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# Mathematics is Indisputably the Greatest Subject in the World

## The 2024 Presidential Address

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### *Introduction*

A good friend of mine asked, if mathematicians are not proud of their subject, then who on earth will be? No longer must our subject be seen as irrelevant, boring and a joke. And it starts in schools – full stop! Let's call it as it is. Mathematics is Indisputably the Greatest Subject in the World.

According to the mathematician Sir John Kingman,

“Mathematicians are better if they stay a bit childish and play the game as a game. This is the key to teaching mathematics, it's not to flood people with practical problems, rather it's to say that this is the best game that has ever been invented. It beats Monopoly, it beats chess and it happens that it can enable you to land rockets on the moon. The real mathematical advances have been made by people who just loved it.”

It can be argued that mathematics is part of our history, our culture and our future. In BBC News 8th December 2014, David Cameron the former UK Prime Minister, claimed that

“If countries are going to win in the global race and children compete and get the best jobs, you need mathematicians and scientists – pure and simple.”

Mathematics is a beautiful and powerful subject; it is the poetry of logical ideas. What other subject is the foundation of science, engineering and technology? It influences the structure of art and music. Mathematics teaches geography to geographers, economics to economists and physics to physicists. Mathematics is truly a global phenomenon.

One can only truly appreciate mathematics by getting right in the middle of the challenging intellectual arena to pursue and conquer the logical battle for that elusive truth. One of the most influential and universal mathematicians of the 19th and early 20th century, David Hilbert, remarked that

“Distance in four dimensions means nothing to the layman. Even four-dimensional space is wholly beyond ordinary imagination. But the mathematician is not called upon to struggle with the bounds of imagination, but only with the limitations of his logical faculties.”

He also commented that

“A mathematical theory is not to be considered complete until you have made it so clear that you can explain it to the first man whom you meet on the street.”\*

Mathematics is indisputably the greatest subject in the world! Why? Because it is the language of the world. Mathematics crosses racial, geographical and cultural boundaries.

### *A Radio Interview*

In 2005, I wrote an article for the IMA journal *Mathematics Today* called “Proud to be a Mathematician!” In this article, I informed the mathematics community how I had a lively debate with a radio DJ who had said that mathematics is boring! I never realised at the time that my actions would inspire so many up and coming mathematicians. To this day, I am still approached by some random mathematician who has read the article. However, the most humbling moment was when I received an email from an US soldier serving in Afghanistan. He said that reading about the radio debate had inspired him to pursue a career in mathematics. This is how the story unfolded.

In 2004, whilst driving home late one evening, I was listening to a radio station that broadcasts to the whole of the West Midlands. On this late-night talk show there was a presenter and a co-presenter. To my alarm, this is what I heard.

*Co-presenter:* One of the topics tonight is maths. There was a maths teacher at a conference recently who stated that mathematics should not be compulsory for fourteen-year-olds.

*Presenter:* That is right! Maths is BORING!

The presenter really emphasised the ring of boring by holding the syllable for five seconds. I was not very happy when I heard this. When I arrived home after fifteen minutes I telephoned the the radio station and introduced myself as a professional mathematician and I went straight on air!

*Presenter:* On line one, we have Nira. Nira how can we help you?

The dialogue proceeded as follows:

*Nira:* The reason why I have phoned is because of what you have been saying about mathematics. I disagree with you. Mathematics should be compulsory for fourteen-year-olds. At that age, as a country, we are mathematically behind countries like France, Germany, Japan and India. I think we should be looking at ways of strengthening mathematics, not weakening it. Mathematics is a beautiful and powerful subject.

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\* Address to the International Congress of Mathematics, Paris 1900.

*Presenter:* Wow, wow, wow Nira! What are you going on about? Mathematics is a beautiful and powerful subject? Come on Nira! Everybody knows that mathematics is BORING!

I considered this as a verbal slap in the face. From this point on I lost all my nervousness and replied:

*Nira:* Mathematics *IS* the poetry of logical ideas!

For a moment there was a stunned silence. Then, the presenter countered:

*Presenter:* Okay, but Nira tell me why a fourteen-year-old needs mathematics?

*Nira:* Doing mathematics you acquire speed, accuracy and understanding. You also acquire skills such as strategy and organisation for everyday use. If you are talking about not making mathematics compulsory for fourteen-year-olds you might as well not make English compulsory as well!

*Presenter:* No, no, no Nira! We need English! We don't need maths!

*Nira:* Mathematics is one of the few scientific subjects that can be described as an art form. Studying mathematics is almost like playing a sport. It is a subject that teaches geography to geographers, biology to biologists, engineering to engineers, economics to economists, etc.

*Presenter:* Okay, okay Nira, I give you that! Mathematics is not boring; it is the teachers that make it boring! But answer me this, why does a fourteen-year-old need mathematics?

*Nira:* Teaching a fourteen-year-old child mathematics, at that age, enhances their natural mathematical abilities!

After a stunned silence, I heard the co-presenter whisper to his colleague. "He's highly educated." A bit of a pause, after which the presenter spoke to me in a calmer and slower manner.

*Presenter:* Nira, what do you do?

*Nira:* I am a Chartered Mathematician.

*Presenter:* Educated to what level?

*Nira:* Masters.

*Presenter:* And what do you in your job?

*Nira:* I write mathematical simulation models that solve complex engineering problems.

*Presenter:* Oh! Well Nira, thank you for phoning this radio station this evening.

The presenter paused, then continued very slowly.

*Presenter:* I really am sorry, but I still disagree with you. I can see why mathematics is relevant to somebody like you though. But hey, at least your views have been broadcast right across the West Midlands.

Then to my surprise the presenter said this:

*Presenter:* Actually, Nira! Congratulations! You are the first person I have ever spoken to, who has made mathematics sound sexy! Goodbye.

*Have attitudes towards maths improved?*

The above interview happened in 2004. Now that we live in a digitally driven world, have we moved on?

In 2023 the UK Prime Minister announced plans to extend mathematical education to 18-year-olds. This has received a wave of anti-mathematical rhetoric such as

- “You don't need mathematics for anything!” – from a British TV comedian at her graduation ceremony

to

- “You can't fix broken Britain with a quadratic equation” – British politician.

The quotation which follows is from the book *Math Maker – The Lives and Works of 50 Famous Mathematicians* by Alfred Posamentier and Christian Spreitzer – the introduction begins as follows:-

“It is unfortunate that in our culture, mathematics in general is viewed unfavorably by a majority of well-educated people. Oftentimes they are proud to admit that they were not good students of mathematics in their school days. Admitting this weakness is almost like a badge of honor, which is rarely attributed to any other school subject.”

So how can we attempt to fix this and what is the root cause of such negative attitudes?

*What is the point of mathematics?*

In 2014, the television journalist Robert Peston's charity *Speakers for Schools* put me on the path to become a mathematics communicator. However, my first speaking assignment didn't go well. I went into a school, spoke to about 200 14-year-olds and gave them a full-blown lecture on mathematics. At the end, a pupil put up his hand and asked me this question

“Sir – *What is the point of mathematics?*”

I had no answer. If he had asked about the point of music, biology, art or PE, my answer would have rolled off the tip of my tongue. However, many of us in the mathematics community find this a hard question to answer. One may argue that if we can't convince our most important stakeholders (school children) then they will grow up into adults questioning its relevance. As a mathematics communicator if I could not show the power, the applicability, the beauty and the relevance of mathematics then calling it indisputably the greatest subject in the world would be nothing but empty rhetoric.

*The art of mathematics – story telling*

In Ancient Africa, before slavery and colonisation, mathematics knowledge was passed down was by story telling. Would this work? Could I tell a story where mathematics is the hero? I tried it on my *Speakers for Schools* talks and I began to get consistently good reviews from the teachers. Talks were mostly based on my experience of being a professional mathematician and the problems I faced and solved where mathematics is the hero.

I would tell the pupils, no matter their age, that mathematics is indeed indisputably the greatest subject in the world. I mentioned seven themes and gave examples associated with each.

1. It is fascinating – *Maths simulation of hip hop dancing.*
2. It can be an experimental science – *The Galton Board.*
3. It is awesome – *Designing the UK's largest aircraft carrier.*
4. It is relevant – *Searching for the missing plane MH370.*
5. It is powerful – *Discovering the existence of black holes.*
6. It is insightful – *Explaining the financial crash of 2008 by linking to flash mob dance.*
7. It is the future – *the mathematics of an AI basketball player!*

These themes and examples are not exhaustive but show the scope and depth of mathematics. Indeed if you do go down deeply enough into anything you will find mathematics!

Some of the themes and examples are explained further in the following sections.

*It can be an experimental science*

Some people think that mathematics is mechanical, cold and fixed. They do not see it as creative or that it can be used as part of an experimental science. The organisation *Maths Explorer*, headed by Rita Ball, focuses on this theme very well. I applaud this organisation and many like it. One such organisation I worked with is *Big Ideas*. They wanted me to do a big interactive mathematical experiment with 5000 primary children in the North East of England (Teesside).

The experiment was that each child would roll a die six times, add the scores and submit the result. The distribution of the scores would then be instantly displayed. The pupils were so excited when they saw collectively that they had created a Bell Curve! Mathematics as an experimental science!

### *It is powerful*

In 1796, in his *Exposition du Système du Monde*, the French mathematician Pierre-Simon de Laplace described the idea of massive stars from which no light could escape. Laplace called such objects dark bodies. So, without using computers, satellites or X-rays, just pen, paper and mathematics, Laplace had described what we now know as a black hole. This shows the power of mathematics as it can predict a phenomenon in space that nobody can see. How much more can we do now on Earth, with computers and things that we can see? How about saving the football club Aston Villa? In 2019, with 10 games to go, I used mathematics to predict where Aston Villa would finish and who they would play in the play-off semi-final. I was spot on! I gave Aston Villa eight to ten weeks notice of who they were going to play – West Bromwich Albion. Aston Villa beat them and then went on to win in the final and made it into the Premier League. Five years on Aston Villa are still going strong and in the 2023/24 season they qualified for the Champions League! The Power of Mathematics!

### *It is the future*

In the 1980s, when I was a teenager, my computer science teacher told me that in the future we will have computer screens that will resemble shuffling paper around. I thought – “What rubbish!” How wrong was I. Usually when we talk about the relevance of mathematics, it is the mathematics of the past. What about the mathematics of the near future, the mathematics that the school children of today will be using in their 20s, 30s, 40s and beyond. We can safely assume that Artificial Intelligence (AI) will play a major role in the future. However, people think with the rise of AI, we will be using less mathematics. Wrong, we will be using it more! Whatever the AI of the future will be, it will need people skilled in mathematics to design and build, test and support them, as well as analyse and challenge any output and decision the AI makes. An individual living in a future AI-driven world will need mathematical skills.

### *Big Math Off Competition 2018*

In 2018, *The Aperiodical*, a magazine for maths enthusiasts' headed by Christian Lawson-Perfect. ran a competition for 16 maths communicators. The idea was that it would be a knock-out competition and each contestant would put up some interesting mathematical presentation. The idea was that it would be a knock-out competition and each contestant would put up some interesting mathematical presentation. The general public would then vote which maths they found the most interesting and after 48 hours, the

contestant with the most votes would go on to the next round. In the final the eventual winner would be crowned the World's Most Interesting Mathematician. A team consisting of me and my family won the competition with a presentation on the mathematics of the superhero Black Panther Nira Chamberlain - Spectrums of Maths Modelling (youtube.com) won the competition. However, the real winner was mathematics. I have never seen the general public talking about maths in such a positive way. This competition had captured the public attention and the diversity of maths on display in this and the following year's competition was a sight to see.

*So what is the point of mathematics?*

So what is the point of mathematics? The Asia Society Understanding the World Through Math | Asia Society, which is a Charity/Forum Group that promotes Asian culture worldwide, sums it up very nicely here

*It gives us a way to understand patterns, to quantify relationships and to predict the future. Maths helps us understand the world – and we use the world to understand maths.*

*The world is interconnected. Everyday maths shows these connections and possibilities.*

Throughout my Presidency, I have conducted a range of VLOGs called *What is the Point of Mathematics?* I interviewed many mathematicians, teachers and stakeholders, all having diverse views on what is the point of mathematics.

*Conclusion*

My role model and heroine, Katherine Johnson, whose life was so wonderfully depicted in the film *Hidden Figures*, once said

*Some things will drop out of the public eye and will go away – but there will always be mathematics.*

As a mathematics community we owe it to our most important stakeholders, our school pupils, to show that Katherine Johnson is right and that mathematics is indeed indisputably the greatest subject in the world.

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