maths INSPIRATION

20 years of inspirational maths shows for teenagers

Intro

> I'm trying to remember those first shows. I do remember thinking you were totally nuts and it was never going to work... and look now!
>
> Claire Ellis

It's 9:45am on 9th December 2004 at the Royal Exchange Theatre in Manchester. Over 300 teenagers and their teachers are gathered expectantly. The lights dim, and Claire Ellis walks on to the stage and cheerfully announces "Welcome to Maths Inspiration"...

Little did we know that this would be the first of over 350 (and counting!) maths shows that we would hold in theatres around the country, and indeed the world.

The idea for Maths Inspiration had been sown a year earlier. In the early 2000s, Maths author Simon Singh and I had taken part in several big school lecture events in London, but we'd noticed that there was little if anything like this available to schools in the rest of the country. And the lecture days we'd spoken at were all-day affairs – fine for teenagers who were already fans of the subject, but a stretch for those who were less committed.


Simon Singh

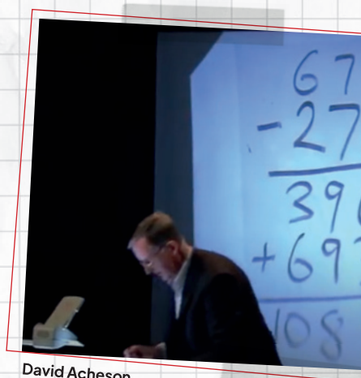
We were keen to do something in another city, and settled on Manchester. The first "Maths for Sixth Formers" event was held in a university Hall of Residence in 2003. There was a good turnout, but the venue was hot and stuffy, and it felt like a school hall. If this was to happen again, it would need to be held somewhere more convenient and more inspirational. Where better than the futuristic Royal Exchange Theatre in the centre of the city. In 2004, Maths Inspiration was born.

The tone of Maths Inspiration shows was set that day. From now on shows would always be held in theatres or concert halls, so they didn't feel like school. They had to be interactive, to focus on topics likely to engage a teenager, and they needed to have a sense of humour, too. The mission was to demonstrate there is more to maths than taking exams, and to encourage teenagers to pursue mathematical subjects to a higher level – which for GCSE students meant A Level, and for sixth formers meant maths, engineering and related subjects at university.

We wanted to appeal to a diverse audience, and that meant covering a broad range of maths-related topics from a broad range of people. On the Speakers page you can see how many people have done talks for us.

Our shows have always been open to every school, but we've targeted our marketing at state schools that didn't have a history of doing maths outings. Thanks to some wonderfully supportive sponsors, we've been able to keep ticket prices low, make teacher seats free, and give extra support to schools where money is tight.

A teacher who went to that first show in 2004 would notice quite a few changes if they fast-forwarded to 2024, not least in technology. It's incredible to recall that in 2004, some presenters were still using an overhead projector with acetates. In those days there was no pre-show music and no way of interacting electronically with the speakers.


David Acheson

But some things haven't changed. The usual format of a compere with three speakers, our quirky feedback forms, and even some of the jokes, are much the same as they were back in the day.

Twenty years on, we're thrilled that Maths Inspiration still has a loyal following from schools across the country. It would be great to think that this might continue to be the case twenty years from now.

Rob Eastaway, Director

November 2024

354 shows

307,000* Total audience reached

*approximately

Different theatres performed in **77**

The Timeline

2003
We run a lecture event in a hall linked to Manchester University, morning and afternoon. The aim is to show that there's more to maths than taking exams. About 500 attend in total.

2004
Rob Eastaway repeats the event in a theatre in the centre of Manchester - the Royal Exchange. The event is called Maths Inspiration and our tradition of holding all our events in theatres and concert halls is born. Two sell-out shows reach nearly 700 teenagers.

> "I still remember the "show zero" in an overheated student hall in Owen's Park (Manchester University). The very first Maths Inspiration show at the Royal Exchange, with posh seats in an amazing iconic setting, seemed like luxury.
>
> Amanda Padbury
>
> Amanda has looked after registration at every Manchester show since 2004


Jen Visser-Rogers

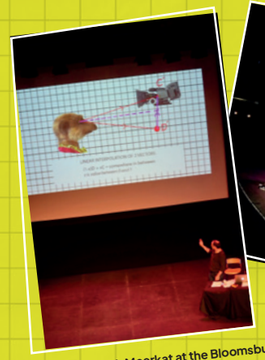
The DVD Box Set

2014
We celebrate our tenth anniversary with a reception below the OXO Tower in London. We meet our aim of having at least one woman speaker at each show. Coralie Colmez, Hannah Fry and Jen Visser-Rogers are three of our new speakers.

2013
With Stage on Screen, we record six shows in two days at Greenwich Theatre, to create our set of DVDs. The audiences are Year 9 and 10 pupils. This begins our tradition of holding Year 9/10 shows at the end of the summer term.


Hannah Fry

2015
The Maths Association of NSW invite us to perform shows in Sydney. The shows feature on the national TV news as an example of how to make maths relevant and exciting for teenagers. Our summer show at the Bloomsbury Theatre has a special guest: Aleksandr Meerkat.



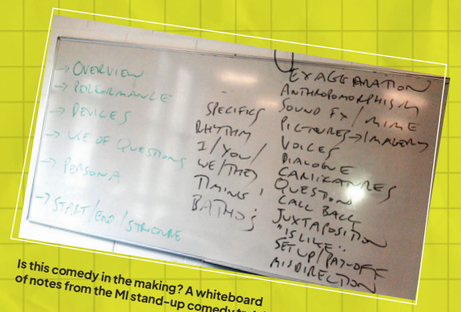
Aleksandr Meerkat at the Bloomsbury Theatre, London.

> "Of those I still know well that went to the show with me, we are all now in either engineering, finance or software development.
>
> Student from Manchester

2016
We approach the National Theatre, who agree to let us perform The Curious Coincidence of Maths in the Day-Time on the award-winning set of The Curious Incident of the Dog in the Night-Time at the Gielgud Theatre. Over 4000 attend the six shows presented by Matt Parker, Hannah Fry, Ben Sparks and Rob Eastaway.

2017 - 19
We are invited by theatres in Sydney and Melbourne to present Curious shows on top of the touring production. Meanwhile the Museum of Math in New York invite us to do our first ever show in the USA. And thanks to support from Edinburgh University, we do our first shows in Scotland.

2005 - 6
The programme expands to theatres in Birmingham, Greenwich and Cardiff, with over 2500 students and teachers attending shows. Hugh Hunt and David Acheson make their first Maths Inspiration appearances.



Is this comedy in the making? A whiteboard of notes from the MI stand-up comedy training.

2007 - 10
Cambridge, Reading, Southampton, Liverpool, Leeds, Bath and Nottingham have all become venues, with annual attendance of over 8000. Lots of new speakers have appeared, including Matt Parker (pre-Numberphile), engineer and presenter Kate Bellingham, Oscar animation winner Sue Rowe and London Eye engineer John Roberts. We also trial mini-shows in several venues, including the Theatre by the Lake in Keswick.

2011 - 12
Having outgrown the Criterion Theatre in London and the Adrian Boult Concert Hall in Birmingham, we move to larger theatres in those cities. Annual attendance exceeds 10,000 for the first time. A group of speakers spend two days in Bath learning the techniques of stand-up comedy. New speakers around this time include Ben Sparks, Timandra Harkness and Steve Mould.


Performing over Skype.

2020 - 21
Covid and lockdown force us to switch to live online shows. Some of these reach huge audiences, including our Climate Change show, for which nearly 200 schools sign up, and we estimate a live audience of about 10,000. But we are delighted when we return to in-person shows in November 2021, starting at the Chester Storyhouse theatre.

2022 - 23
An audience of over 1000 attend our Pi Day show at the Bristol Hippodrome, hosted by Matt Parker, with Zoe Griffiths, Rob Eastaway and Colin Wright. For a short time, this holds record attendance title.

> "As I held the door open for one of the teachers, they told me that the first time they saw an MI talk was when they were in Year 11 – now they are head of maths!
>
> Colin Wright

Matt welcomes the audience at Bristol Beacon, 2024.

2024
Our twentieth anniversary. We beat our previous record attendance with an audience of over 1100, again at Bristol (this time at the newly-refurbished Bristol Beacon), featuring Matt Parker, Tom Crawford, Ben Sparks and Jen Visser-Rogers.

The Speakers

Maths Inspiration would not exist without the many inspiring, creative speakers who have appeared in our shows. With a huge variety of backgrounds and specialisms, they have one thing in common – a love of communicating maths in exciting and original ways.

Our speakers over the last twenty years have included:


Alex Bellos


Alison Kiddle


Andrew Jeffrey


Aoife Hunt


Ayliean Macdonald


Ben Sparks


Bobby Seagull


Chris Budd


Claire Ellis


Colin Wright


Coralie Colmez


David Acheson


David Spiegelhalter


Hannah Fry


Helen Pilcher


Hilary Costello


Hugh Hunt


Jackie Bell


James Grime


Jen Visser-Rogers


John Roberts


Katie Steckles


Mark Lewney


Matt Parker


Matthew Scroggs


Nira Chamberlain


Paul Shepherd


Richard Lissaman


Rob Eastaway


Sammie Buzzard


Simon Singh


Sophie Maclean


Steve Mould


Timandra Harkness

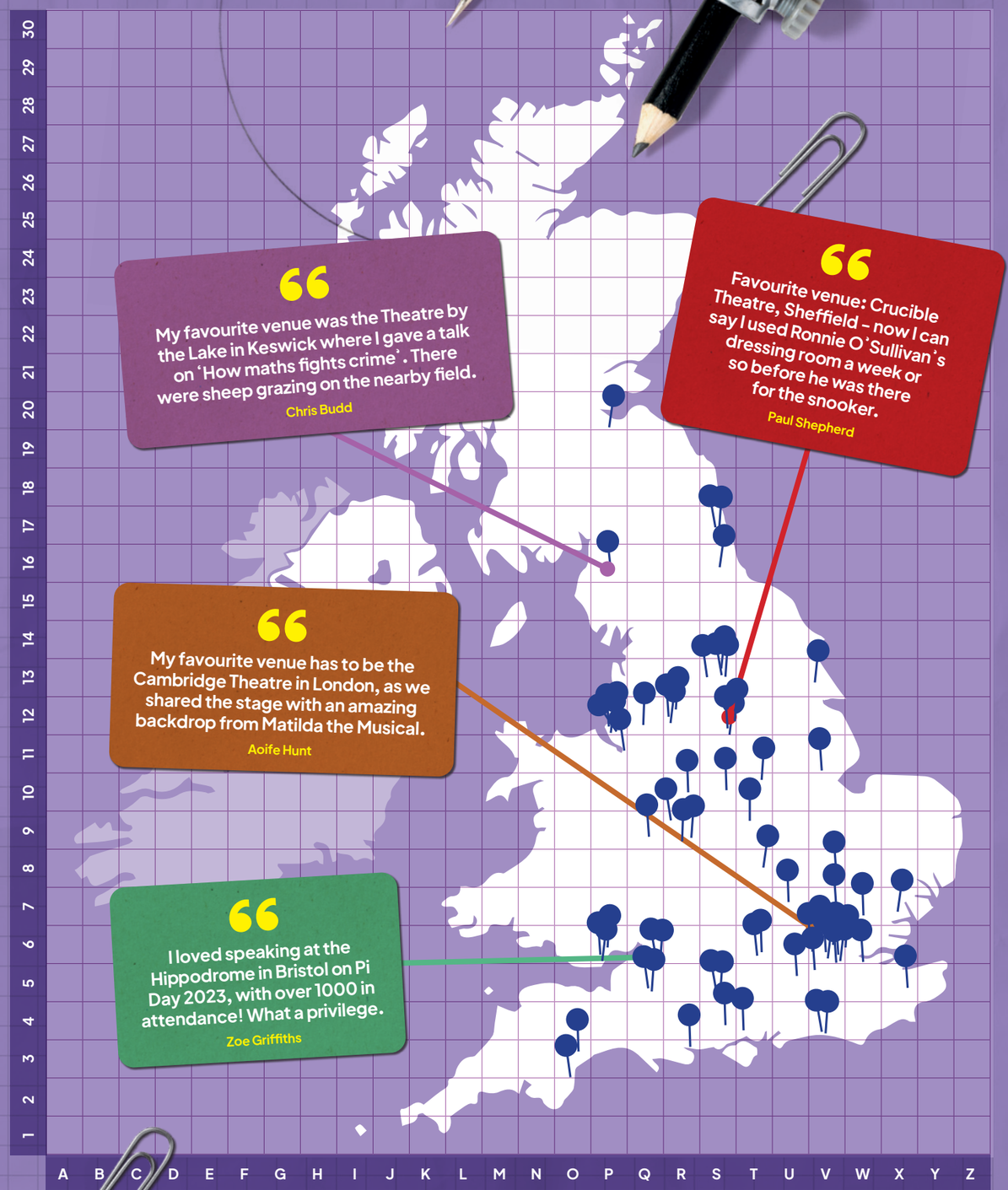

Tom Crawford


Yolanda Ohene


Zoe Griffiths

> I was finishing my PhD and wanted to do more talking about maths with students. Someone recommended Maths Inspiration so I sat at the back of a Manchester venue and watched a fantastic show. I immediately wanted to be involved, and for a couple of shows I was a helper. To graduate up to being a speaker made me feel very legitimate.
>
> James Grime

The Venues



"My favourite venue was the Theatre by the Lake in Keswick where I gave a talk on 'How maths fights crime'. There were sheep grazing on the nearby field.
Chris Budd

"Favourite venue: Crucible Theatre, Sheffield – now I can say I used Ronnie O'Sullivan's dressing room a week or so before he was there for the snooker.
Paul Shepherd

"My favourite venue has to be the Cambridge Theatre in London, as we shared the stage with an amazing backdrop from Matilda the Musical.
Aoife Hunt

"I loved speaking at the Hippodrome in Bristol on Pi Day 2023, with over 1000 in attendance! What a privilege.
Zoe Griffiths

Q5	BATH	Forum
Q5	BATH	Theatre Royal
R9	BIRMINGHAM	Adrian Boult Hall
R9	BIRMINGHAM	Crescent Theatre
R9	BIRMINGHAM	New Alexandra
S13	BRADFORD	St George's Hall
V4	BRIGHTON	Dome Studio Theatre
V4	BRIGHTON	Sallis Benney Theatre
Q6	BRISTOL	Hippodrome
Q6	BRISTOL	Beacon
V8	CAMBRIDGE	West Road Concert Hall
X5	CANTERBURY	Marlowe Theatre
P6	CARDIFF	Reardon Smith Theatre
P6	CARDIFF	Dora Stoutzker Hall
P6	CARDIFF	Sherman Theatre
W6	CHATHAM	Central Theatre
W7	CHELMSFORD	Chelmsford Theatre
P11	CHESTER	Storyhouse
X7	COLCHESTER	Mercury Theatre
S10	DERBY	Derby Theatre
S16	DURHAM	Gala Theatre
P20	EDINBURGH	George Square Theatre
O3	EXETER	Northcott Theatre
O3	EXMOUTH	College Theatre
V6	GREENWICH	Greenwich Theatre
U5	GUILDFORD	Yvonne Arnaud
V13	HULL	Truck Theatre
P16	KESWICK	Theatre by the Lake
S13	LEEDS	City Varieties
S13	LEEDS	Playhouse
S13	LEEDS	Town Hall
T9	LEICESTER	Curve Studio
V11	LINCOLN	New Theatre Royal
P12	LIVERPOOL	Capstone Theatre
P12	LIVERPOOL	Everyman Theatre
P12	LIVERPOOL	Playhouse
P12	LIVERPOOL	St George's Hall
P12	LONDON	Cambridge Theatre
V6	LONDON	Criterion Theatre
V6	LONDON	Gielgud Theatre
V6	LONDON	Greenwood Theatre
V6	LONDON	Lyceum Theatre
V6	LONDON	Palace Theatre
V6	LONDON	Phoenix Theatre
V6	LONDON	Piccadilly Theatre
V6	LONDON	Savoy Theatre
R12	MANCHESTER	RNCM Concert Hall
R12	MANCHESTER	RNCM Theatre
R12	MANCHESTER	Royal Exchange Theatre
U7	MILTON KEYNES	Milton Keynes Theatre
S17	NEWCASTLE	Northern Stage
S17	NEWCASTLE	Theatre Royal
T8	NORTHAMPTON	Girls School Theatre
T10	NOTTINGHAM	Playhouse
R3	POOLE	Lighthouse Theatre
T4	PORTSMOUTH	Theatre Royal
T6	READING	Hexagon Theatre
T6	READING	Town Hall
V7	SAFFRON WALDEN	Saffron Hall
S12	SHEFFIELD	Crucible Theatre
S12	SHEFFIELD	Playhouse
S12	SHEFFIELD	Drama Studio
S4	SOUTHAMPTON	Nuffield Theatre
R10	STRATFORD-UPON-AVON	Playhouse
Q9	TELFORD	Telford Campus Lecture Theatre
Q12	WARRINGTON	Parr Hall
V5	WIMBLEDON	Polka Theatre
S5	WINCHESTER	St Swithuns Theatre
S5	WINCHESTER	Theatre Royal

INTERNATIONAL

Australia

SYDNEY	Chatswood Concourse
SYDNEY	Seymour Centre
SYDNEY	Riverside Theatre
SYDNEY	Bankstown Sports Club
MELBOURNE	Roslyn Packer Theatre
NEWCASTLE	Civic Theatre
BATHURST	Theatre

USA

NEW YORK	Mason Hall

Most northerly city performed at:
Edinburgh

Most southerly:
Melbourne

Most westerly:
New York

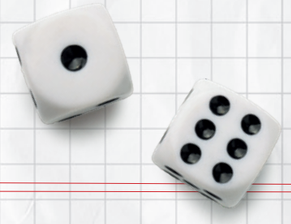
Most easterly:
Sydney

Biggest attendance:
1120
Bristol Beacon Theatre, 2024

Most used theatre:
West Road Concert Hall, Cambridge (15)
(Every year since 2008, apart from 2020)

52.2025° N, 0.1086° E

The Audience



Maths Inspiration wouldn't exist without the enthusiasm of the students and teachers who make up the audience. We always love to hear their feedback, and sometimes the audience Q&A becomes the most creative part of the show.

"

The general buzz and excitement from the young adults still blows me away every year. I always remember the confidence of the young students at one of the early Royal Exchange shows asking the panel very challenging questions - I really hope they don't lose that curiosity.

Amanda Padbury

"

I first went to a Maths Inspiration show as a PGCE student. One of the core parts of how I approach lesson planning has been to try to have a surprise in every lesson, mathematical or not. The show I attended helped to set me on that path, and I am very grateful.

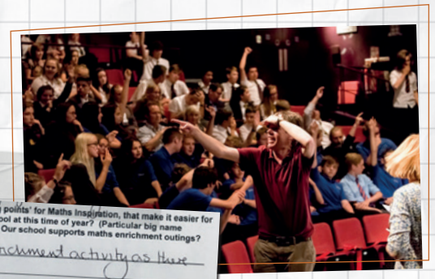
John Brennan-Rhodes formerly of Woodhouse College, London

"

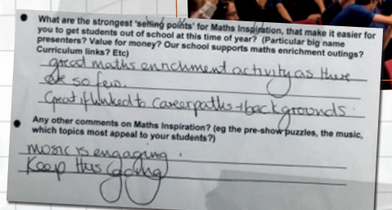
I often say that one of the best bits of feedback we get is when one of us overhears a student leaving at the end of a show saying to their friend, 'That was better than I expected.' It means we've reached somebody who would not have chosen to go to a maths show.

Rob Eastaway

Sheffield Crucible - Paul Shepherd demonstrates the strength of a catenary arch with help from audience volunteers.



Exeter Northcott - Rob Eastaway asks for volunteers.



What are the strongest 'selling points' for Maths Inspiration, that make it easier for you to get students out of school at this time of year? (Particular big name presenters? Value for money? Our school supports maths enrichment outings? Curriculum links? Etc)

great maths enrichment activity as there are so few.

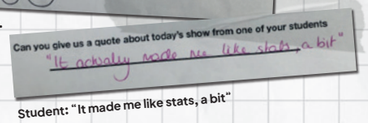
Great linked to careerpaths - backgrounds

Any other comments on Maths Inspiration? (eg the pre-show puzzles, the music, which topics most appeal to your students?)

music is engaging.

Keep this going

A happy teacher.



Can you give us a quote about today's show from one of your students

"It actually made me like stats a bit"

Student: "It made me like stats, a bit"

"

When I taught at Allerton High, I always used to volunteer to organise the trip to the Leeds Maths Inspiration lectures because it was the only way I could be sure that I was allowed to attend every year!'

Kate Selway Secondary Maths Specialist, White Rose Education

"

It was always such a thrill to read all of the positive comments and see how much the teachers and pupils got out of the show.

Claire Ellis

"

I love doing a lottery and asking how many students chose the number 7. There's always enough students at an MI show that you see trends in students' favourite numbers very clearly.

Zoe Griffiths

Zoe Griffiths asks a volunteer to choose between bags - one has a bigger prize but a higher risk.

Hexagon Theatre Reading - Sammie Buzzard explains how melting ice affects ocean levels.

Everyman Theatre Liverpool - Hannah Fry plays Heads or Tails with the audience.

Waiting to enter the Phoenix Theatre, London.

"

An audience member asked if I could explain Fermat's Last Theorem through the medium of dance. My wife and ballroom-dancing partner, Rachel, was in the audience. She came onstage and we found a way to link the Viennese waltz to Andrew Wiles proof of the theorem. The student seemed happy with the answer!*

Colin Wright

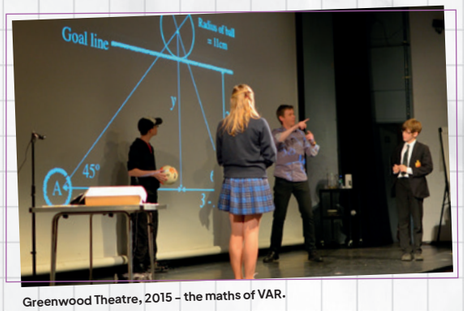
James Grime signs a calculator.

Yolanda Ohene explains MRI scanners.

"

I brought a bike wheel and a stick to one show to help me explain how magnetic resonance imaging (MRI) works. I was happy to have lots of enthusiastic volunteers (especially the girls) who were willing to give this slightly chaotic experiment a go.

Yolanda Ohene



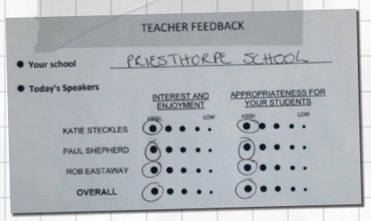
Greenwood Theatre, 2015 - the maths of VAR.

*Colin has a wonderful explanation but it's too long to fit in the space

"

We started working through a great audience-submitted Fermi question - 'How many cats are there in the world?' A student in the front row said 'It's 600 million. I just googled it.' Afterwards I found out that '600 million cats' was one of those internet stats that somebody makes up which then takes on a life of its own. This is a story I still use when I'm talking to audiences about knowledge and technology, and it's all thanks to those students in the audience.

Timandra Harkness



TEACHER FEEDBACK

Your school: PRIESTHORPE SCHOOL

Today's Speakers

	INTEREST AND ENJOYMENT (HIGH / LOW)	APPROPRIATENESS FOR YOUR STUDENTS (HIGH / LOW)
KATIE STECKLES		
PAUL SHEPHERD		
ROB EASTAWAY		
OVERALL		

Another happy teacher.

"

There was always some interesting maths you could take back into the classroom, whether it be which property you should buy on in a game of Monopoly, improving your chances of better scores in a game of darts or stopping people being sick on a rollercoaster.

Graham Barlow Retired Teacher

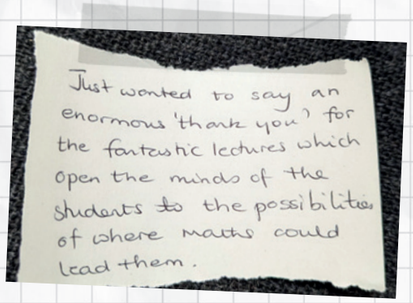
A coin flip to decide who goes first.

Volunteers use logic to deduce the colours of their hats.

"

Sometimes we forget that our audience isn't just pupils and teachers. At every show, there are stewards who are members of the public that have been hired by the theatre to show people to their seats. They have to sit through the show for health and safety. What's really touching is that quite often at the end of a show a steward will walk up to the stage as we're packing up and say 'I really enjoyed that. I never got on with maths at school, but I found your show really interesting'.

Hugh Hunt



Just wanted to say an enormous 'thank you' for the fantastic lectures which open the minds of the students to the possibilities of where maths could lead them.

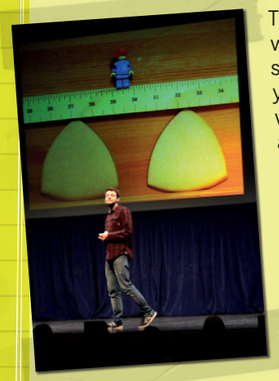
The Maths

Every Maths Inspiration show features a huge variety of exciting mathematics. We've picked out a few very different examples that appear in talks from some of our speakers.

My Mathematical Obsessions – Steve Mould
Shapes of Constant Width

What shape has a constant diameter? A circle, of course! But is that the only one? Remarkably, there are other shapes that have a constant width. One of these is the 'Reuleaux triangle'.

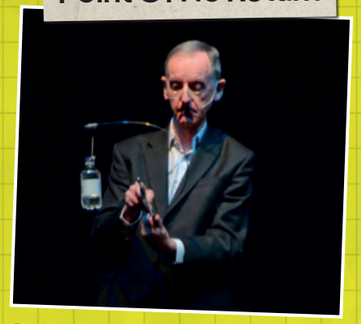
To create a Reuleaux triangle, you start with an equilateral triangle and then round the edges by drawing three arcs, each centred at one vertex and going through the other two. It is also the shape made by the intersection of three circles of the same size that pass through each other's centres.



These shapes make terrible wheels, but with the help of a small Lego figure and a ruler you can show that they do work as rollers. There's even a 3-dimensional version, the Reuleaux tetrahedron, which is the solid made by the intersection of four spheres. By delving into the murky world of lathe enthusiasts, Steve has managed to procure some of these shapes, and discovered that they work just as well as balls for rolling.

Steve demonstrates how well the Reuleaux tetrahedra work for rolling by pouring them onto the stage and standing on a large board placed on top - with a little assistance (a shove) from an audience volunteer, he zooms across the stage. (Lego figure costume optional.)

Point Of No Return



David Acheson demonstrates a catastrophic point of no return using a bottle of water and a rod. He bends the rod (with the bottle hanging off it) and it slowly lifts up, until it reaches a certain point when the bottle flips over the top – and then no amount of twisting it back the way it came will return it to the previous situation. This is comparable to climate change reaching a catastrophic tipping point.

> I enjoyed using Alphabetti Spaghetti to talk about the maths and makeup of the genetic code.
>
> Helen Pilcher

Stats Important! – Jen Visser-Rogers
Statistical Modelling

Newspaper headlines love to use phrases such as 'Storm of the Century'. But how do we determine if a storm is a 1 in every 100 year event?

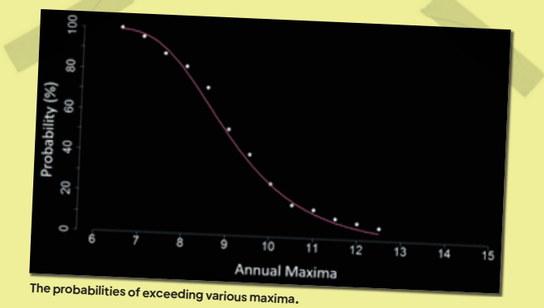
One way is to use the statistics of storm surges, which is where coastal waters are pushed towards the shore by the force of the strong winds, causing them to rise abnormally high.

							8.8	8.8	8.9
8.9	8.9	8.9	9.0	9.1	9.1	9.3	9.3	9.4	9.5
9.6	9.6	9.7	9.7	9.8	10.0	10.0	10.2	10.3	10.4
10.5	10.5	10.8	11.1	11.5	11.8	12.2	12.6	12.7	13.0

New Orleans storm surge maxima (in feet) over 50 years

Using the relative frequencies of 50 years' worth of annual storm surge maxima in New Orleans, you can calculate the probability that the annual maximum storm surge will exceed a certain level. For example, what's the probability that a maximum surge will exceed 8.75 feet? Looking at the data, 33 out of 50 maxima are greater than 8.75 feet, which gives a probability of 66%.

In August 2005, Hurricane Katrina hit New Orleans with a storm surge level of 14.4 feet above sea level, causing $108bn worth of damage and killing 1833 people. What's the probability that the annual maximum surge would be greater than 14.4 feet? Well, according to the data it is 0% - impossible! And yet it happened.



The probabilities of exceeding various maxima.

This is where we need to move to thinking about statistical modelling instead of relative frequencies. By calculating and plotting the probabilities of exceeding various maxima using the available data, we can use a Gumbel distribution to generate a smooth line of best fit running through the points. And this gives an equation to calculate the probability of a storm surge greater than 14.4 feet. It turns out to be 0.01, so Hurricane Katrina was indeed a 1 in every 100 year event - it really was a 'Storm of the Century'.

> All my memories of past shows are very happy ones indeed. One memory that stands out was one of our students, many years ago, who was so impressed by Hugh Hunt's talk on spinning things that he went home that same night and made his own boomerang (which had a turning circle of a few metres in diameter) and brought it in next day to terrify anyone he could throw it at! He, unsurprisingly, went on to study engineering at university!!
>
> Nev John, Head of Maths, The Willink School

The Maths of Spin

Hugh Hunt showing the gyroscopic properties of a spinning bike wheel in his talk The Maths of Spin.

He Ain't Heavy...

John Roberts uses a rope and ladder to show the forces that were involved in lifting the London Eye wheel into position.

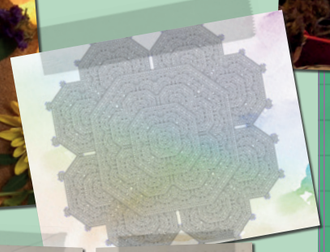
Win! Win! Win!

Matt promises a prize of "whatever is in this large box" to a student. Upon winning Matt opens the box and pulls out a roll of paper, which he unfurls while saying "you win... Learning!", to general groans and applause.

The Maths

The Beauty of Maths – Ayliean Macdonald
Toothpick Fractals

Are these just pretty pictures? Or are they maths? Or could they possibly be both?



Ayliean Macdonald on stage.

Well, they are definitely mathematical. They are, in fact, pictures of a toothpick fractal after different numbers of iterations. To build the fractal, start with a line segment and, at each iteration, add two more line segments to each exposed end. Ayliean found the fractal in a paper called 'The Toothpick Sequence and Other Sequences from Cellular Automata', which includes lots of lovely equations and analysis of different variations of toothpick sequences.

But there's also no denying that they are pretty pictures! In fact, Ayliean uses an animated version to invite people to find a relaxed flow state whilst still thinking mathematically. Toothpick fractals are perfect for this discussion because the descriptive algorithm of how to build them is very simple, yet as the iterations build the structures become profoundly complex. So complex, in fact, that there are still open questions about them – and it's important to know that! It's hard to encourage young people to learn maths if they think we already have it all figured out – they need to know that there is a place for them in the world of maths, and that there are mysteries still to solve.

Maths doesn't have to be competitive and it also doesn't necessarily have to have practical applications to be meaningful. There are as many ways to be a mathematician as there are people in the world, and you never know what useful or beautiful thing you might find by playing around and enjoying maths.

> "I remember watching Hugh do the exact same 'accidental mishaps' in both talks – which is when I learned everything you do on stage is on purpose."
>
> Tom Crawford

> "I bought these buckets from a garden centre in 2005, stuck on some letters, and I've been using them for variants of the Monty Hall problem ever since."
>
> Rob Eastaway

The Sacred Geometry of Chance – Ben Sparks
The Birthday Bet

How many people would you want in a room before you'd bet that (at least) two people share a birthday? (Just the day and the month.)

This is, in some circles, a famously counter-intuitive probability puzzle, but it's an accessible question, and one that most people immediately feel they have some intuition for. But unless you've done the maths already, your intuition will probably be wrong.

One way to think about it is to consider the probability that there is no shared birthday. If you have a single pair of people, the probability that they don't share a birthday is 364/365, or 99.73%. Add in a third person, and there are only 363 days left that won't match the birthday of one of the first two, so the probability of no shared birthday in a group of three is 364/365 × 363/365, which is 99.18%. The more people you have, the lower the probability that there is no shared birthday (and hence, the higher the probability that there is a shared birthday). Ben uses some live spreadsheet mathematics to calculate the odds and demonstrates the famous conclusion that you need only 23 people to have 50:50 odds for a matching birthday pair.

A sample of about 60 people from the large Maths Inspiration audience is an excellent chance to test this out! Ben bets that two people in the sample will share a birthday and allows the audience to talk him up to a bet of £50 with a gambling volunteer, who is invited on stage (with their £1) to settle the wager. Having shaken hands in full view of hundreds of witnesses, and established that the only way to be certain Ben wouldn't lose is to use 366 people in the sample, they proceed to check the sample of 60.

In fact, the probability of a matching birthday pair among 60 people is close to 99.5%, so the volunteer should have talked Ben up to around £200 if they had wanted to expect a fair return on their bet.

In every Maths Inspiration show so far, there has been at least one matching pair of birthdays, and Ben has won his bet. Ben keeps the money, but the humbled volunteer is usually compensated in chocolate form, and goes away with a lesson they'll never forget.

"If you are prepared to bet £1 against me, I'm prepared to put more money on the table..."

No. of people	Chance of no shared birthday	Chance of at least one shared birthday
53	1.89%	98.11%
54	1.61%	98.39%
55	1.37%	98.63%
56	1.17%	98.83%
57	0.99%	99.01%
58	0.83%	99.17%
59	0.70%	99.30%
60	0.59%	99.41%
61	0.49%	99.51%

> "Giving Maths Inspiration talks was such a new and exciting experience where I learned an enormous amount from the other speakers (in terms of maths, public speaking, and outreach) and frankly, it was just fun!"
>
> Hilary Costello

The Great Escape

Aoife Hunt uses the rope and stopwatch to time volunteers' escape speed under various conditions.

Special Shows

Not all of our shows follow the regular format. We've occasionally taken the opportunity to put on special shows with a particular theme. Here are some of our favourites.

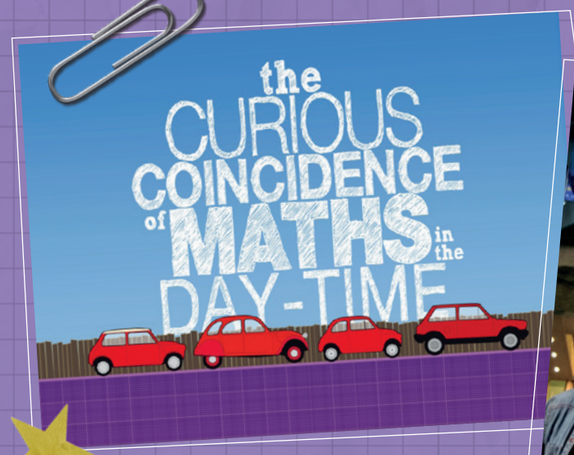
Curious Coincidence

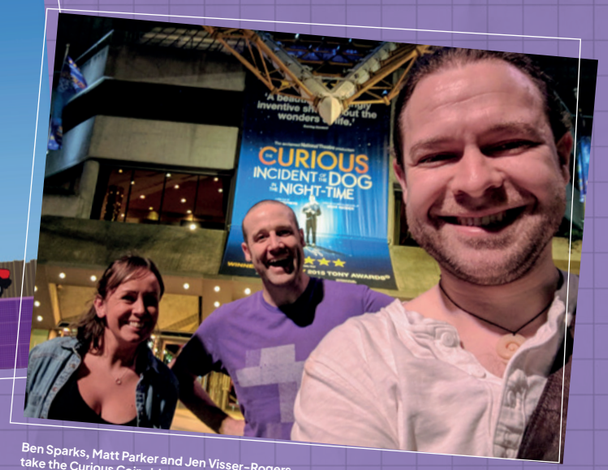
In 2016, Rob Eastaway and Ben Sparks created The Curious Coincidence of Maths in the Day-Time, a special Maths Inspiration show that took place at the Gielgud Theatre on the set of The Curious Incident of the Dog in the Night-Time.

The mathematical precision of the set reflected the mind of the main character, Christopher. The walls were lined like graph paper, and spectacular graphics and lighting effects were projected onto them throughout the play. It was the perfect place to do a maths show, and it was hosted by Matt Parker with Rob, Ben and Hannah Fry.

The first part of the Maths Inspiration show explored ideas from the book, including the logical deductions of Sherlock Holmes, the maths of finding your way around the city, Monty Hall, and how the fluctuations of frog populations lead to some beautiful patterns.

The second half opened with the actor who played Christopher performing the A Level maths question that appears at the end of Mark Haddon's book. The theatre allowed us to use the full lighting effects from the show – it was spectacular! The finale was an explanation of how the show's composer Adrian Sutton had used maths (especially prime numbers) to compose the play's music. Over 4000 attended the six full house shows at the Gielgud over three days, and our show then went on a world tour. Well, we took it to Sydney, Melbourne and Milton Keynes. One of the true highlights in Maths Inspiration's history.





Ben Sparks, Matt Parker and Jen Visser-Rogers take the Curious Coincidence show to Melbourne.

The Rugby World Cup Show

In 2015, England hosted the Rugby World Cup, and we were invited to do a special show in the town of Rugby itself. The entire show was dedicated to the maths behind rugby, including the dynamics of throwing a ball, the vectors involved in deciding whether a pass is forward, and the geometry of kicking. We were joined onstage by former England international and expert kicker Paul Grayson.

In one demonstration, Paul was asked to pick out, on a GeoGebra diagram, the point where he felt the best place would be for placing the ball for a conversion. He selected a point, and then we revealed what the mathematically optimal pont was. Remarkably (or perhaps not remarkably) it was almost exactly where Paul had pointed to.

The following March, we did another rugby show in Cardiff – where else? That time we were joined by former Wales captain Ryan Jones.

Paul Grayson and Rob Eastaway with Ben's GeoGebra demo file.

Online Shows

During Covid lockdowns, we faced the challenge of how to present shows when we couldn't perform in theatres. This led us to put on a series of themed shows online. Without doubt the most successful of these was our Climate Change show, How Maths can Save the Planet. We were joined by statisticians and engineers who explained both the maths behind climate change, and also some of the ways that maths can help to address the challenges.

The show was planned to coincide with the huge COP26 conference in Glasgow, and Hugh Hunt delivered his section live from that city. Around 200 schools signed up for the show, and we reckon over 10,000 watched it live in school halls and classrooms around the country, with thousands more watching the recording.

> My debut as a Maths Inspiration speaker was at one of the online shows during lockdown, so it was a bit of a different type of debut! I had to know more about video mixing software than the average MI speaker.
>
> Alison Kiddle

Musical Inspiration

Maths and music have a strong shared history. Many historical and current mathematicians are also musicians and music theorists – and the Maths Inspiration speakers are no exception.

Several Maths Inspiration speakers have used live music in their performances – including Mark Lewney, David Acheson, Ben Sparks and Kyle Evans. Some speak about the mathematical relationships in music, and some use it as a story-telling device. Some do both, resulting in memorably scene-stealing moments.

“”

The idea I most enjoy communicating has to be the mathematics of string vibration on my electric guitar, together with a self-composed rock instrumental. I was always careful to sit down to play, desperate to avoid looking like some old guy pretending to be young, and the surprise element then really hit home. At one event, at question time, a teenage voice from the darkness asked ‘Does playing the electric guitar help you pull?’ As I was at least 65, and dressed neatly in a dark suit, I could only ham up being speechless, and had to be saved by the show’s compere, a professional comedian. The final guitar memory I have is of Greenwich in 2013, simply because the whole thing was being filmed for a DVD. Knowing that this would probably be the only permanent public record of me playing my rock tune, ‘Fighting On’, I was very nervous, but just ‘went for it’ all the same, and by a bit of a miracle there were no mistakes.

David Acheson

“”

The instant that David Acheson turned from ‘man in grey suit’ to ‘rock star’ with the first riff on his electric guitar delighted the audience every time.

Claire Ellis

“”

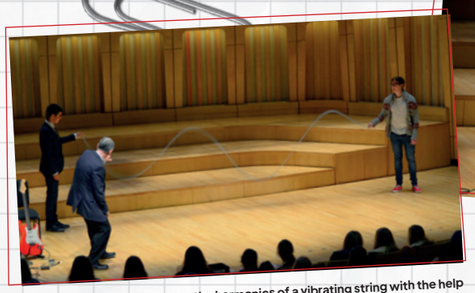
I remember once pre-show when Ben was soundchecking his guitar, nipping off to the toilet and singing along to his rendition of Sound of Silence to myself in the empty ladies room. When I came back on stage an amused technician told me the sound desk had reviewed my mic channel and kindly chose not to broadcast it! #dontgiveupthedayjob.

Aoife Hunt

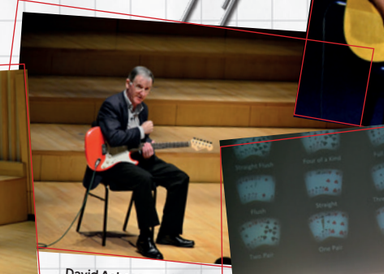
“”

David Acheson was my applied maths lecturer at university, and stood out as a teacher who cared enough about his audience to enliven each lecture with memorable moments. He would occasionally bring out his guitar (with the excuse of discussing vibrations). Years later, sharing a stage for Maths Inspiration, we got a chance to perform on-stage together to close the show in Cardiff 2013.

Ben Sparks



David Acheson demonstrates the harmonics of a vibrating string with the help of two volunteers in Cardiff .



David Acheson with his electric guitar.

Ben Sparks sings Sting’s The Shape of My Heart, a song about a poker player, while talking about the maths of poker hands.

The *MI*xtapes

In 2010 we had the idea of playing some pre-show music to build the atmosphere for the show. To begin with we just borrowed the tracks being used by Matt Parker’s “Festival of the Spoken Nerd”, but from 2015 we started putting songs into themes.

2015 – Number Mix

The 2015 mix was just a bunch of songs that featured numbers. Some of them are pretty obscure, but it set the tone for what would follow in later years.

Scan to play on Spotify

- Love Potion No. 9 – The Clovers
- Number 9 Train – Tarheel Slim
- 15 to 20 – The Phenomenal Handclap Band
- 1234 – Feist
- 2-4-6-8 Motorway – Tom Robinson Band
- Love is a Number – White Rose Movement
- The End of the Over – Duckworth Lewis Method

2016 – Countdown Mix

In 2016, we had the idea of a countdown, starting at ten, but we couldn’t find an upbeat song featuring the number 4. Our creative solution was for the counting to go down to 5, then teasingly go up again (5, 6, 7, 8) before racing down from 9 to 1.

Scan to play on Spotify

Ten Feet tall – Afrojack	10
Love Potion No. 9 – The Searchers	9
Grade 8 – Ed Sheeran	8
7 Rings – Ariana Grande	7
Six Degrees of Separation – The Script	6
5,6,7,8 – Steps	5,6,7,8
9 to 5 – Dolly Parton	9,8,7,6,5
5 4 3 2 1 – Manfred Mann	5,4,3,2,1

2017 – Prime Mix

We spotted that 2017 is a prime number, so that year we put together a prime number mix. It included Prince’s song 1999, which was another prime year. Alas, we won’t be able to use this mix again until 2027.

Scan to play on Spotify

2step – Ed Sheeran	2
Three Little Birds – Bob Marley	3
Five Colours in her Hair – McFly	5
Seven Nation Army – White Stripes	7
Thirteen Sad Farewells – Stu Larsen	13
17 – Avril Lavigne	17
Nineteen Ninety-Nine – Prince	1999

2018 – Symmetry Mix

Our most ambitious mix was introduced in 2018, when we went with the broader theme of symmetry. This was co-ordinated with some great visuals that linked the songs together (the number 66 turning upside down to become 99, for example).

Scan to play on Spotify

- Eleven plus Eleven – Nine Below Zero
- (Get Your Kicks on) Route 66 – The King Cole Trio
- 2002 – Anne-Marie
- SOS – ABBA
- Perfect Symmetry – Keane
- Shape of U – Ed Sheeran
- 99 Red Balloons – Nena
- Upside Down – Paloma Faith
- 22 – Taylor Swift
- Symmetry – Little Boots

The Puzzles

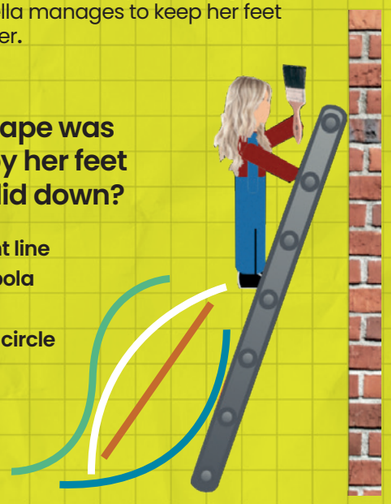
> Some of my favourite Maths Inspiration moments have been when sharing puzzles with the audience: watching them during the pre-show, or even when I'm on stage giving them time to discuss and think, it means I can look out into the audience and see people engaging with maths and really enjoying it.
>
> Katie Steckles

1.

Bella is standing on the middle rung of a ladder painting the wall.The ladder starts to slip downwards (always touching the wall) but Bella manages to keep her feet on the ladder.

What shape was traced by her feet as she slid down?

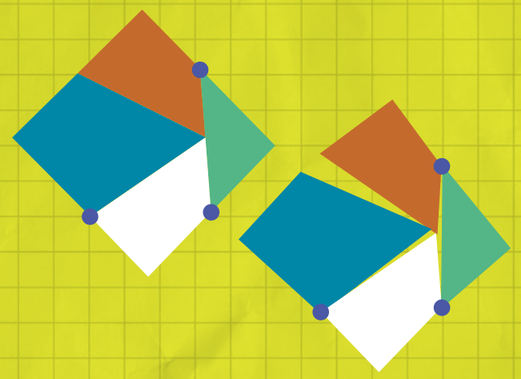
a) a straight line
b) a hyperbola
c) a wiggle
d) part of a circle



2.

This square is divided into four sections. The sections are joined by hinges.

What shape do you get if you swing all the pieces round the hinges?

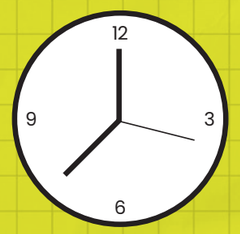


3.

Which of these two numbers is bigger?

The number of seconds in six weeks

The product of all the numbers from 1 to 10



$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10$

4.

4	1
5	2
6	3
7	7
9	8
=24	=21

The numbers 1 to 9 have been written on cards, and put into two columns.

The column on the left adds to 24, and the column on the right adds to 21.

Move one (and ONLY one) card to make the two columns add to the SAME TOTAL.

Solutions on the Sponsors page

Unscripted Moments

"

The Palace Theatre in London was showing "Singing in the Rain" in the evening. Onstage, I realised that we were performing in a sort of empty pool a couple of inches deep - presumably where the Gene-Kelly character did his dancing when the 'rain' came down.

David Spiegelhalter

Matt takes a sink to Sydney as a prop for one of his videos.

"

I remember arriving for my first MI in Sydney and Matt telling me to meet him by the Sydney Harbour Bridge where he was 'doing some filming'; I turn up to find that he has a full size sink set up and is testing if the water goes clockwise or anti clockwise.

Jen Visser-Rogers

"

At MI in Southampton the data projector bulb exploded five minutes into my talk. There was a loud whisper from off-stage saying 'Improvise Chris!'. So I gave a ten minute maths talk about things that I had in my pockets while they rustled up a second projector.

Chris Budd

"

I enjoyed Ben leading us on a trek through a muddy valley complete with suitcases and no spare clothes, between the hotel and the theatre in Exeter.

Zoe Griffiths

"

At the Cambridge show in 2014, one of the stewards didn't turn up. The custodian of the venue insisted that unless we trained up another steward, the show couldn't go ahead. Matt Parker agreed to fill in, and dutifully donned a sash and traipsed around on the health and safety briefing with three fresh-faced undergraduates. The custodian didn't seem to spot that 20 minutes later, that same steward had whipped off the sash and was announcing himself on stage to welcome the audience to the show.

Rob Eastaway

"

At the Newcastle show in March 2015, at the huge Theatre Royal. I was a last-minute replacement because another speaker had to pull out, and I remember it went really well, probably because I had had less time to be stressed beforehand.

Coralie Colmez

"

Maybe not a favourite memory but certainly a memorable occasion was my compering debut. I'd been told I could borrow Matt Parker's joke of pointing out the fire exits on the ground floor, then telling students in the balcony they'd have to jump down in case of a fire. This also happened to be the first (and hopefully only) MI show where we had a fire alarm. Luckily no-one attempted to jump.

Sammie Buzzard

"

At The Criterion in 2009, I was due to be called on stage when I tripped over something large and soft - it was a body, face down, with a dagger in its back. As I began my act, desperately trying to hold myself together, it dawned on me that it was a stage prop - the evening production at The Criterion that day was The 39 Steps, which includes a murder.

David Acheson

Hannah Fry and Matt Parker do ad-lib phone comedy, pretending to be mathematical crime scene investigators.

"

I have so many good memories of MI! The late night trip to Trinity Clock Tower with Hugh Hunt and his dog (!!) the night before Cambridge 2022 will always be up there, especially as I was a student at Trinity.

Sophie Maclean

Hugh Hunt in the Clock Tower with his dog.

The Sponsors

It's very important that we make Maths Inspiration accessible to as many schools as possible. This has only been possible thanks to the generosity of like-minded sponsors over the last twenty years. In 2024, we are delighted to have the support of the organisations below.

Jane Street
As a company built on the power of mathematics, Jane Street is passionate about fostering mathematical talent and curiosity. Nurturing mathematical skills is crucial for addressing complex global challenges and driving progress across everything, from finance to technology. We're thrilled to support Maths Inspiration because we want to inspire the next generation of problem solvers, critical thinkers, and innovators.*
Beth Gorman, University Relations Lead, Jane Street

Trinity College, Cambridge
Trinity College has supported Maths Inspiration since 2020 with a partnership that has ensured that schools who would normally struggle to finance trips have been able to access free seats. Maths Inspiration is one way that students are able to start making links with university study.
Amber Silk, Outreach Co-ordinator, Trinity College, Cambridge

Institution of Civil Engineers
The Institution of Civil Engineers (ICE) is excited to partner with Maths Inspiration to showcase what civil engineering has to offer. Maths Inspiration's brilliantly engaging shows bring Maths and STEM careers to life. Together we hope to foster a new generation of talented engineers who can tackle the complex environmental challenges of the future.
Suzanne Moroney, Head of Member Engagement, Institution of Civil Engineers

Insitution of Structural Engineers
The Institution of Structural Engineers has been a proud supporter of Maths Inspiration for over a decade. Their work inspiring young people into continuing their maths studies through fun and engaging lectures is admirable, and supports the next generation of engineers.
Rebecca Carey, Head of Membership and Education, The Institution of Structural Engineers

Advanced Maths Support Program
The AMSP supports students who want to study mathematics beyond GCSE. We have been delighted to work with Maths Inspiration over many years. It is always a pleasure to attend a show and see the excitement with which students, many of whom have never previously attended a theatre, engage with the presenters and enthusiastically join in active thinking and learning – there is never a shortage of volunteers!
Cath Moore, AMSP 11-16 Student Support Lead, MEI

*Like us, Jane Street are big fans of puzzles. They post a new puzzle every month at **www.janestreet.com/puzzles**. If you think you've solved a puzzle, submit your solution!

PUZZLE SOLUTIONS
1. Bella's feet trace out a quarter circle 2. The square swings out to form an equilateral triangle 3. They are the same!
4. Lateral thinking is needed here, eg turn the 9 upside down to make a 6, or put the 1 card on top of the 5 (both columns = 20)

CREDITS
Designer: Adam Robinson Editor: Sam Hartburn
Photos: Ben Sparks, Paul Shepherd, Sophie Maclean, Katie Steckles, Matt Parker, Helen Pilcher, Jen Visser-Rogers, Aoife Hunt, Yolanda Ohene

OUTRO

I've been involved with Maths Inspiration for 75% of its existence, sometimes giving talks but most of the time as the compere. I find hosting a show is a fun combination of being an entertainer while also using my (now fairly out of date) teacher instincts to keep several hundred teenagers facing the correct direction.

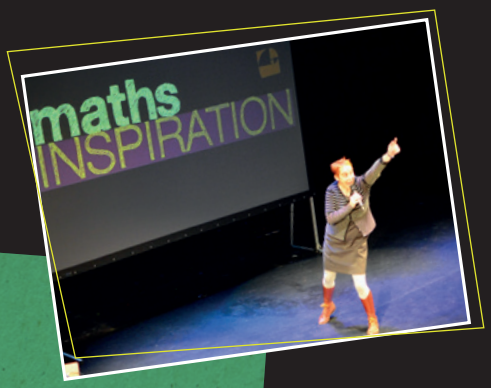
One of the key roles of the compere is to make sure the show wraps up neatly on-time and send the audience on their way, full of renewed maths enthusiasm. Which is why I've been given the last word here.

This time I don't have to remind teachers to complete feedback forms, or tell the students where they can wait to get their calculators signed after the show. But I do need to thank you for coming — to many Maths Inspiration shows past, and hopefully many more in the future.

Please follow the directions of your teacher and take all litter with you. See you again soon!

MATT PARKER

maths INSPIRATION



> The shows are a wonderful example of high-quality maths enrichment for schools, and provide students with an incredible experience.
>
> Katie Steckles

Maths Inspiration was founded in 2004. This celebration of the last twenty years includes memories of wonderful moments and near disasters, what the speakers get up to behind the scenes, superstar audience volunteers and, of course, the maths we've used to inspire students and teachers over the last twenty years.

> As much as maths in school is interesting, getting to go out of school always felt special and, by extension, more impactful.
>
> Student from Tytherington School, Manchester

www.mathsinspiration.com