner, he did not disappear immediately into his study. Though I was busy cleaning up, he seemed to be looking for a topic of conversation.

"February twentieth."

"Is that so?"

The Professor had picked the carrots out of his potato salad and had left them on the plate. I cleared the table and wiped the table, noticing that he still seemed to spill a great deal, even when he wasn't thinking. It was spring, but still chilly once the sun set, so the oil heater was burning in the corner.

"Do you send a lot of articles to magazines?" I asked.

"I wouldn't call them 'articles.' They're just puzzles for amateur mathematicians. Sometimes there's even a prize. Wealthy men who love mathematics put up the money." He looked down, checking his suit in various places, and his gaze fell on a note clipped to his left pocket. "Oh, I see. I sent a proof to the *Journal of Mathematics* today."

It had been much more than eighty minutes since I'd made my trip to the post office.

"Oh, dear!" I said. "If it's a contest, I should have sent it express mail. If it doesn't get there first, I suppose you don't get the prize."

"No, there was no need to send it express. Of course, it's important to arrive at the correct answer before anyone else, but it's just as important that the proof is elegant."

"I had no idea a proof could be beautiful ... or ugly."

"Of course it can," he said. Getting up from the table, he came over to the sink where I was washing the dishes and peered at me as he continued. "The truly correct proof is one that strikes a harmonious balance between strength and flexibility. There are plenty of proofs that are technically correct but are messy and inelegant or counterintuitive. But it's not something you can put into words—explaining why a formula is beautiful is like trying to explain why the stars are beautiful."

I stopped washing and nodded, not wanting to interrupt the Professor's first real attempt at conversation.

"Your birthday is February twentieth. Two twenty. Can I show you something? This was a prize I won for my thesis on transcendent number theory when I was at college." He took off his wristwatch and held it up for me to see. It was a stylish foreign brand, quite out of keeping with the Professor's rumpled appearance.

"It's a wonderful prize," I said.

"But can you see the number engraved here?" The inscription on the back of the case read President Prize No. 284.

"Does that mean that it was the two hundred and eighty-fourth prize awarded?"

"I suppose so, but the interesting part is the number 284 itself. Take a break from the dishes for a moment and think about these two numbers: 220 and 284. Do they mean anything to you?"

Pulling me by my apron strings, he sat me down at the table and produced a pencil stub from his pocket. On the back of an advertising insert, he wrote the two numbers, separated strangely on the card.

220

284

"Well, what do you make of them?"

I wiped my hands on my apron, feeling awkward, as the Professor looked at me expectantly. I wanted to respond, but had no idea what sort of answer would please a mathematician. To me, they were just numbers.

"Well ...," I stammered. "I suppose you could say they're both three-digit numbers. And that they're fairly similar in size—for example, if I were in the meat section at the supermarket, there'd be very little difference between a package of sausage that weighed 220 grams and one that weighed 284 grams. They're so close that I would just buy the one that was fresher. They seem pretty much the same—they're both in the two hundreds, and they're both even—"

"Good!" he almost shouted, shaking the leather strap of his watch. I didn't know what to say. "It's important to use your intuition. You swoop down on the numbers, like a kingfisher catching the glint of sunlight on the fish's fin." He pulled up a chair, as if wanting to be closer to the numbers. The musty paper smell from the study clung to the Professor.

"You know what a factor is, don't you?"

"I think so. I'm sure I learned about them at some point...."

"For 220 is divisible by 1 and by 220 itself, with nothing leftover. So 1 and 220 are factors of 220. Natural numbers always have 1 and the number itself as factors. But what else can you divide it by?"

"By 2, and 10...."

"Exactly! So let's try writing out the factors of 220 and 284, excluding the numbers themselves. Like this."

220 : 1 2 4 5 10 11 20 22 44 55 110 142 71 4 2 1 : 284

The Professor's figures, rounded and slanting slightly to one side, were surrounded by black smears where the pencil had smudged.

"Did you figure out all the factors in your head?" I asked.

"I don't have to calculate them—they just come to me from the same kind of intuition you used. So then, let's move on to the next step," he said, adding symbols to the lists of factors.

220 : 1 + 2 + 4 + 5 + 10 + 11 + 20 + 22 + 44 + 55 + 110 = 142 + 71 + 4 + 2 + 1 : 284

"Add them up," he said. "Take your time. There's no hurry."

He handed me the pencil, and I did the calculation in the space that was left on the advertisement. His tone was kind and full of expectation, and it didn't seem as though he were testing me. On the contrary, he made me feel as though I were on an important mission, that I was the only one who could lead us out of this puzzle and find the correct answer.

I checked my calculations three times to be sure I hadn't made a mistake. At some point, while we'd been talking, the sun had set and night was falling. From time to time I heard water dripping from the dishes I had left in the sink. The Professor stood close by, watching me.

"There," I said. "I'm done."

220 : 1 + 2 + 4 + 5 + 10 + 11 + 20 + 22 + 44 + 55 + 110 = 284

220 = 142 + 71 + 4 + 2 + 1 : 284

"That's right! The sum of the factors of 220 is 284, and the sum of the factors of 284 is 220. They're called 'amicable numbers,' and they're extremely rare. Fermat and Descartes were only able to find one pair each. They're linked to each other by some divine scheme, and how incredible that your birthday and this number on my watch should be just such a pair."

We sat staring at the advertisement for a long time. With my finger I traced the trail of numbers from the ones the Professor had written to the ones I'd added, and they all seemed to flow together, as if we'd been connecting up the constellations in the night sky.

That evening, after I'd got home and put my son to bed, I decided to look for "amicable numbers" on my own. I wanted to see whether they were really as rare as the Professor had said, and since it was just a matter of writing out factors and adding them up, I was sure I could do it, even though I'd never graduated from high school.

But I soon realized what I was up against. Following the Professor's suggestion, I tried using my intuition to pick likely pairs, but I had no luck. I stuck to even numbers at first, thinking the factors would be easier to find, and I tried every pair between ten and one hundred. Then I expanded my search to odd numbers, and then to three-digit numbers as well, still to no effect. Far from being amicable, the numbers seemed to turn their backs on each other, and I couldn't find a pair with even the most tenuous connection—let alone this wonderfully intimate one. The Professor was right: my birthday and his watch had overcome great trials and tribulations to meet each other in the vast sea of numbers.

Soon, every inch of the paper was filled with figures. My method was logical, if a little primitive—yet I ended up with nothing to show for all my work.

I did make one small discovery: the sum of the factors of 28 equals 28.

$$28 : 1 + 2 + 4 + 7 + 14 = 28$$

Though I wasn't sure this amounted to anything. None of the other numbers I'd tried were the sum of their own factors, but that didn't mean there weren't more out there. I knew it was an exaggeration to call it a "discovery," but for me it was just that. This one line of numbers stretched across the page as if pulled taut by some mysterious intention.

As I got into bed, I finally glanced at the clock. It had been much more than eighty minutes since we'd had our talk about amicable numbers. By now he'd have forgotten all about our secret, and he'd have no idea where the number 220 had come from. I found it difficult to fall asleep.

From a housekeeper's perspective, working for the Professor was relatively easy: a small house, no visitors or phone calls, and only light meals for one man who had little interest in food. At other jobs I always had to do as much as possible in a short amount of time; but now I was delighted to have so much time to do a truly thorough job of cleaning, washing, and cooking. I learned to recognize when the Professor was beginning a new contest, and how to avoid disturbing him. I polished the kitchen table to my heart's content with a special varnish and patched the mattress on his bed. I even invented various ways to camouflage the carrots in his dinner.

The one thing about the job that was always a little tricky was understanding how the Professor's memory worked. According to the old woman, he remembered nothing after 1975; but I had no idea what yesterday meant to him or whether he could think ahead to tomorrow, or how much he suffered.

It was clear that he didn't remember me from one day to the next. The note clipped to his sleeve

simply informed him that it was not our first meeting, but it could not bring back the memory of the time we had spent together.

When I went out shopping, I tried to return home within an hour and twenty minutes. As befit a mathematician, the device in his brain that measured those eighty minutes was more precise than any clock. If an hour and eighteen minutes had passed from the time I walked out the door to the time I got back, I would receive a friendly welcome; but after an hour and twenty-two minutes, we were back to "What's your shoe size?"

I was always afraid of making some careless remark that might upset him. I nearly bit my tongue once when I started to mention something the newspaper had said about Prime Minister Miyazawa. (For the Professor, the prime minister was still Takeo Miki.) And I felt awful about suggesting that we get a television to watch the summer Olympics in Barcelona. (His last Olympics were in Munich.) Still, the Professor gave no sign that this bothered him. When the conversation veered off in a direction he couldn't follow, he simply waited patiently until it returned to a topic he could handle. But, for his part, he never asked me anything about myself, how long I'd been working as a housekeeper, where I came from, or whether I had a family. Perhaps he was afraid of bothering me by repeating the same question again and again.

The one topic we could discuss without any worry was mathematics. Not that I was enthusiastic about it at first. In school, I had hated math so much that the mere sight of the textbook made me feel ill. But the things the Professor taught me seemed to find their way effortlessly into my brain—not because I was an employee anxious to please her employer but because he was such a gifted teacher. There was something profound in his love for math. And it helped that he forgot what he'd taught me before, so I was free to repeat the same question until I understood. Things that most people would get the first time around might take me five, or even ten times, but I could go on asking the Professor to explain until I finally got it.

"The person who discovered amicable numbers must have been a genius."

"You might say that: it was Pythagoras, in the sixth century B.C."

"Did they have numbers that long ago?"

"Of course! Did you think they were invented in the nineteenth century? There were numbers before human beings—before the world itself was formed."

We talked about numbers while I worked in the kitchen. The Professor would sit at the kitchen table or relax in the easy chair by the window, while I stirred something on the stove or washed the dishes in the sink.

"Is that so? I'd always thought that human beings invented numbers."

"No, not at all. If that were the case, they wouldn't be so difficult to understand and there'd be no need for mathematicians. No one actually witnessed the first numbers come into being—when we first became aware of them, they'd already been around for a long time."

"And that's why so many smart people try so hard to figure out how they work?"

"Yes, and why human beings seem so foolish and frail compared to whoever or whatever created these numbers." The Professor sat back in his chair and opened one of his journals.

"Well, hunger makes you even more foolish and frail, so we need to feed that brain of yours. Dinner will be ready in a minute." Having finished grating some carrots to mix into his hamburger, I carefully slipped the peelings into the garbage pail. "By the way," I added, "I've been trying to find another pair of amicable numbers besides 220 and 284, but I haven't had any luck."

"The next smallest pair is 1,184 and 1,210."

"Four digits? No wonder I didn't find them. I even had my son help me. I found the factors, and then he added them up."

"You have a son?" The Professor sat up in his chair; his magazine slipped to the floor.

"Yes."

"How old is he?"

"Ten."

"Ten? He's just a little boy!" The Professor's expression had quickly darkened, he was becoming agitated. I stopped mixing the hamburger and waited for what I was sure was coming: a lesson on the significance of the number 10.

"And where is your son now?" he said.

"Well, let's see. He's home from school by now, but he's probably given up on his homework and gone to the park to play baseball with his friends."

"*Well, let's see!* How can you be so nonchalant? It'll be dark soon!"

I was wrong, there would be no revelations about the number 10, it seemed. In this case, 10 was the age of a small boy, and nothing more.

"It's all right," I said. "He does this every day."

"Every day! You abandon your son every day so you can come here to make hamburgers?"

"I don't abandon him, and it's my job to come here." I wasn't sure why the Professor was so concerned about my son, but I went back to my recipe, adding some pepper and nutmeg.

"Who takes care of him when you're not home? Does your husband come home early from work? Does his grandmother watch him?"

"No, unfortunately there's no husband or grandmother. It's just the two of us."

"So he's at home all alone? He sits and waits for his mother in a dark house while you're here making dinner for a stranger? Making *my* dinner!"

No longer able to control himself, the Professor jumped up from his chair and began circling the

table. The notes on his body trembled as he ran his hand nervously through his hair. Dandruff sprinkled on his shoulder. I turned off the soup just as it began to boil.

"You really don't need to worry," I said, trying to sound calm. "We've been doing this since he was much younger. Now that he's ten, he can manage for himself. He has the phone number here, and if he needs help, he knows to ask the landlord downstairs—"

"No, no, no!" The Professor cut me off as he paced around the table. "You should *never* leave a child alone. What if the heater fell over and started a fire? What if he choked on a candy? Who'd be there to help? Oh! I don't want to think about it. Go home right now! You should make dinner for your child. Go home!" He grabbed my arm and tried to pull me toward the door.

"I'll go," I said, "but I just have to make these hamburgers for you."

"Are you going to stand there frying hamburgers while your child could be dying in a fire? Now listen to me: beginning tomorrow you'll bring your son along with you. He can come straight here from school. He can do his homework, and be near his mother. And don't think you can fool me just because I'll forget by tomorrow."

He pulled off the tag that read "the new housekeeper" and fished a pencil from his pocket. Under the portrait, he added the words "and her son, ten years old."

I left that evening—or rather, I was chased out—without having time to wash my hands, let alone clean the kitchen properly. The Professor appeared even angrier than when I had interrupted his thinking. But his anger seemed to hide a deep fear, and I hurried home wondering what I would do if I found the apartment in flames.

Any reticence or wariness I felt for the Professor vanished the moment I saw him with my son, and from that point on I trusted him completely. As I'd promised the evening before, I gave my son a map to the house and told him to come directly from school. It was against agency rules to bring children to the workplace, but there was no denying the Professor.

When my son appeared at the door the next day with his schoolbag on his back, the Professor broke into a wide grin and opened his arms to embrace him. I didn't even have time to point at the line he'd added to his note—"and her son, ten years old." As a mother, it was a joy to see someone so completely embrace my child, and I felt a slight twinge of jealousy that my welcome from the Professor was always much more reserved.

"I'm so glad you've come!" he said, without any of the questions he asked me every morning. Bewildered by the unexpected greeting, my son stiffened, but managed a polite answer. The Professor took off my son's Hanshin Tigers baseball cap and rubbed his head. Then he gave him the nickname before he'd even learned his real one.

"I'm going to call you Root," he said. "The square root sign is a generous symbol, it gives shelter to all the numbers." And he quickly took off the note on his sleeve and made the addition: "The new housekeeper ... and her son, ten years old, $\sqrt{\quad}$."

At first I made us name tags, thinking that if the Professor weren't the only one with notes clipped to him he might feel less anxious. I told my son to change his school name tag for one I made that read " $\sqrt{\quad}$." The experiment proved less successful than I'd hoped. No matter how much time passed, I was always the young woman who made painfully slow progress with numbers, and my son would be the boy who simply appeared, and was embraced.

My son soon grew accustomed to the Professor's enthusiastic greeting and even came to enjoy it. He would take off his cap at the door and present the flat top of his head, as if to show how proud he was to be worthy of the name Root. And for his part, the Professor never missed his cue, he mentioned the square root whenever he met my son.

My contract stipulated that I would make dinner for him at six o'clock and leave at seven after finishing the dishes; but the Professor began objecting to this schedule as soon as my son arrived on the scene.

"I won't stand for it! If you have to finish here and then make another meal once you get home, Root won't get his dinner until eight o'clock. That just won't do. It's inefficient; it's illogical. Children should be in bed by eight o'clock. You can't deprive a child of his sleep—that's when he does his growing."

For a mathematician, his argument wasn't very scientific, but I decided to ask the director of the agency if it would be possible to deduct the cost of our dinner from my salary.

The Professor had never before thanked me for my efforts in the kitchen, but his attitude changed when the three of us sat down to dinner together for the first time. His manners were exemplary. He sat up very straight and ate quietly, without spilling so much as a drop of his soup on the table or his napkin—all of which seemed odd, given how terrible his manners had been when it was just the two of us.

"What's the name of your school?" he asked.

"Is your teacher nice?"

"How was lunch today?"

"What do you want to be when you grow up?"

As he squeezed lemon on his chicken or picked out the carrots from his soup, the Professor would ask Root one question after another, without hesitating, even when the question concerned the past or the future. He was determined to make our dinner hour as peaceful and pleasant as possible. Though Root's answers to his questions were mostly perfunctory, the Professor listened attentively, and it was thanks to his efforts that we ate together without drifting into any awkward silences.

He was not simply humoring a child. Whenever Root would put his elbows on the table or clatter his dishes or commit any other breach of etiquette (all things the Professor had done himself at his earlier solitary meals), the Professor would gently correct him.

"You have to eat more," he said one evening. "A child's job is to grow."

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