MATHEMATICAL ASSOCIATION

supporting mathematics in education

2013 ANNUAL CONFERENCE

Telling the Great Stories of Mathematics

3rd—5th April Loughborough University

- **Marcus Du Sautoy**
- **Rachael Horsman**
- **David Spiegelhalter**
- **Art Benjamin**

Sponsored by OCR

Dear Colleague,

Telling the Great Stories of Maths,

Welcome to the Mathematical Association Annual Conference for 2013.

Mathematics came alive for me as a student at school when a teacher showed me some of the great stories you can tell using the language of mathematics. All too often, tasked with teaching curriculum, we lose sight that one learns a language to communicate interesting ideas and exciting stories. I hope this conference will help delegates to enjoy and be inspired by the power of our mathematical fireside tales.

We have a great line-up of speakers. **Rachael Horsman**, a Mathematical Association regular, will be giving the opening address inspiring teachers with her experiences at the front line of teaching. **David Spiegelhalter**, the Professor for Public Understanding of Risk at the University of Cambridge, will close the meeting with tales of risk and probability that are as surprising as they are entertaining and informative. In between, the extraordinary **Art Benjamin** will be using his *mathemagics* to entertain us at the conference dinner and I will deliver my Presidential Address.

The organisers have put together an exciting and stimulating programme of sessions covering the huge range of issues that face teachers. At a time when the government is planning big reforms of the teaching of mathematics, this conference will give delegates the platform to find out what the future holds and offer their own visions.

Once again, I would like to thank you for your support of the MA, and look forward very much to seeing you at the conference to share your great stories of maths.

Marcus du Sautoy, President 2012-13

Programme at a glance

Wednesday 3 April

12.00-1.30	Registration/lunch
1.45-3.00	**Opening Lecture: Rachael Horsman**
3.00-3.20	Refreshments
3.20-4.15	Session 1
4.25-5.20	Session 2
5.30-6.30	Open meeting of Teaching Committee
6.45	Dinner
8.00	Opening evening social activity

Thursday 4 April

7.30-9.00	Breakfast
9.00-9:55	Session 3
9.55-10.15	Refreshments and ***Publishers' Exhibition*** (Exhibition Hall)
10.15-11.10	Session 4
11.20-12.15	Session 5
12.30-1.40	Lunch and ***Publishers' Exhibition*** (Exhibition Hall)
1.40-2.55	**Presidential Address: Marcus du Sautoy**
2.55-3.15	Refreshments and ***Publishers' Exhibition*** (Exhibition Hall)
3.15-4.10	Session 6
4.20-5.15	Session 7
5.25-6.40	AGM
7.30	President's reception
8.00	**Annual Dinner (After-dinner speaker: Art Benjamin)**

Friday 5 April

7.30-9.00	Breakfast
9.00-9.55	Session 8
10.05-11.00	Session 9
11.00-11.20	Refreshments (Exhibition Hall)
11.20-12.30	**Closing Lecture: David Spiegelhalter**
1.00-2.00	Open meeting of Branches Committee

The organisers reserve the right to make changes as and when needed.

SESSIONS, TITLES, ABSTRACTS, BIOS

Opening Lecture by Rachael Horsman, Wednesday 5th April, 1.45-3.00

Session 1 Wednesday, 3rd April 3.20-4.15

1A David Acheson

Aimed at: All

Whatever Happened to Geometry

Abstract: The fastest way I know into the whole spirit of mathematics at its best, especially for a very young person, is through geometry. But what is the best way of actually doing it?

About the speaker: David writes and lectures maths for the general public, and is the author of *1089 and All That*. He was MA President for 2010-11.

1B Vinay Kathotia

Aimed at: P, S, P16, G

Nuffield Mathematics

Abstract: Engage with a range of resources designed to support the learning and teaching of mathematics, primary and secondary, arising from projects funded by The Nuffield Foundation. Areas we will touch on include algebra, co-operative learning, practical mathematics, probability, statistical literacy, visual representation – and research-based guidance on teaching key ideas.

About the speaker: Vinay Kathotia is Project Head for Mathematics at the Nuffield Foundation, which supports research and development in mathematics education. Areas of interest include foundations of mathematical learning and support for quantitative approaches across subjects and post-16. Prior to working at Nuffield, Vinay helped coordinate the UK-wide Royal Institution mathematics masterclasses.

1C Bill Richardson

Aimed at: Newcomers

First-Timers Forum

Abstract: This session will provide an opportunity to uncover and find out how an MA conference works. A chance to ask and discuss.

About the speaker: Bill is a long time MA member and has been to many conferences but he can still remember the excitement of his first one!

1D Lara Alcock, co presenter Mark Hodds

Aimed at: All

Promoting effective reading of mathematical proofs

Abstract: This session will report eye-tracking research demonstrating a) that experts and novices use different processes when reading mathematical proofs, and b) that a simple intervention might dramatically improve the ability of novices to engage with such proofs. It will include opportunities for participants to reflect on their own reading processes.

About the speaker: Lara Alcock teaches mathematics and mathematics education at Loughborough University. She conducts research on students' thinking in undergraduate mathematics, with a focus on comprehension and construction of proofs and definitions, and has recently published a book entitled *How to Study for a Mathematics Degree*.

1E Stefano Pozzi

Aimed at: P, S, P16

Reviewing the mathematics curriculum: what will this mean for your school or college?

Abstract: Stefano will present the reforms to the National Curriculum and Key Stage 4 qualifications, explaining the purpose of the reforms and the changes in content, structure and expectations from 5 to 16. With the statutory consultation of the National Curriculum due to conclude in the Spring, he will explore what this is likely to mean for your school/college and will want to hear your views.

About the speaker: Stefano leads on the National Curriculum for mathematics, music and art & design at the Department for Education. He has worked for the Department since 1998, including on Every Child Matters and child health policies. Before becoming an official, Stefano worked in mathematics education research at the Institute of Education, University of London.

1F David Crawford

Aimed at: All

It's a Kind of Magic

Abstract: In this session I will present some mathematical tricks that I use to generate excitement and to provide a setting for algebraic work in the classroom. There will be plenty of audience participation required so please bring a pen and paper and prepare for some mathematical fun.

About the speaker: David is Head of Maths at an independent school in Leicester where he has taught for the last 15 years. David has been giving sessions like this at teacher conferences and in pupil masterclasses for the last 10 years or so and in 2008 the MA published his book on the subject *It's a kind of Magic*. He is also involved with UKMT writing Team Maths Challenge questions and editing Kangaroo papers.

Session 2 Wednesday, 3rd April 4.25-5.20

2A Gerry Leversha

Aimed at: S, P16

Going slowly, going deeply: achieving enrichment in everyday classroom teaching

Abstract: A significant danger in teaching GCSE and A-level is that of going too fast. This tendency is particularly marked when dealing with able pupils, in the belief that the faster they get through the syllabus the better, and it is often associated with the misguided policy of taking GCSE and A-level modules early. But this acceleration is often achieved only at the expense of sacrificing understanding. Students who have an aptitude for mathematics need, in particular, to approach the subject slowly, savouring each new idea and exploring concepts in depth. They must be offered every opportunity to experience the intellectual rigour of mathematics and to appreciate the value of tackling challenging multi-stage problems. The speaker will be illustrating this belief with many examples from his own teaching career of ways to achieve this end.

About the speaker: Editor of the *Mathematical Gazette*, author, setter, marker, speaker and volunteer with the UK Mathematics Trust.

2B Tom Button

Aimed at: P16

Further Pure Mathematics with Technology

Abstract: FPT is a new A2 Further Mathematics unit being developed by MEI for first examination in summer 2013. Students will have access to a computer with graph-plotter, spreadsheet, CAS and programming language in the teaching, learning and assessment. The development of the unit and resources will be discussed.

About the speaker: Tom Button is the Student Support Leader for the Further Mathematics Support Programme and MEI's Learning Technologies Specialist. Prior to this he taught mathematics in sixth form colleges. He has a strong interest in the use of ICT in the teaching and learning of mathematics, especially at A-level.

2C Peter Ransom

Aimed at: P, S, G

Creativity in the mathematics classroom

Abstract: Participants combine creativity and mathematical history to inspire learners from the wide spectrum of attainment. This is a hands-on session where you make a variety of old mathematical instruments from basic materials. A CD-ROM of everything will be freely available. Forget the national curriculum and do some enjoyable applicable mathematics!

About the speaker: Peter is the President Designate of the MA. He takes risks. He has enjoyed mathematics all his life and tries to pass on that enjoyment to all he meets. Currently he does some part time work for Bath Spa University and freelances (no reasonable offer refused).

2D Steve Humble

Aimed at: P, S, P16

Emotional mathematics across the curriculum

Abstract: Creating maths memories in students using stories from the history of mathematics and starters that are linked to events from that day in history. Including Egyptians, Romans, Tudors, Victorians, WWI, and WWII, famous people, special numbers, art, science, poetry, literature and a whole lot more.

About the speaker: In his role as a maths publicist Steve Humble (aka *Dr Maths*) writes puzzle books, teacher materials and a fortnightly newspaper column to help create greater interest and understanding of mathematics. He holds the Guinness World Record for the most children learning maths outside the classroom. He works part time at Newcastle University in researching into teachers' beliefs. He feels that beliefs play a very important role in teachers' decision making, student learning and student memories.

2E Steve Chinn

Aimed at: All

What can be done about the bottom quartile of achievers?

Abstract: A recent survey by the speaker of almost 2000 students age 7 to 19 across the UK, highlights overall achievement and areas of particular concern in basic mathematics. The data is interpreted and the implications for teaching are discussed.

About the speaker: Steve Chinn was a teacher for 39 years, 25 of those with students with specific learning difficulties. His current interest is in maths learning difficulties, which is generally defined as the bottom quartile of learners. He has written several books and papers about this facet of maths education.

2F Lynne McClure

Aimed at: P, S, P-16, T, G

So you want to be a Chartered Maths Teacher?

Abstract: C.Math.Teach is a relatively new designation, set up by the MA in partnership with ATM, NANAMIC and the IMA. It is appropriate for teachers of mathematics in all phases of education, including primary. In this short session Lynne will talk about the benefits, explain the process and suggest how the MA can support you in your application.

About the speaker: Lynne is the Director of the NRICH project at the University of Cambridge, is a member of the MA council and sits on the C.Math.Teach authority.

Session 3 Wednesday, 4th April 9.00-9.55

3A Stuart Naylor

Aimed at: P, S

Maximising engagement in mathematics

Abstract: Does engagement in mathematics matter, or is mathematics supposed to be tedious for pupils? This session will focus on quick, simple and effective strategies that can make your life easier, make lessons more enjoyable, and make learning more creative and engaging.

About the speaker: Stuart Naylor has experience in secondary and primary classroom teaching and teacher education, and now works as a writer, researcher, consultant and course provider. He has a reputation for innovative publications, thought-provoking professional development and creative ways of enhancing teaching, learning and assessment.

3B David Bedford

Aimed at: G

Mathematics and the Imagination

Abstract: I've always been interested in mathematical problems which yield to deceptively simple and/or imaginative solutions. In this session I will present some of my favourites. No maths beyond A-level will be required.

About the speaker: David is a Senior Lecturer in Mathematics at Keele University with over 20 years' experience of lecturing to undergraduates. Alongside his research interests in Combinatorics, he has been actively involved in encouraging school children to explore the world of mathematics beyond the curriculum.

3C Samantha Durbin, co presenter Amy Hooker

Aimed at: S

Maths Through Secondary Masterclasses

Abstract: Royal Institution Mathematics Masterclasses aim to open the eyes of young people to the excitement, beauty and value of mathematics through hands-on and interactive sessions which go far beyond the school curriculum. Come along to find out more about the programme and masterclass network, and get some ideas to take away.

About the speaker: Samantha is Clothworkers' Associate in Mathematics (Secondary) at the Royal Institution. Her role involves supporting and developing the national network of secondary mathematics Masterclass groups and speakers, as well as delivering classes. Sam has worked in STEM enrichment and teaching, and has an MMath and an MSc in Science Communication.

3D Farzana Aslam, co presenter Nathan Dyke

Aimed at: S, P16, G

Spiritual, moral, social and cultural (SMSC) development through mathematics

Abstract: This session will highlight how teaching of mathematics can foster spiritual, moral, social and cultural development.

About the Speaker: I am currently working as Senior Lecturer at Coventry University. My research interests are in area of Mathematics Education, STEM outreach and Nano-Photonics.

3E Michael Fox

Aimed at: S, P16, T, G

Simple Solutions to Puzzling Problems in Geometry

Abstract: Some constructions are hard or impossible with ruler and compasses. Yet with a few simple ideas they can be done accurately on a computer. We look at many examples and see what different software can do. No advanced knowledge of geometry is needed.

About the speaker: Michael Fox is a regular speaker at MA conferences. He is a former secondary school teacher for whom geometry is a retirement pursuit.

3F Tony Gardiner

Aimed at: All

Pal Erdős = 100

Abstract: Erdős was born on 26 March 1913. We shall celebrate his centenary by looking at some of his problems, the solvers he made famous, and by reflecting on his approach to mathematics.

About the speaker: tba

Session 4 Thursday, 4th April 10.15-11.10

4A Paul Harris

Aimed at: P16, T, G

Mathematical uses of spread-sheets for non-specialist undergraduates.

Abstract: At the University of Brighton we have been teaching non-maths students how to use Excel to carry out/solve mathematical and statistical investigations. In this talk I will discuss some of the ways we go about this and talk about my experiences of teaching this material to non-specialist undergraduates.

About the speaker: Paul Harris has worked in the mathematics division at the University of Brighton for over twenty years. In that time he has taught mathematics on a variety of courses, including the mathematics degree course, engineering courses and biological science courses. He has also served the MA as the chair of some committees and as Treasurer. He is currently the Editor-In-Chief.

4B Amy Hooker, co presenter Samantha Durbin

Aimed at: P

Maths through Primary Masterclasses

Abstract: In primary masterclasses, children enjoy lively sessions which, through games, activities and investigations, develop their mathematical reasoning, problem solving and communication skills. In this session delegates will hear about the programme and masterclass network, and will get ideas to take back to young mathematicians.

About the speaker: Amy is Clothworkers' Associate in Mathematics (Primary) at the Royal Institution. Her role involves supporting and expanding the RI's network of primary mathematics Masterclass groups. Before joining the RI, she worked as a primary school teacher for over five years in Suffolk and Shropshire.

4C Farzana Aslam, co presenters Shaun Fisher, Sana Javaid

Aimed at: S, P16, G

An investigation of key factors influencing the learning styles of GCSE students

Abstract: This session will highlight the key findings of research undertaken on learning styles of GCSE students using Kolb Learning Styles Inventory version 3.1 .The session will also showcase the ways how findings of this research will help to design effective teaching resources in mathematics and outreach activities.

About the speaker: as before.

4D Rachael Horsman

Aimed at: S, P16

A Whistle Stop Tour of Engaging Ideas II

Abstract: During the session we will try out a wealth of resources developed to encourage pupils to engage and enjoy their maths lessons; with the emphasis on problem solving and collaboration. Every attendee is free to receive as many of the resources and ideas for themselves as they wish.

About the speaker: Rachael is Assistant Head and Head of Maths at Mount Grace School, Potters Bar. She is also a Specialist Leader of Education for the Wroxham Training School. Rachael has taught in France, Spain, Hong Kong and Mongolia. As a keen traveller she has taken school trips to the States and Africa.

4E Ray Huntley

Aimed at: P, S, G

Tales of Favourite Mathematical Curiosities

Abstract: This session looks back over many years of mathematical discovery and I select several personal favourites amongst mathematical ideas, results and curiosities. Some old favourites, some maybe less well known that might make you think! Some tales will be told, some maths will also need to be engaged with!

About the speaker: Ray Huntley has worked as teacher and headteacher in primary and secondary schools in the UK and Australia. He is passionate about mathematics teaching and learning and enjoys solving problems as well as teaching budding mathematicians of all ages! Ray is a lecturer in mathematics education at Brunel University, London.

4F Cyril Isenberg

Aimed at: S, P16, T, G

A Journey Through the Solar System (repeated in session 6F)

Abstract: The application of Newton's laws of motion have enabled man to explore the solar system. Some of the principles involved will be explained with the aid of demonstration.

About the speaker: Dr. Isenberg is a retired lecturer in theoretical physics from the University of Kent who is known for his demonstration lectures.

Session 5 Thursday, 4th April 11.20-12.15

5A Emma Low

Aimed at: P

Telling the Time

Abstract: Teaching children to tell the time, and use time in problem solving, is often a cause of frustration for us. In this session we will explore pictures, practical resources and humorous stories to support children in their understanding of how time is measured and communicated.

About the speaker: Emma is a mathematics teacher, writer and consultant. She inspires teachers and children through engaging activities and contexts, and creative use of resources. Emma specialises in supporting teachers with practical classroom ideas, including the uses of ICT in mathematics, developing intervention strategies, and encouraging children's collaboration and reasoning.

5B John Baylis

Aimed at: G

Mathematics for the elderly by the elderly

Abstract: I'll report on how the Pembrokeshire U3A Maths Group has developed over the two years since I spoke about it initially (Loughborough 2012), hoping to swap experiences and suggestions with you and persuade you that it's a good way to keep mathematically active after leaving the academic environment.

About the speaker: After 30 years lecturing in maths and maths education with some OU teaching, I took early retirement and did voluntary teaching in junior schools and in the U3A. I have always enjoyed the challenge of making difficult things accessible.

5C Francesca Lyon

Aimed at: P, S, G

The Great Outdoors

Abstract: Like Erastophenes before us, we will be using the sun to calculate the circumference of the Earth, tell the time, and as a compass. Continuing with these new found survival techniques and tie knots using materials found readily in the wild, developing mathematical communication at the same time.

About the speaker: Having taught Secondary Maths for 7 years, Francesca needed some time off, so had a baby!

5D Andrew Taylor

Aimed at: S, P16, G

Qualifications Reform: What will the next generation of mathematics exams look like?

Abstract: GCSEs are to be replaced and A-levels reformed with universities closely involved in the process. This session will look at the emerging picture of the suite of qualifications that will be taken by students over the next five years, and consider the implications of change in the classroom and beyond.

About the speaker: Andrew is Head of mathematics at AQA, one of the three English exam boards. He is responsible for the development and delivery of a range of mathematics qualifications from Entry level through to Further Mathematics A-level. He has been closely involved in assessment pilot work through the Curriculum Pathways Project and, more recently, the Linked Pair Pilot for GCSE mathematics.

Before joining AQA, Andrew taught mathematics for 17 years and was Head of Faculty in large comprehensive schools in Cambridgeshire and Manchester.

5E Farzana Aslam, co presenter Sally Mendoza

Aimed at: S, P16, G

Opening Minds in mathematics: An investigation on competence-based curriculum

Abstract: The session will showcase the ways in which an Opening Minds curriculum is delivered by expert but non specialist teachers and the skills which they bring to the class room in order to facilitate the transition for students from Key Stage 2 into Key Stage 3.

About the speaker: as before.

5F Clare Parsons & Simon Clay

Aimed at: P16

Tips and Tricks for teaching A-level

Abstract: Delivering the MEI TAM course to teachers starting to teach A-level for the first time this year, we have come across little tricks and tips which we wish we had known earlier – including 'new' ways of explaining concepts, resources for promoting rich thinking and suggestions for differentiating learning. We would like to share them with you.

About the speakers: Until May 2012 Clare Parsons was Head of Maths in a Sixth Form College in East London and Simon Clay was the Head of Faculty at King Edward VI Sixth Form College, Nuneaton. They now work for MEI as deputy course coordinators on the 15 month TAM course (Teaching Advanced Mathematics).

Presidential Address, Marcus Du Sautoy, Thursday, 4th April 1.40-2.55

Session 6 Thursday, 4th April 3.15-4.10

6A Rob Eastaway & Andrew Jeffrey

Aimed at: G

Maths Marmalade

Abstract: Join Rob and Andrew for an assortment of their favourite maths ideas to engage you and your class. You'll discover the power of Zequals, an astounding card game, and as many other titbits as we can squeeze into an hour. Why "Maths Marmalade"? Because it's a bit like Maths Jam (look it up!), but with slightly chunkier segments.

About the speakers:

Rob Eastaway is the author of numerous bestselling books, including "*Why do Buses Come in Threes?*" and most recently "*More Maths for Mums & Dads – The Teenage Years*". He is Director of Maths Inspiration, and is a Past President of the Mathematical Association.

Andrew Jeffrey is an author, INSET provider and international conference speaker. He is the director of Magic Message Ltd, and has a passion for children learning mathematics. He is well known for his free newsletters and books, though is occasionally also called upon to perform his Magic of Maths shows.

6B Rachael Horsman

Aimed at: P, S

Padlock Problems

Abstract: Can you solve the challenges to open the padlock and win the prize? During this session we will use some new MA resources – Padlock Problems. We will discuss how to put together a problem using the publication, different ways of working with the resource and subtle ways to differentiate and support weaker/more able pupils.

About the speaker: as before.

6C Farzana Aslam, co presenter Rowena Riddiford

Aimed at: S, P16, G

Technology Integration for Mathematics Engagement at Key Stage 3

Abstract: This session will explore the use of different Maths ipad Apps for teaching mathematics at Key Stage 3.

About the speaker: as before.

6D Adam McBride

Aimed at: S, P-16, T, G

1, 1/2, 1/3, 1/4, …

Abstract: We consider reciprocals of positive integers. First we add a few together and look at Egyptian fractions. Then we get more daring and add together infinitely many. Expect some curious happenings, try to win a million dollars and find out how a bug was detected in the original Pentium Chip.

About the speaker: Past President of the MA and of the Edinburgh Mathematical Society. Past Chairman of the Scottish Mathematical Council and the British Mathematical Olympiad Committee. Currently Chair of MA Council and Treasurer (formerly Vice-Chairman) of the United Kingdom Mathematics Trust. And from 01/10/11 Adam became Emeritus Professor.

6E Liz Woodham

Aimed at: P

Children Recording Mathematics

Abstract: This practical session will explore how a flexible approach to children's recording of mathematics can help to support a problem solving approach. By tackling one or more tasks from the NRICH website (http://nrich.maths.org) participants will have the opportunity to discuss our expectations of learners as they record their mathematical ideas.

About the speaker: Liz is one of the Primary Coordinators of NRICH. Her role, as part of a team, is to create primary-level content for the NRICH website and help run associated professional development. She is a member of the MA/ATM Primary Group.

6F Cyril Isenberg

Aimed at: S, P16, T, G

A Journey Through the Solar System (repeated in session 4F)

Abstract: The application of Newton's laws of motion have enabled man to explore the solar system. Some of the principles involved will be explained with the aid of demonstration.

About the speaker: Dr. Isenberg is a retired lecturer in theoretical physics from the University of Kent who is known for his demonstration lectures.

Session 7 Thursday, 4th April 4.20-5.15

7A Liz Russell

Aimed at: P, S

Robot Wars and other problem solving ideas.

Abstract: I believe that we need to help our students build up resilience for problem solving, so come and take part in a Robot war where working in a team using reasoning and above all being resilient will help you win. This activity has been used with students from year 7-10 as part of a personal development week.

About the speaker: Liz is a teacher in a very large secondary school which serves the local community.

7B Tony Robin

Aimed at: S, P16, T, G

Generating Functions

Abstract: We shall look at mainly but not entirely probability generating functions. We see how to find GFs for a variety of sequences, their properties and how they can be used. We find them for probability distributions which you are unlikely to have seen before. Also double GFs.

About the speaker: Tony taught at secondary level, with 20 years as Head of Department. Now he's an A-level examiner for Cambridge Assessment (statistics papers), and regularly leads sessions at the annual conference on a variety of topics.

7C Mark McCourt

Aimed at: All

Beluga Maths: A Mathematics Learning World

Abstract: Beluga Maths is an immersive learning world covering the whole of the mathematics curriculum. Influenced by Stern and constructivism, Beluga is the world's first app through which children actually learn mathematics, building their own knowledge, rather than just practice. This will be a hands-on workshop, in which delegates will find out more about the research and principles of Beluga then explore the app themselves. iPads will be provided.

About the speaker: Mark McCourt is Chief Executive of the Independent Learning Foundation, bringing Beluga Maths to the community. He was formerly Senior Director at Tribal, Director at NCETM, school leader, AST and inspector. He now works with a range of organisations worldwide on innovative technology solutions for education and teacher professional learning. Mark owns the website emaths.co.uk and tweets as EmathsUK.

7D Samantha Durbin, co presenter Amy Hooker

Aimed at: P, S

My Favourite Maths Ideas -MYO Masterclass

Abstract: Following on from the 'Maths through Masterclasses' sessions, this optional workshop gives you the opportunity to produce your own activity. Bring along your favourite maths idea and develop a masterclass-style session or activity to tell your own 'great story of mathematics'.

About the speaker: as before.

7E Jim Simons

Aimed at: S, P16, G

Why don't mice eat grass? (Dimensional Analysis)

Abstract: Dimensional analysis appears very briefly in the GCSE and A-level syllabi. Here we put on our dimensional analysis glasses, and look through them as aspects of mathematics, physics, engineering and biology. Partly to suggest a few cross-curricular enrichment ideas for A-level students, but mainly for fun.

About the speaker: After a career as a professional mathematician at GCHQ, Jim is now a private tutor for maths and physics A-level.

7F Graham Smart, co presenter Lilly Northop

Aimed at: P16

Innovative Assessment at Key Stage 5

Abstract: This session will look at innovative ways to carry out assessment at KS5 using online tools with readily available content covering core modules. Learn how you can reduce marking time confidently whilst engaging students.

About the speaker: Graham is determined to use the technology to inspire the next generation of mathematicians and firmly believes that this is possible. He is currently spending most of his time working on making A-level maths more current to the younger generation.

Session 8 Friday, 5th April 9.00-9.55

8A Alan Walker

Aimed at: P

Questions for Learning - London Maths research project

Abstract: Alan will give an overview of the random control trial research approach into how teaching primary maths improves learner confidence, numeracy and attainment. It will include a practical hands-on demonstration using handsets and video of classroom practice.

Delegates will have the opportunity to access free online resources for Primary schools.

About the speaker: Alan Walker is passionate about the effective use of classroom technology to support teachers and learners using formative assessment in maths. Involved in the technology industry since 1983, in 2003 he started a company to develop interactive whiteboard resources. The company was acquired by Promethean in 2006 and he headed the global content and alliances group while advising the world's leading education publishers. Partnering with The University of Wolverhampton in 2006, he oversaw the REVEAL action research project, observing best practice in the use of formative assessment handheld technology in schools across the UK. In 2010 in partnership with the Institute for Effective Education at the University of York Alan participated in 2011 research into self-paced maths learning in primary schools using wireless handsets. This was followed in 2013 with a large scale maths study in London primary schools.

8B Andrew Palfreyman

Aimed at: S, P16, F, T,

Factors of Polyominoes

Abstract: After a brief introduction to polyominoes, we will find which rectangular blocks particular small polyominoes divide into, as well as finding all the factors of some rectangular blocks. Self-replicating polyominoes and 3D polycubes will also be considered. Useful for investigative purposes at secondary school level.

About the speaker: Andrew Palfreyman teaches Maths at Twyford CE High School in Ealing, and is the KS5 coordinator in the department. He has been fascinated by polyominoes since being a teenager and, in addition, has given a Royal Institution Mathematics Masterclass to Y9 students on polyominoes since 2006.

8C Paul Brown

Aimed at: S, G

Bringing proof to younger students

Abstract: Proof is vital to mathematics and the earlier that students are involved with conjecture, reasoning and proof the better. This session will present successful classroom-ready methods of bringing proof to junior secondary students.

About the speaker: Dr Paul Brown teaches mathematics, chess and philosophy in Perth, Australia. His book on mathematical proof for senior secondary students has sold in many countries and he welcomes your feedback on ideas for the next book designed for a younger audience.

8D Alison Clark-Wilson

Aimed at: S

Students learning mathematics with technology: How do they do it in Europe?

Abstract: This session will introduce participants to the outcomes of the 'EdUmatics' project, which involved 20 universities and schools from 7 EU countries. The partners worked to create a professional development resource for secondary mathematics teachers that encapsulated the most effective uses of technology from their curricula. Please bring a fully charged laptop with mathematical software* installed if you would like to work on some of the mathematical problems during the session. * Geogebra, TI-Nspire, Cabri-geometry, The Geometer's Sketchpad would all be suitable.

About the speaker: Alison is a researcher in mathematics education, formerly of the University of Chichester (UoC) where she coordinated the work of The Mathematics Centre. Alison was the Project Director for 'EdUmatics' (European Development for the Use of Mathematics Technology in Classrooms), which was a 3-year project that was funded by the Comenius fund of the EU Lifelong Learning Programme (50324-UK-2009-COMENIUS-CMP).

8E Jenni Back, co presenters Teachers from the networks

Aimed at: P

Telling Stories About Teaching Arithmetic

Abstract: Jenni will share experiences of working with networks of teachers from throughout England to develop the teaching and learning of arithmetic in early key stage 2. We will explore the transition from counting and active reasoning to multiplication.

About the speaker: Jenni is an experienced maths teacher and teacher educator and has worked for NRICH, CIMT and NCETM, as well as in primary and secondary schools. She is passionate about supporting teaching in primary schools. Jenni is joint editor of the MA journal *Primary Mathematics*.

8F Sidney Tyrrell

Aimed at: All

Stories in Statistics

Abstract: A string of stories threading their way through simple practical ideas which I have found helpful for teaching statistical concepts to students who find statistics boring, hard or both. Take away ideas together with a disk with resources to use, links to web based resources, useful real data sets, and useful Excel spreadsheets.

About the speaker: Sidney Tyrrell is an Honorary Teaching Fellow at Coventry University, engaged in outreach work to schools. A National Teaching Fellow she taught statistics to undergraduates for many years from mathematicians to nurses and town planners, and enjoyed the challenge of making stats interesting and sensible, which it is.

8G Howard Fay

Aimed at: S, P16, T, G

The teaching of complex numbers

Abstract: There is no such thing as the square root of -1 but let's pretend there is." Can we find an alternative to this common but dishonest approach that does not involve bewildering axiomatics?

About the speaker: Howard teaches mathematics in a comprehensive school and also teaches under the Further Mathematics Support Programme.

Session 9 Friday, 5th April 10.05-11.00

9A Lydia Showan

Aimed at: Anyone involved in STEM education

The National STEM Centre

Abstract: The National STEM Centre is home to the UK's largest resource collections for STEM subjects ages 5-19. Come along to investigate: * a treasure chest of inspirational resources * how List functionality provides packages of resources to support teaching * how our online community can support your school/college and networks * where to look for wider STEM support.

About the speaker: Lydia Showan is the mathematics specialist at the National STEM Centre. Her background is secondary mathematics education, as a subject leader and assistant Head Teacher, and mathematics consultancy.

9B Sue Waring

Aimed at: P, S SEN

Maths Adventures with Twoo - stories for KS1 Maths

Abstract: *Maths Adventures with Twoo - stories and activities to promote mathematical reasoning at KS1* is a new MA publication. A description of the ideas underpinning the book will be followed by story-telling with the aid of a whiteboard presentation and practical tips on using the material.

About the speaker: Sue Waring is the author of *Can you prove it?*, which is based on over 30 years teaching experience and research into the use of pattern as a vehicle for teaching proof at school level.

9C Sara Santos

Aimed at: All

Cubics and banquets *- where does* ***i*** *fit in?*

Abstract: Set in the Renaissance, this is the story of Cardano, Tartaglia, dal Ferro, Fior and Ferraria in the quest for solving the cubic equation. Fior challenged Tartaglia for a mathematical duel, the weapons being 10 cubic equations. The looser's forfeit is a banquet for the winner and his friends. At the same time, arising in the solution of the cubic- even to obtain real roots - the imaginary numbers were formalised by Bombelli. This show will work the audience through the solution of the cubic and the fascinating stories of the mathematicians involved.

About the speaker: Dr Sara Santos is the director and co-founder of Maths Busking, awarded a Recognition of Distinction at EngageU, European Competition of Best University Outreach and Public Engagement programme, and winner of the Seed of Science 2011 award in Science Communication. Sara's recent shows include 'Gems of Geometry' at Bulgaria's RATIO science event and 'Who is your audience' at The Schools Network Mathematics Conference 2012. Sara regularly trains communicators to engage with people using mathematics or science. Every year Sara's performers entertain passers by at festivals such as the British Science Festival and The Big Bang Fair, as well as at the queue at the Royal Institution Christmas Lectures. Sara's clients include the leading engineering firm ARUP, The Royal Society, The British Council and the Francis Crick Institute.

9D Paul Andrews

Aimed at: S G

Same base, same height, same area: A great mathematical story

Abstract: One great mathematical story is that given the same base and height, the area of triangles will be the same. In this session colleagues will solve several problems, each of which exploits this simple principle, to highlight some delightful and unexpected results, many of which allude to some interesting generalities.

About the speaker: Paul Andrews works in mathematics education research at the University of Cambridge. His research, typically based on videotaped lessons and interviews, focuses on how teachers in different countries present mathematics to their students. In so doing he collects problems from around the world that interest or amuse him.

9E James Arathoon

Aimed at: S, P16, T, G

Precision Engineered Mathematics

Abstract: Can mathematics teaching benefit on occasion from an engineer's perspective? I will explore how some basic mathematical concepts and operations are interpreted and used by engineers to implement practical applications in the real world. The engineer designs a computing device and an associated algorithm to produce an answer fast enough for an application to work, and within a budget the client can afford. To end the session I describe how thinking from an engineering perspective may lead us to a practical implementation of a polynomial time factoring algorithm that can be applied in more than just a few special cases.

About the Speaker: James has a background in mechanical engineering and physics and has worked with computers for over 30 years, initially starting with a simple algorithm to calculate triangle numbers on an early (and slow) Research Machines 380Z computer that had been donated to his school (around 1980).

9F Art Benjamin

Aimed at: G

Secrets of Mental Maths

Abstract: Learn Dr Benjamin's secrets for rapid mental calculations, memorizing numbers, and other amazing feats of mind.

About the speaker: Arthur Benjamin is Professor of Mathematics at Harvey Mudd College in Claremont, California. He is most well-known for his ability to entertain with mathematics. One of his TED talks has been viewed over 5 million times. Reader's Digest calls him "America's Best Math Whiz."

Closing Lecture by David Spielgelhalter, Friday, 5th April 11.20-12.30

Stan Dolan ***(Session withdrawn)***

Aimed at: S, P16, G

Mathematics from Ancient Egypt - I

Abstract: This talk will look at a variety of classroom activities based upon mathematical ideas evident in Egyptian writings. The activities will cover the Secondary school age range.

About the speaker: An experienced Secondary School Mathematics teacher, examiner and author. He is the current editor of the Maths Association's 'Student Problems'.

Stan Dolan ***(Session withdrawn)***

Aimed at: P16, G

Mathematics from Ancient Egypt - II

Abstract: The second part of this talk will be much more mathematical in nature. It will concentrate on a survey of the Erdos-Straus Conjecture and will illustate an important application of quadratic reciprocity.

About the speaker: as before.

Elena Nardi ***(Session withdrawn)***

Aimed at: All

Key issues in the transition from secondary school to university mathematics: An ICME12 Report

Abstract: I will draw on a commissioned report produced by an international team and presented at ICME12, in order to discuss findings, grounded on a literature review and a survey of university mathematics lecturers' views, concerning the transition from secondary school to university mathematics. The session will be sample-based and interactive.

About the speaker: Elena Nardi is Professor of Mathematics Education and author of *Amongst Mathematicians: Teaching and Learning Mathematics at University Level* (Springer, 2008). She leads the Research in Mathematics Education Group at UEA, is director of the MA in Mathematics Education and has been editor of Research in Mathematics Education since 2007.

The MA would like to thank all speakers, delegates, and exhibitors for supporting its 2013 Annual Conference.

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