

$$\mathbf{1} = \mathbf{0}$$

**Synopsis:** I show you a proof of something that is blatantly false. We follow your actions as you try to understand it.

**Setting:** The modern world, various unspecified locations.

**Other Notes:** The narrator is the only character who speaks, but other characters may represent the actions the narrator describes.

**Character List:**

**NARRATOR** (any gender): The first-person perspective character. Has all speaking roles and provides the initial proof. Acts aloof, as if stirring up trouble on purpose.

**PROTAGONIST** (any gender): The second-person perspective character. A rather reasonable person.

*All other characters are optional, but they are listed below.*

**MATHEMATICIAN** (female): A friend of the protagonist and a very experienced mathematician and professor.

**COUSIN** (male): The protagonist's cousin and good friend. He's great at sounding like he knows what he's talking about.

**Other friends** (any gender, any number).

NARRATOR: Let's say I showed you a proof that 1 was equal to 0 (*gives PROTAGONIST* a piece of paper). Obviously, that's ridiculous. One cannot be equal to 0. You've seen a few proofs that *seem* to show that 1 equals 0, but they were always tricks or learning exercises. When you looked into the math you could always find somewhere that sneakily divides by zero, slips in a false assumption, or does some other illegal operation.

NARRATOR: But you can't find any of those tricks in my proof. You keep looking at each step, but everything looks completely valid. Though, of course, that doesn't mean you believe me. And that's not at all unreasonable. One and zero being unequal is a fact of life; they are clearly two different quantities. And if they were the same, well, all of math would suddenly make no sense. So that can't be the case. There *is* a trick. Maybe *you* can't spot something wrong with the proof, but you might know someone who *can*.

NARRATOR: A friend of yours is a math professor whom you trust very much; you certainly trust her more than you trust me. You take the proof to her confident that she will tell you exactly what's wrong with it. But she can't. She looks at each step and comes to the same conclusion as you. It's rigorous; in fact, even more rigorous than you'd thought before. She's able to patch all the holes that you thought you might be able to poke in it with a bit more skill. She doesn't tell you that one equals zero; she agrees with you that something must be up, but she can't find what's wrong either.

NARRATOR: But this doesn't satisfy you. She's supposed to be good at math, so why can't she spot my error? Did I do something to her? Is she in on this? Maybe she is, or maybe she's just not as good a mathematician as you thought. But to be safe, you need to show this proof to someone else, someone neither she nor I knows.

NARRATOR: You take the proof to your cousin and good friend. He doesn't know any of your other friends. Your cousin doesn't have the most mathematical background, but he always seems confident and grounded in what he says; he's never told you anything you couldn't trust. So you show him this proof, and he finally gives you what you've been after! A simple error: I took the square root of negative one! That's not a real number. It's just like those proofs that divide by zero; it's an invalid operation and it can't lead to any valid results. Perfect. You walk home happy that this whole conundrum is finally resolved. Of course 1 and 0 aren't equal. That would turn the world on its head. So you go to bed.

NARRATOR: The next day, your mathematician friend calls you back. She says she's looked more into the proof you showed her yesterday. And that the conclusion is undeniable. Somehow, 1 equals 0. You chuckle a bit, surprised she hadn't found what your cousin had spotted instantly. You tell her what he told you. She dismisses it, explaining that the square root of negative one is  $i$ , and that it's a perfectly valid operation. You argue back; it's *called* imaginary! Of course it's not legitimate. After all, it can't be. If it was, then 1 would need to be equal to 0. But she won't listen.

NARRATOR: You tell your other friends about the proof you found. (*Note: You Tell. You do not show*) Luckily, they agree with you! (*FRIENDS and PROTAGONIST exchange friendly conversation, ending in them laughing together*) Of course no proof could possibly show that 1 and 0 were equal. What would it even *mean* for that to be true? Is everything the same as nothing? Is one person the same as no people? Are two people the same as one person? Are you the pope? Of course not. We know this. Your friends know this. And you tuck away the 'proof' in the back of your filing cabinet. (*PROTAGONIST puts paper away without friends seeing it*)

NARRATOR: This subject eventually becomes a hot debate topic among your friend group. Most people are on your side, but the mathematician becomes more and more vehement in her defense of my proof. It gets to the point that it's all you ever talk about when she shows up. (*Show an argument of FRIENDS and PROTAGONIST versus MATHEMATICIAN. The argument escalates over time to end in mimed shouting.*) Then, one day, she stops showing up. Before all this started, you didn't feel particularly passionate about 1 and 0 being unequal. You just believed that they were. But now you've lost a friend. Was your disagreement worth it?

NARRATOR: After she leaves, you begin to hear your friends claim incorrect things. One day, someone says that negative numbers aren't real. And that zero isn't even a number in the first place! You try to explain to them that these are valid mathematical quantities, but they won't listen. They tell you that you're sounding just like *her*.

NARRATOR: These new claims become a point of contention. At first, you drop the topic. But it keeps coming back. Eventually even irrational numbers are off the table. "We just don't have

enough detail yet to decipher their real values. Even Pythagoras knew this!" You try to show them that they're wrong. You show that any fractional representation of the square root of two must have an even numerator and an even denominator. But they won't listen. Whatever you say just seems to fuel them even more, as if they're not even listening to anything you're saying. And every time, the argument ends the same way. You're sounding just like *her*.

NARRATOR: (*PROTAGONIST sits at a desk, in thought*) And so, you're alone. 1 is not equal to 0; you know this, right? You *know* this (*Spoken slower and less confidently the second time*). Your friends know this too, but they seem just as confident in completely incorrect beliefs. The mathematician has continued her work. She's shown my proof to others in the field, and some are beginning to agree with her. They don't know what it means yet, but they know my results are valid. Maybe it's just an issue of notation, of some strange technicality in an axiom, or maybe it hints at something else, something that invalidates millennia of mathematical thought. You take the proof back out of your cabinet and look through it one more time. You've since researched imaginary numbers, and you can accept that they yield valid solutions. But you still can't just accept that  $1 = 0$ . She was wrong about one thing: the proof isn't undeniable. Denying it was *easy*, at first. Now it's become much harder.