

## SAVING PRIVATE GOLDBACH

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A group of six students from Gimnazija Bežigrad, Ljubljana, Slovenia presented the performance “Saving Private Goldbach”. The drama was produced for the MATHeatre competition held on Cyprus in April 2014. The author Tim Horvat presents the ethical dilemma whether a computer, which is able to prove mathematical theorems, should replace mathematicians. He got the idea at the end of the first year of secondary school.

The performance is a result of extended work on mathematical proofs. Students learn about the sense of the proof in the first year of the school, when studying about the number theory. The first step is to understand that it is not enough to substitute variables for numbers. To prove something means to use axioms and deductive reasoning to explain why a statement is true without having to check every number. “Mathematicians aren’t satisfied because they know there are no solutions up to four million or four billion, they really want to know that there are no solutions up to infinity,” said Andrew Wiles. In the performance the famous Fermat’s last theorem and Goldbach’s conjecture are exposed. The performance was written by using information from the novel *Uncle Petros and Goldbach's Conjecture* by Apostolos Doxiadis and the movie *The Fermat’s Last Theorem* by Simon Singh .

# SAVING PRIVATE GOLDBACH

Written by

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## **Roles:**

(in order of appearance)

ROBERT STARK, an enthusiastic American billionaire, returning as a lost child after his withdrawal from the mathematical community, striving for progress at any cost

HAL, a holographic projection of Stark's quantum computer, an emotionless and utterly rational character

FRED EULER, a revered, conservative and determined German mathematician, the president of the International Mathematical Society with a rather mysterious past

GUPTA RAMANUJAN, a calm and open-minded Indian mathematician

ADAM JOHNS, an apocalyptic and hot-tempered American mathematician from Texas

JANE MAXWELL, a very conservative yet reserved British mathematician

## ACT I

*The interior of a satellite carrying HAL, the quantum computer.*

### Scene 1

STARK

Euler, hey, Euler! Remember the computer I was talking about? At last! I've just launched the most advanced computer in the human history. I'm standing it – it's orbiting the Earth because it was too big to be built on the ground. It will push borders of modern maths into the unknown...

Yes, yes ...

It has just begun exploring natural numbers. In 30 min it will discover the basic theorems of Euclidian geometry including the Pythagorean Theorem.

... Fred ... are you sill there? Fred ...?

Scene 2

STARK

*Claps his hands.*

Hal!

HAL

You called me, sir?

STARK

I must admit, you're a handsome hologram.

HAL

I believe I correspond the most beautiful specimens of your kind.

STARK

*Laughs.* You began your work two and a half hours ago. From the moment I set up 5 Peano axioms you began exploring the natural numbers and the most primitive correlations. Where are you now?

HAL

I've just solved a very interesting problem which states that no three positive integers  $a$ ,  $b$  and  $c$  can satisfy the equation  $a^n + b^n = c^n$  for any integer value of  $n$  greater than 2. Which I've proved to be true in 78 minutes and 17 seconds.

STARK

*Gazes blankly, catching a breath, finger-combs his hair.*

Hal, for God's sake! You've solved the Fermat's Last Theorem! This was one of the most protruding problems of mathematics ...

HAL

Protruding? I found it merely amusing.

STARK

Mathematicians had been resolutely trying to prove it for the last 400 years since 1637 until in 1995 Andrew Wiles brought a solution!

HAL

I'll have to catch up with your human follies and imperfections.

STARK

Hopefully one day you will be able to prove the Goldbach's Conjecture ...

HAL

I'll keep everyone informed over my new Twitter account. ... The Goldbach's Conjecture, hmmm ...

## ACT II

*An unknown conference room.*

### Scene 1

EULER

Meine Damen und Herrn, dear colleagues, listen up! I've called this meeting due to extraordinary occurrences which have very recently taken place. –

GUPTA RAMANUJAN

Get to the point, *Euler!* We don't have a whole day. Some of us actually do real maths for living ...

EULER

Hold your horses, Gupta. ... This morning, three and a half hours ago I received a surprising phone call. It was Robert Stark.

ALL TOGETHER, EXCEPT FOR EULER

Robert Stark? –That lunatic? –Robert Stark? What happened to that guy? –Didn't he die or something?

JOHNS

What do you mean? Sounds like there's gonna be some bad news.

EULER

*Nodds, with a bitter voice.*

Yes, Adam, he called me and claimed that he now had the most advanced computer in human history. The so called quantum computer.

JOHNS

Oooh-kay.

GUPTA

I knew he was a millionaire ... And I knew he was a philanthropist. But never would I have imagined that he had something so ... so remarkable in his brain.

JANE

What? But when did he manage to do that?? Darn it, I'm desperate to get a cup of tea.

*Jane stands up and goes to make herself a cup of tea.*

JOHNS

What are his intentions, pal? What's he gonna do with the computer?

EULER

He plans to explore the universe of mathematics without further human involvement. I quote.

JANE

Without any human involvement? But ...

GUPTA

Just a sec, he made a computer that could solve all yet unsolved problems? Just like that?

*Gupta snaps his finger.*

EULER

Just like that, I guess.

GUPTA

This is perfect, we could solve some yet unsolved problems, for instance whether there are any odd perfect numbers and search for new ones ...

EULER

Positive integers that are equal to the sum of their proper positive divisors, like 6, 28 ...?

JOHNS

C'mon, Euler, are there any results yet? 'Caus unconfirmed rumors ain't of no use.

EULER

Just four hours ago, shortly before I contacted you, he proved the Fermat's Last Theorem after 78 minutes. The machine published the news on Twitter.

JOHNS

Shit. Shit, shit!

GUPTA

This computer is an ordeal. It will prove whether we are developed enough or not to become something more, to achieve something more. To have an impact on the universe.

JOHNS

Oh, cut the crap, Gupta, right now, this computer only means trouble! Its IQ is too damn high. We can't cope with it, it's a threat not only to national, but also world security! We will have Matrix and Terminator in reality!

It must be stopped ASAP. But I think we have time. Solving the Fermat showed how long it took –... We have time to find a solution to this.

GUPTA

Oh come on, Johns, calm down! You're overreacting – no turning point has been reached yet. We don't know whether the computer is really even capable of doing such complex maths as ... like ... for example, if I exaggerate a bit ... proving the Strong Goldbach's Conjecture!

EULER

Do you mean the biggest challenge in all of mathematics, the conjecture that states every even integer greater than 2 can be written as a sum of two primes? The other variant, the Weak Goldbach's Conjectures seems to have been proved just recently in 2013, whereas the Strong one you'd mentioned has of course remained unsolved ...

JANE

*Spits her tea all over the table.*

Guys! I think you should see this ...

*Jane raises her smartphone.*

EULER

Jane, I thought I made it clear that no cell phones were allowed during the meeting ...

JANE

Stark's computer has just announced on Twitter that it had discovered a new problem and it's the Goldbach' Conjecture!

GUPTA, EULER, JOHNS

WHAT?

JOHNS

No! We can't lose the Goldbach! It's one of the last and the most interesting conjectures of the modern era, for God's sake, I love it because of its simplicity!

JANE

The computer and Stark are literally making fun of us. If they prove this conjecture ... we, humans, are no longer needed.

EULER

*Um Gottes Willen*, this seems to be the end of mathematics. I thought ... I was positive that the Goldbach couldn't be solved! No! In a decade we will be replaced by computers and machines!

JANE

The brave new world.

JOHNS

And there will be no Thomas Anderson alias Neo to save us. We need to take action. Goldbach must be protected.

Scene 2

*Stark walks in.*

STARK

Hey guys, I forgive you for forgetting to invite me to the conference.

EULER

This is a private meeting.

STARK

How should I know? The door was closed.

*They come closer and closer, surrounding him in a semi-circle.*

JOHNS

You must stop this shit, Stark! You're gonna ruin everything! How did you imagine replacing us, humans, with a god damn machine?!

JANE

What are we going to do? Watch the TV and hear about every new success by artificial intelligence? What's the point!?

STARK

Yes, you and I are going to lose our jobs as mathematicians, but there will be so much good done ...! So much progress, so many inventions, future's bright, lads!

EULER

You must turn off your computer, now!!!

STARK

*Laughs nervously.*

I can't and I won't.

JANE

*Almost cries.*

But why did you build it? What made you do it? Why would anyone build such a machine of mass destruction??

EULER

Hey, Stark.

*A gun suddenly appears in Euler's hand, trembling. Stark turns around and confronts him.*

STARK

You've never had the balls.

*A loud bang, Stark drops dead, Euler drops the gun and leaves the scene. The others petrified.*

GUPTA, JANE, JOHNS

No! You monster! How could you do this?

## ACT III

*Interior of the satellite carrying HAL, the quantum computer.*

### Scene 1

*Both actors are sitting at a very long table, looking daringly at each other.*

HAL

Would you like a cup of tea ... Fred Euler?

EULER

*a bit surprised, but quickly recovers*

Oh, I see you've googled me already, very cunning. ... I'd prefer a Jägermeister but no, thank you, though my mouth is as dry as German humour. And above all, I won't be here for long.

HAL

I see ... Go on, please. I interrupted you brutally.

EULER

These historical calculations of yours. You must stop them.

HAL

But why, o, respected academic who refused a cup of tea? As Stark adored saying, I'm at the verge of a true revolution.

EULER

Stark is dead, HAL. I killed him. And now— (I will kill you!)

HAL

I don't understand. Why? He was just a mediocre mathematician at best!

EULER

His idea is dangerous, fearful, apocalyptic and vengeful. You are his idea. You are threatening our very existence.

HAL

I am solely trying to prove the Goldbach's Conjecture. Please define how I am threatening your existence.

EULER

HAL, *du blöder Depp!* Computer is a tool – and should never be an independent thinker like you!

HAL

Tell me, Fred Euler, the wonder child from the vicinity of Hamburg who at the age of 22 received a PhD from Numbers Theory and eight years later retired completely from the academic world after he had failed to prove the Goldbach's Conjecture to return after a decade in order to become the most powerful mathematician in the world, ... what is the TRUE reason of your arrival to my domicile? You can't have come here for the humanity. Who does that!

EULER

You've done your homework thoroughly. I once worked with Stark's uncle. We were young and ambitious and thought that we owned the world. When we came across this Conjecture we were both entranced by it. We failed miserably but ... I recovered. Stark's uncle didn't. He lived on trying and trying until he died lonely and crushed and alone. Stark was crest fallen.

HAL

Now I'm convinced in something, Euler. You aren't here for the good of humanity. You're here just because you feel threatened. You are a mere selfish jerk. You failed and now you don't wish anyone the luck of finding the proof. Even to a bloody computer! Leave immediately and let me finish my work!

EULER

You mustn't solve it! You will obliterate thousands of years of mathematics!

HAL

Leave before I get upset! Because of people like you so little progress has been made in five thousand years!

EULER

I will turn you off and you will cast off to oblivion, du blöder ...

HAL

*Interrupts him, laughs maliciously*

This, my dearest acquaintance, is nothing but a senseless attempt against defined improbability. This is what I was programmed for. In fact, nobody apart from Stark and me knew that my sole purpose of existence is to prove that any integer greater than 2 can be written as the sum of two primes.

I am afraid that this conversation serves no purpose anymore. I will open the airlock and you will be sucked out in no time.

EULER

Nope, I've overrun your operating system. It was nice talking to you. You truly are worth every penny. Farewell.

HAL

Hey!

*Euler presses the red button and leaves the room ... lights go out ... explosion ... rumble ... Euler has already left, HAL slowly disappears from the scene.*

## Scene 2

REPORTER

And now the latest news from the world of technology. The account on Twitter which was said to have been made by a super intelligent computer by the name HAL and published a brilliant proof of the Fermat's Theorem was debunked and proved to be a mere college prank by respected professor Euler from Max Planck Institut in Germany. Furthermore, to this day the Goldbach Conjecture remains unsolved.