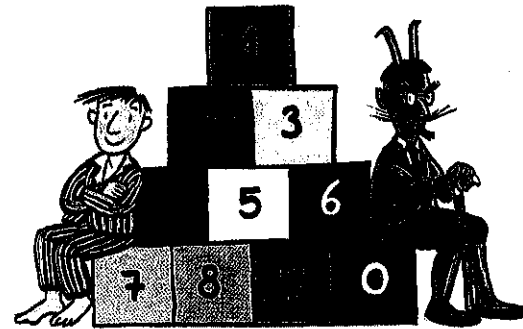# THE NUMBER DEVIL

A MATHEMATICAL ADVENTURE

HANS MAGNUS ENZENSBERGER

WITH ILLUSTRATIONS BY ROTRAUT SUSANNE BERNER

Translated by Michael Henry Heim

The
Number Devil

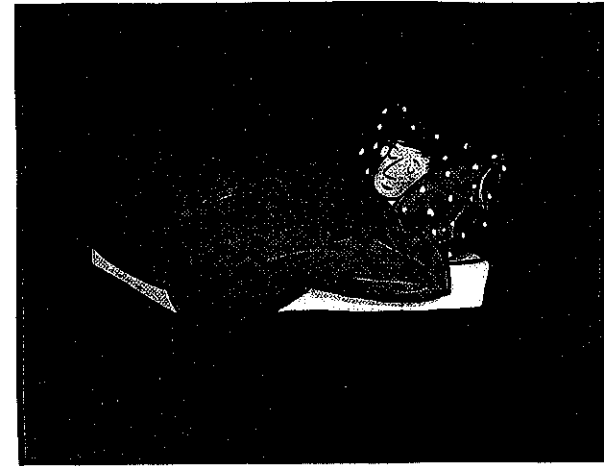## A Mathematical Adventure

Hans Magnus Enzensberger

Illustrated by
Rotraut Susanne Berner

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The First Night

Robert was tired of dreaming. I always come out looking dumb, he said to himself.

For example, he would dream of being swallowed by a big ugly fish, and even after it was over he could smell the fish's awful stench. Or he'd be sliding down an endless slide, faster and faster, and no matter how many times he cried out *Stop!* or *Help!* on he went until finally he woke up drenched in sweat.

His dreams also played tricks on him whenever he wanted something really bad. Once he had his heart set on a racing bike with twenty-eight gears, and he dreamed that the bike was waiting for him in the basement. It was an unbelievably detailed dream: the bike had a purple metallic finish and was parked next to the wine cabinet. He even knew the sequence of the combination lock: 12345. He couldn't forget *that* now, could he? Well, in the middle of the night, still woozy with sleep, he

staggered down to the basement in his pajamas, and what did he find next to the wine cabinet? A dead mouse. That was a low blow!

Eventually Robert came up with a way of dealing with the tricks his dreams played on him. The minute one started, he would think (without waking up), It's just another one of those yucky fish. I know just what's going to happen. It's going to gobble me up. But I also know it's only a dream, because only in dreams can a fish swallow a person. Or he'd think, Here I go sliding again, but there's nothing I can do about it. I can't stop, and I'm not *really* sliding, anyway. And when the fantastic racing bike came back to haunt him, or a computer game he couldn't live without—there it was, right
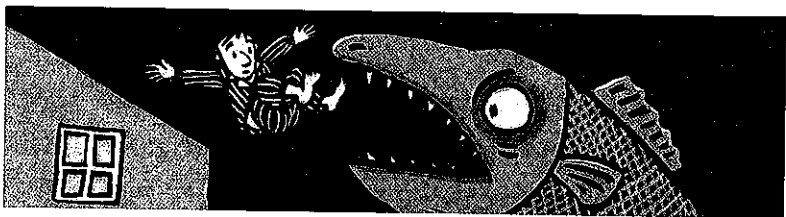
next to the telephone—he knew it was just a hoax. He didn't even look at the bike; he turned away. But no matter what he did, the dreams kept coming back, and that troubled him.

And then suddenly one night—there was the number devil!

Robert was thrilled to be free of the hungry fish and the endless slide. This time he dreamed of a meadow. The funny thing was that the grass grew so tall that it seemed to reach the sky, or at least over his head. And what did he see but a gigantic beetle glaring at him, a caterpillar perched on a blade of grass, and an elderly man the size of a grasshopper bobbing up and down on a spinach leaf and staring at him with bright and shining eyes.

"Who are you?" Robert asked.

The man responded in a surprisingly loud voice.

"I am the number devil!"

Robert was in no mood to put up with nonsense from a pip-squeak like that.

"First of all, there's no such thing as a number devil."

"Is that so? How can you be speaking to me if I don't exist?"

"And besides . . . I hate everything that has to do with numbers."

"And why is that, may I ask?"

"You sound as though you never went to school. Or maybe you are a teacher yourself?

" 'If 2 pretzel makers can make 444 pretzels in 6

hours, how long does it take 5 pretzel makers to make 88 pretzels?'

"How dumb can you get!" said Robert. "A colossal waste of time if you ask me. So get going! Scram! Shoo!"

But instead of doing as he was bidden, the number devil made an elegant leap and landed smack next to Robert, who was staging a sit-down strike in the tall grass.

"Where does your pretzel tale come from? School, I bet."

"Where else?" said Robert. "Mr. Bockel—he's our teacher, a new teacher—well, he's always hungry, though he's got plenty of fat on him. Whenever he thinks we're not looking because we're so into the problems he gives us, he sneaks these pretzels out of his briefcase and wolfs them down."

"I see," said the number devil with a wry smile. "I have nothing against your Mr. Bockel, but that kind of problem has nothing whatever to do with what I'm interested in. Do you want to know something? Most genuine mathematicians are bad at sums. Besides, they have no time to waste on them. That's what pocket calculators are for. I assume you have one."

"Sure, but we're not allowed to use them in school."

"I see," said the number devil. "That's all right. There's nothing wrong with a little addition and subtraction. You never know when your battery will die on you. But *mathematics*, my boy, that's something else again!"

"You're just trying to win me over," said Robert. "I don't trust you. If you give me homework in my dream, I'll scream bloody murder. That's child abuse!"

"If I'd known you were going to be such a scaredy-cat, I wouldn't have entered your dream. All I want is to perk you up a little, and since I'm off duty most nights, I thought I'd spare you those endless slides you've been going down."

"Gosh, thanks."

"I'm glad you understand."

"But I hope *you* understand that I won't let you take me for a ride."

Suddenly the number devil leaped up out of the grass, a pip-squeak no more.

"That's no way to talk to a devil," he shouted, his eyes sparkling, and he trampled the grass until it was all flat.

"I'm sorry," Robert said meekly, though the whole thing was getting weirder and weirder. "But if talking about numbers is as simple as talking about movies or bikes, why do they need their own devil?"

"You've hit the nail on the head, my boy," the devil replied. "The thing that makes numbers so devilish is precisely that they *are* simple. And you don't need a calculator to prove it. You need one thing and one thing only: one. With one—I am speaking of the numeral, of course—you can do almost anything. If you are afraid of large numbers—let's say five million seven hundred and twenty-three thousand eight hundred and twelve—all you have to do is start with

$$1 + 1$$
$$1 + 1 + 1$$
$$1 + 1 + 1 + 1$$
$$1 + 1 + 1 + 1 + 1$$
$$\cdot \ \cdot \ \cdot$$

and go on until you come to five million etcetera. You can't tell me that's too complicated for you, can you? Any idiot can see that."

"Right," said Robert.

"And that's not all," the number devil added, picking up a walking stick with a silver knob and twirling it in front of Robert's nose. "When you

get to five million etcetera, you can go on. Indefinitely. There's an infinite number of numbers."

Robert didn't quite know whether to believe him.

"How can you be so sure?" he asked. "Have you ever tried?"

"Can't say I have," the devil answered. "It would take too long, for one thing. And it makes no sense anyway. It would be a waste of time."

Robert didn't see why.

"Either I can count to the end, in which case there is no such thing as infinity, or there is no end and I can't count to it."

"Wrong!" the number devil shouted, his mustache quivering, his eyes bulging, and his face turning red with rage.

"What do you mean 'wrong'?" Robert asked.

"You nincompoop! Tell me, how many pieces of chewing gum do you think have been chewed to this day?"

"I have no idea."

"Guess."

"Billions," said Robert. "If you take my friends Al and Betsy and Charlie, and the rest of the kids in the class, and in the city, and the country, and the world . . . trillions!"

"At least," said the number devil. "Okay, now let's pretend that everyone's gone on a chewing spree and we're down to the last piece of chewing gum. I pull another one out of my pocket, the last one that I've saved for myself, and what have we got? All those trillions of chewed pieces of chewing gum plus one. Do you see what I mean? I don't really *need* to count them. All I need is a recipe to take care of anything that comes along. And that I have."

After thinking over all that the number devil had said, Robert was forced to admit that he had a point.

"By the way, the reverse is true as well," the number devil added.

"The reverse? What do you mean?"

"Simple," said the number devil with a grin. "Just as there are infinitely large numbers, there are infinitely small numbers. And an infinite number of infinitely small numbers." And so saying, he twirled his walking stick like a propeller in Robert's face.

I'm starting to feel dizzy, thought Robert. It was the same feeling he'd had on the slide.

"Stop!" he shouted.

"Why so jittery, Robert?" asked the number devil. "It's perfectly harmless. Look. I just pull another piece of chewing gum out of my pocket . . ."

And he did. Only it was as long as a ruler, hard as a rock, and a strange shade of purple.

"You call that chewing gum?" Robert asked.

"The chewing gum of your dreams," the number devil replied. "And I'm going to share it with you. Watch carefully now. As long as it's whole, it's *my* chewing gum. One piece, one person." And sticking a piece of chalk—also a strange shade of purple—to the end of his walking stick, he said, "Here's how we write it—"

$$\frac{1}{1}$$

He traced the two ones on the sky, the way planes skywrite advertisements. The purple numbers floated for a while against a bank of white clouds, then melted slowly like a scoop of raspberry ice cream.

"Cool!" Robert said. "What I wouldn't give for a stick like that!"

"Oh, it's nothing special. Though it does write

on anything: clouds, walls, screens. And I never need a notebook or briefcase. But that's neither here nor there. Let's get back to our chewing gum. If I break it in two, you have a half and I have a half. One gum, two people. The gum goes on top, the people on the bottom:

$$\frac{1}{1+1}$$

Now your friends will want some too, of course."

"Al and Betsy."

"As you like. And let's say Al asks you for gum, and Betsy asks me, and we share equally. That means we each get a quarter:

$$\frac{1}{1+1+1+1}$$

But that's just the beginning. Everyone else will want a piece. The rest of the class, the rest of the

city . . . So each of us four will have to break his fourth in half, and then that will have to be halved, and that halved, and that halved, and so on."

"Till the cows come home," said Robert.

"Till the pieces are so tiny that you can't see them with the naked eye. Be that as it may, we go on halving them until the six billion people on earth have all had their share. But then come the six hundred billion mice, and they all want *theirs.* In other words, we'll never come to the end of it."

Meanwhile he had been writing an endless row of purple ones along the sky.
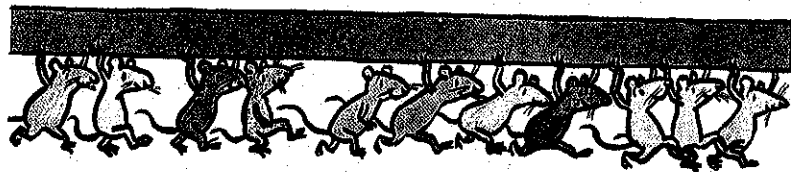
"You'll fill the whole world if you go on like this!" Robert cried.

"Well," said the number devil, puffing himself up again, "I'm only doing it for you! You're the one who's afraid of numbers. You're the one who wants everything simple so you won't get mixed up."

"But all those ones get so boring after a while. I don't think it's simple. It's just that all those ones give me a headache. They actually make things more complicated than they are."

"Well, well," said the number devil, clearing the sky with a casual wave of the hand. "So you agree we need something less clumsy than $1 + 1 + 1 + 1 \ldots$ Numbers, for instance. Which is why I invented them."

"You? You expect me to believe that you invented numbers?"

"Me or a few others. It doesn't matter who exactly. Why are you so suspicious? What do you say I show you how to make all numbers out of ones?"

"Okay. How?"

"Simple. I start as follows:

$$1 \times 1 = 1$$

And go on to:

$$11 \times 11$$

I bet you need your calculator for that."

"Don't be silly," said Robert.

$$11 \times 11 = 121$$

"See?" said the number devil. "You've made a two out of nothing but ones. Now try this—"

$$111 \times 111$$

"That's too hard. I can't do it in my head."

"Then use your calculator."

"My calculator! You don't think I take it to bed with me, do you?"

"Then use this one," he said, pressing one into Robert's hand. It had a funny feel to it, slimy, like dough, and it was a sickly shade of green, but it worked. Robert entered:

$$111 \times 111$$

and got:

$$12321$$

"Cool," said Robert. "Now we have a three."

"Right. Just keep going."

So Robert entered the following:

$$1111 \times 1111 = 1234321$$
$$11111 \times 11111 = 123454321$$

"Very good," said the number devil, patting Robert on the shoulder. "I'm sure you've noticed that not only do you get a new number each time, you get a number that reads the same forward and backward, like ANNA or TOOT or ROTATOR."

Robert thought that this was a pretty good trick, and so he tried six ones as well—and it worked! But when he got to

$$1111111 \times 1111111$$

the calculator gave up the ghost. To Robert's surprise, it suddenly went *Pfft!* and melted down into a sickly green goo.

"Yuck!" said Robert, wiping the green mess from his fingers.

"All you need is a bigger calculator or a computer. A computer would spit out the answer in no time."

"Are you sure?"

"Of course I'm sure."

Robert thought that the number devil was a bit too confident. Maybe he was just bluffing. Robert decided to take a chance and said, "You haven't tried it with

$$11\ 111\ 111\ 111 \times 11\ 111\ 111\ 111$$

have you?"

"No, can't say I have."

"Well, I bet it doesn't work."

The number devil started doing the problem in his head, but his face turned bright red again and swelled up like a balloon. Was it because he was angry, Robert wondered, or because the problem was hard?

"Wait a second," the number devil mumbled. "I can't seem to come up with anything. Damnation! You were right. It doesn't work. How did you know?"

"I didn't. You don't think I'm crazy enough to try a problem like that do you? I was just guessing."

"Guessing? Guessing is not allowed in mathematics! Mathematics is an exact science!"

"But when you said that numbers don't stop, that they go on till the cows come home, that was a guess, wasn't it?"

"How dare you? What are you, anyway? A beginner! A rank amateur! And you want to teach me my trade?"

He grew bigger and fatter with every word; he started huffing and puffing. Robert was frightened.

"You pinhead! You pip-squeak! You stuck-up

little number midget!" he screamed, and no sooner had the number devil got the last word out than he burst with a great bang.

Robert woke up. He had fallen out of bed and was a little dizzy, but he laughed to think he had outwitted the number devil.

The Second Night