Session Booklet

Mon 10 April	Tue 11 April	Wed 12 April	Thu 13 April
	**Session B** 09:00 – 10:30	**Session E** 09:00 – 10:30	**Session I** 09:00 – 10:30
Registration 11:00 – 12:30	**Session C** 11:00 – 12:30	**Session F** 11:00 – 12:30	**Closing Plenary** 11:00 – 12:30
Opening Plenary 14:00 – 15:30	**EXTRA SESSION** 14:00 – 15:30	**Session G** 14:00 – 15:30	
Session A 16:00 – 17:30	**Session D** 16:00 – 17:30	**Session H** 16:00 – 17:30	

A • Single Session • Monday 16:00-17:30

A1 - Preparing for Problem Solving at A Level - Jocelyn D'Arcy and William Macro

In this session we will explore some of the mathematics we will be using to prepare students for the problem solving aspects of the new A Level and briefly showcase how we have embedded these problems into our schemes of work.

KS5 *Hands-on/ Practical*

A2 - Supporting teachers to use variation in their lesson design - Laurie Jacques

Current examples of primary teachers' own task design show that they often do not pay sufficient attention to the sequence of exercises or examples they use to represent a mathematical idea. This session will share some evidence from a pilot study for a PhD thesis to support primary teachers to design tasks and learning so that pupils think mathematically and purposefully by building carefully considered procedural or conceptual variation of the object of learning. Examples of tasks will be shared and worked on and discussion around the purpose of these tasks will be facilitated. Suitable for those interested in learning more or deepening their understanding of variation theory.

Advisory, KS1, KS2, KS3 *Hands-on/ Practical, Interactive Discussion*

A3 - Mixed Attainment Mathematics - KS3 and KS4 - Helen Hindle **CANCELLED**

In this session I will share my experience of teaching mixed attainment mathematics classes at KS3 and KS4. I will discuss resources and strategies that I have used with mixed attainment classes and the impact of these on student engagement and attitudes towards mathematics. I will also explain how I use Learning Journeys to support students to select tasks at an appropriate level of challenge. During the workshop, participants will be given opportunities to collaboratively create differentiated activities for use in the classroom.

A4 - Geometry, data handling and problem solving with the aid of GeoGebra; 11-16 – Tom Cowan and Douglas Butler

Join this session to learn and share ideas which widen opportunities for students to work with visualisations and multiple representations of mathematical situations, using GeoGebra. Teachers need to become familiar with GeoGebra and discover how best to incorporate it in their work - including how to intervene effectively as their students experiment. This session will introduce the GeoGebra user interface through several KS3 and KS4 lesson plans, including geometry, data handling and problem solving. Online resources will be explored: Geogebra tutorials from other users, and the ability to save your own work as an applet. Participants should bring a laptop, mouse and power lead.

Advisory,KS3,KS4 *Hands-on/ Practical, Interactive Discussion*

A • Single Session • Monday 16:00-17:30

A5 - Primary tasks promoting reasoning, talk and problem solving - with a focus on 'open mindsets' and 'making connections'. - Ray Huntley and Suja Sivadasan

This session shares a number of engaging primary tasks for use across KS1 and KS2 that promote reasoning, talk and problem solving. This is an Interactive session, providing primary teachers with an opportunity to discuss the mathematics as well as the mathematical thinking processes. This session provides KS1 and KS2 teachers with a collection of rich tasks to take back and share and to use in their own classroom. This session also highlights the importance of 'open mindsets' and 'making connections' in the teaching and learning of mathematics to effectively promote reasoning, talk and problem solving.

KS1, KS2 -

A6 - Investigating Mathematical Attainment and Progress - Jeremy Hodgen and Colin Foster

Evidence indicates that the problem of low attainment in secondary mathematics is getting worse. Over the last year, the Investigating Mathematical Attainment and Progress: The Low Attainment in Year 9 Project has been exploring what low-attaining secondary students know about number, multiplicative reasoning and algebra. In this session we will relate our findings to the literature and explore possible classroom strategies and interventions to address low attainment in mathematics. This project is a collaboration between the University of Nottingham, Durham University and King's College London. For more information about the project please go to http://www.nuffieldfoundation.org/low-attainment-mathematics-investigation-year-9-students

KS3 *Interactive Discussion*

A7 - The Dot Problem - Jonny Griffiths

A simple problem, accessible to pretty much anyone, that has hidden depths. How will you choose to explore it: using ideas that primary mathematicians might use, or methods that older students might employ? I should add that this is a problem for which I don't have a full answer, so I won't be offering The Correct Solution! No mathematics planned here beyond GCSE.

Advisory, KS1, KS2, KS3, KS4, KS5, Tertiary *Hands-on/ Practical*

A8 - Inquiry & Investigation Based Learning for Alevel - Oliver Bowles **CANCELLED**

Not having heard something is not as good as having heard it; having heard it is not as good as having seen it; having seen it is not as good as knowing it; knowing it is not as good as putting it into practice.□ (Xun Kuang, Xunzi: bk8 - Ruxiao). A carousel format of four or five very hands on, engaging and classroom tried & tested activities that exemplify an inquiry approach to teaching at Alevel. Fun guaranteed, come and have a go and bring along your own ideas for exchanging (optional)! Bring a laptop if possible (though not essential!).

KS5 *Hands-on/ Practical*

AB • Double Session • Part 1 Mon 16:00 - 17:30, Part 2 Tue 09:00 10:30

AB1 - Practising Mathematics - Tom Francome and Dave Hewitt

Practice makes perfect' - well it is not that simple; yet students do need to practise skills within each topic they learn: 'developing fluency with various techniques' is an important part of mathematics education, as is connecting together different parts of the curriculum. This will be an active session in which we will offer some opportunities to engage with activities where the practice is used as a tool to explore, notice, generalise and justify; developing the mathematician as well as the mathematics.

KS2, KS3, KS4 *Hands-on/ Practical, Interactive Discussion*

AB2 - The Power of One - Dave Fielding and James Towner

The latest additions to the ongoing 'One Size Fits All' theme. A fresh look at building fully differentiated, investigative lessons from simple starting points on a single flipchart page, suitable for all ages and abilities. All lessons to date have been piloted with classes ranging from Year 5 through to Year 13 as well as with mathematics graduates.

KS2, KS3, KS4, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

AB3 - History of Mathematics in and for the Curriculum - Leo Rogers and Sue Pope

Practical tasks and rich starting points for exploring mathematics in the classroom drawing on its rich history.

Advisory, KS2, KS3, KS4, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

AB4 - Twitter-chats on learning-journeys! - Mary Pardoe, Danny Brown and Emmy Bennett

During the first session participants will work on and discuss issues arising from the following question: 'To what extent is it possible to engage in meaningful and enlightening discussions about topics and issues in mathematics education (discussions that impact on personal learning journeys) given that all communication between participants is by means of statements of no more than 140 characters, possibly accompanied by images and links to material on the world-wide web?' During the second session we will carry out a live, on-line, mathematics-education Twitter-chat! Then (with reference to our ideas and conclusions from the first session) we will reflect on what happened!

Advisory, EYFS, KS1, KS2, KS3, KS4, KS5, Tertiary *Hands-on/ Practical, interactive Discussion*

B • Single Session • Tuesday 09:00-10:30

B1 - Mobility - Paul Stephenson

A pencil has rolled under your chair. The mechanism you use to retrieve it is an example of a linkage. The linkage which is your skeleton has a very high mobility. The linkages which control the up-and-over door on your garage or the anglepoise lamp on your desk have a lower mobility. Engineers measure mobility with a simple equation in which you just stick the *i* links and *j* joints. That is what we will do in this workshop for Y8/9s, after building such linkages with Meccano and Geomag. The key concept is degrees of freedom. This is the workshop given in 2016, improved by suggestions from attendees.

Advisory, KS3 *Hands-on/ Practical*

B2 - Exploring the impact of culture on our approach to teaching - Annette Margolis

Can both teachers and learners change their perception(s) of each other's culture through mathematics lessons? This session aims to explore the mathematical and cultural learning journey experienced by a class of high-achieving Saudi seventeen year olds who embarked on a pre-foundation mathematics course at Birmingham International Academy. The talk will be illuminated by a recorded discussion with the teacher and the students concerned, in order to provide answers to the issues involved in teaching and learning across a cultural divide.

KS4, KS5, Tertiary *Interactive Discussion*

B3 - Constraints - John Hibbs

For many teachers of mathematics the constraints placed on them prevent them from teaching in a way that they would wish. This workshop will consider the nature of these constraints and seek strategies to overcome them.

Advisory, EYFS, KS1, KS2, KS3, KS4, KS5,Tertiary *Interactive Discussion*

B4 - Calculus, data handling and problem solving with the aid of GeoGebra; 16-19 – Mark Dawes and Douglas Butler

Join this session to learn and share ideas which widen opportunities for students to work with visualisations and multiple representations of mathematical situations, using Geogebra. Teachers need to become familiar with Geogebra and discover how best to incorporate it in their work - including how to intervene effectively as their students experiment. This session will introduce the Geogebra user interface through several lesson plans for AS, Core Maths and A level, including calculus, data handling and problem solving. Online resources will be explored: Geogebra tutorials from other users, and the ability to save your own work as an applet. Participants should bring a laptop, mouse and power lead.

Advisory, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

B • Single Session • Tuesday 09:00-10:30

B5 - Teacher Subject Knowledge and Pedagogical Knowledge - Transferring Mathematical Content Knowledge to Practice - Denise Phillips **CANCELLED**

We will explore the concept of 'Mathematical knowledge for teachers', development of that knowledge and how it could be fostered through practice-based development. Proposed session structure: 1. Explore ideas of what constitutes 'Mathematical knowledge for teachers' and issues of developing this 'specialised knowledge for teaching mathematics' which according to many remains elusive. 2. Use evidence from Masters (Pedagogy of Mathematics) research project - using practice-based development sessions - including video and collaborative planning. 3. Self-reflection and reflection of others - provide opportunity for attendees to use the 'Knowledge Quartet' or other framework to observe lesson and discuss use as mathematics teaching development.

KS2 *Hands-on/ Practical, interactive Discussion, Lecture/Talk*

B6 - Essential Calculator Skills for the New Post-16 Specifications - Stephen Kean

The new AS and A-level specifications from first teaching in September 2017 have mandatory requirements for students to engage with appropriate technology. This session will focus on utilising graphic calculators to enhance conceptual understanding. There will also be an emphasis on the expected calculator functionality and use in all awarding bodies' examinations. No prior knowledge of graphic calculators is assumed and you will be provided with a calculator to use at each session.

Advisory, KS5, Tertiary *Hands-on/ Practical*

B7 - Getting started with recurring decimals - prime denominators - Derek Ball

What is a recurring decimal? Why do recurring decimals behave the way they do? We shall express some fractions with prime denominators as recurring decimals, and shall consider the number patterns generated. We shall prove some of our observations, using elementary mathematics wherever possible. This session is separate from the other recurring decimals session and there will be very little overlap. So participants can attend one or both sessions. Please bring a calculator to this session.

Advisory, KS2, KS3, KS4, KS5, Tertiary *Hands-on/ Practical*

B8 - Using multi-representational cards to support conceptual understanding - Helen Edginton

Developing conceptual understanding involves connecting different representations of the same mathematics and making sense of how they are connected. This session will give a hands on experience of using multi-representational cards in a variety of ways to support conceptual understanding.

KS1, KS2, KS3, Tertiary *Hands-on/ Practical*

B9 – A journey through the M in STEM – Garrod Musto

This session will be a hands on look at some RAEng resources which are already available to schools. Participants will be able to try out the resources and activities exploring how they may be incorporated into the classroom. In addition the session will demonstrate ways in which maths departments can engage with stakeholders such as parents and former students through social media and technology. The session will be led by the delegates to ensure that they explore areas that fascinate them, and hopefully will take something away with them.

KS3, KS4, KS5, Tertiary *Hands-on/ Practical*

B10 - The transforming power of maths games – John Keyworth

In this session, we will look at how mathematics activity boost a child's learning in so many ways. Problem-solving skills that children learn through mathematics activity, both indoors and outdoors, promote logical thinking, mental fluency and perseverance, which are transferable skills to all curriculum areas. Maths games and puzzles have a bonding effect with parents and families in supporting their child's progress, whilst allowing children to hone their ability to tackle unfamiliar tasks. Maths games have the power to connect generations and I will provide practical ideas for schools to set up high-impact Maths Clubs and parent workshops.

KS1, KS2, KS3 *Hands-on/ Practical, Interactive Discussion*

C • Single Session • Tuesday 11:00-12:30

C1 - Mathematical fluency without exercises - Colin Foster

Fluency with important mathematical processes is a critical part of students' learning journeys. But does this mean that they need to be endlessly practising tedious, repetitive exercises? In this session we will try some tasks that aim to address fluency within richer and more mathematically interesting scenarios. We will think about ways to devise such tasks for different areas of the curriculum and discuss how they could be used in the classroom.

KS3, KS4 *Hands-on/ Practical*

C2 - Poles, snowmen and shadow lengths: predicting, analysing and acting on student responses in a proportional reasoning task - Marc North

Formative assessment involves not only assessing understanding and misconceptions, but also acting on these to challenge methods and move thinking forward. This workshop will invite teachers to participate in the activities of: predicting student responses to a rich task involving proportional reasoning and using these predictions to inform lesson planning; analysing sample student work extracts to identify common and prevalent misconceptions (and comparing these to our predictions); designing and/or modifying a learning programme to target identified and revealed misconceptions. Participants will be supplied with copious amounts of chocolate to ensure a jolly workshop atmosphere!

KS3 *Hands-on/ Practical, Interactive Discussion*

C3 - Teaching for Mastery - Debbie Morgan

Teaching for mastery has been a developing strategy, learning more as we go along. This session will bring you the latest update and share how it is working at a practical level in classrooms.

KS1, KS2, KS3 *Hands-on/ Practical, Interactive Discussion*

C4 - Are you new to using technology in your teaching and learning? - Douglas Butler

Join this session to learn and share ideas about the bewildering array of digital resources these days. We will try to pick a path through the possibilities, but the overriding maxim must be that the chosen technology is as transparent as possible, so that the mathematics always shines through. We will discuss the relative benefits of the hardware scene in the classroom: laptops, desktops, interactive whiteboards, touch tvs, visualisers and tablets (Apple and Android). Then a look at web-based resources, including data, simulations, blogs and online texts. Finally the dynamic software scene: Geogebra, Desmos, Cabri, Sketchpad, Autograph, running on computers and tablets. Delegates should bring a laptop, mouse and power lead, and/or a tablet

Advisory, KS3, KS4, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

C • Single Session • Tuesday 11:00-12:30

C5 - Is good mathematics teaching a branch of geography? - Geoff Tennant

Drawing on my experience of teaching mathematics and working with mathematics teachers in the UK, East Africa and Jamaica, I will lead a discussion as to the extent to which 'good mathematics teaching' is an absolute, and the extent to which it varies across the world. Issues to be considered include perceptions of the role of the teacher and the nature of authority, language, and links with the 'real world' including money. Whilst examples will be taken mostly from KS1 to 3, this session will be of interest to all mathematics teachers looking to maximise access and opportunity.

KS1, KS2, KS3 *Interactive Discussion, Lecture/Talk*

C6 - Getting to the end of recurring decimals - composite denominators - Derek Ball

We shall consider some of the recurring decimals for fractions with composite (not prime) denominators. Why do some decimals have 'tails'? What connections are there between the periods of decimals? We shall prove some of our observations, using elementary mathematics wherever possible. This session is separate from the other recurring decimals session and there will be very little overlap. So participants can attend one or both sessions. Please bring a calculator to this session.

Advisory, KS2, KS3, KS4, KS5, Tertiary *Hands-on/ Practical*

C7 – Digital Resources for Mathematics Teaching and Learning – Ro Bairstow

Ro has attempted to address issues identified in his mathematics teaching career, by forming the BestMaths Foundation, a charitable trust dedicated to creating and distributing digital resources for devices such as tablets, smartphones and computers. These resources include Apps, games and eBooks and a large content website. Ro is still a full time teacher and all of the BestMaths resources are free. He will demonstrate these resources and show the positive benefits to his teaching and his students' learning.

KS1, KS2, KS3, KS4, KS5 Lecture/Talk

C8 - A Mathematical Voyage Inside And Outside "The Box" – Bekir Kaya

This session is about using Nearpod, Book Widgets, iTunesU and iBook Author with your classes. These tools can be used individually or together depending on the teacher's needs. In this session, you will learn how to use these tools both in the mathematics classroom for more interactive communication and to access course content outside the class. It will also focus on how these tools enable the learning processes to continue outside the school environment. This will result in enriched interaction and content that will be more appealing for everyone.

KS2, KS3, KS4, KS5 *Hands-on/ Practical,interactive Discussion*

CD• Double Session • Part 1 Tue 11:00 - 12:30, Part 2 Tue 16:00 – 17:30

CD1 - Dice, dominoes and playing cards; journeys from EYFS to KS4 - Helen Williams and Mike Ollerton

This workshop is about using dice, dominoes and playing cards with learners from early years to KS4. This is the sixth time we have worked together at ATM conference and, as always, we seek to create a practical, hands-on pair of workshops, juxtaposing tasks with the craft and pedagogy of teaching, learning and, by definition, AfL. Colleagues are also invited to bring their own ideas so we can have a jolly time having journeys that embraces the three National Curriculum aims of fluency, reasoning and solving problems.

Advisory, EYFS, KS1, KS2, KS3, KS4 *Hands-on/ Practical, Interactive Discussion*

CD2 - Children's Literature, Creative Writing and Mathematics Learning - Natthapoj Vincent Trakulphadetkrai

In this session, you will be encouraged to think about how children's literature and creative writing can be used to enhance the quality of mathematics learning. Whilst I will be talking about this approach in relation to Key Stage 2 children, Key Stages 1, 3, 4 and 5 teachers will easily be able to appreciate and adapt the principles behind the approach to suit their own students. The participants will initially be given a summary of relevant research before engaging in the collaborative creative process of generating a picture book that can be used to teach a mathematical concept of your choice.

KS1, KS2, KS3, KS4, KS5 *Hands-on/ Practical*

CD3 - Teaching place value and calculation - Liz Gibbs

A good understanding of place value is essential for children, as is a wide and varied mathematical vocabulary. The main focus will be the four operations (using the CPA approach) from counting, mental calculation, estimation, expanded methods to written algorithms. This is a hands on workshop, where delegates will be engaged in calculating, solving problems and thinking about assessment opportunities. Throughout the workshop delegates will be shown a variety of tasks and ideas that can be immediately used at school. A camera, iPad or smart phone would be useful to bring to the workshop.

KS1, KS2 *Hands-on/ Practical, Interactive Discussion*

CD4 - A lot from a little: a long term view of learning mathematics - Henry Liebling

Can we develop activities with young children that sow the seeds that continue to grow into a mature interlinked forest of understanding with subtle exchanges of mathematical energy between species such as number theory, arithmetic, algebra, geometry, data handling, representation and analysis?

Advisory, EYFS, KS1, KS2, KS3 *Hands-on/ Practical, Interactive Discussion*

CD• Double Session • Part 1 Tue 11:00 - 12:30, Part 2 Tue 16:00 – 17:30

CD5 - People Grids to Paper Grids 1 and 2 - Diane Cochrane, Karen Gladwin and Keith Curry

The sessions are designed as stand alone so that you can come to either or both. Our aim is to explore the use of grids as a tool in the mathematics classroom. The activities will include 'people maths' ideas linked to desktop mathematics using grids of various sizes and styles. Problem solving and generalising will underpin the ideas we will consider. We are aiming to use games as a basis to promote mathematical thinking and reasoning whilst having a little fun! The sessions will be suitable for those working at Key Stages 2, 3 and 4.

KS2, KS3, KS4 *Hands-on/ Practical, Interactive Discussion*

D • Single Session • Tuesday 16:00-17:30

D1 - Problem solving approaches for exam questions - Heather Davis

More exam questions than intended are problems to solve for the learners! An approach that involves problem solving strategies in class and on 'the day' will benefit all learners. We will look at some of the tasks in the new publication on problem solving approaches for GCSE and consider how these can be applied to questions on the new GCSE papers.

KS4 *Interactive Discussion*

D2 - Mathematical journeys in paper - Sue Pope and Tung Ken Lam

We will take simple paper folds and explore their potential for learning mathematics. If you have a favourite fold - do bring it with you. If you don't we hope you might have by the end of the session..

Advisory, KS2, KS3, KS4 *Hands-on/ Practical*

D3 - It's a Kind of Magic - David Crawford

In this session I will present some mathematical tricks, both numerical and card based, that could be used to provide opportunities for algebraic proof in the classroom or just for some mathematical fun. Please bring pencil, paper and a calculator if you want and be prepared for plenty of audience participation. (This session will be very similar to my session at the 2016 conference)

KS2, KS3, KS4 *Interactive Discussion*

D4 - Understanding the statistical concepts in large data sets using Excel - Douglas Butler

Join this session to learn and share ideas about large data sets that now feature in the specifications for AS, Core Maths and A level. This session will first find some large data sets on the web for downloading, and then explore the statistical functionality of Excel that is needed to make sense of them. We will also look at other aspects of Excel, and how it can be used to perform simple simulations, for example a coin toss or a geometric progression. Delegates should bring a laptop, mouse and power lead

Advisory, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

D5 - Look at it this way - Andrew Roberts

There are many problems that can be posed that become easier once viewed in a particular way. In this session participants will be invited to work on some such problems and discuss how linking ideas across different topics may help to improve students' understanding.

KS4, KS5 *Interactive Discussion*

D • Single Session • Tuesday 16:00-17:30

D6 - A Journey through Statistical Concepts - Sidney Tyrrell

This session contains simple bite sized practical ideas that I found helpful for teaching statistical concepts to students who initially find statistics far from inspiring but some or all of: confusing, boring, hard. We travel from summary measures to hypothesis testing with much in between. Ideas, links to web based resources, useful real data sets, and Excel spreadsheets.

Advisory, KS5, Tertiary *Hands-on/ Practical*

D7 - AMET Session - The transformative potential of immersion in mathematics teacher education interventions – Sally Bamber and Pinky Jain

This session is presented on behalf of the Association of Mathematics Education Teachers (AMET) and will address some of the current issues facing mathematics teacher educators. Zeichner's (2003) framework for transformative teacher education will be used alongside models of teacher knowledge to discuss how the gap between teacher education programmes and classroom practice can be bridged. This will include examples from practice in primary and secondary mathematics education and the lessons that teachers and teacher educators have learned from these practices.

KS1, KS2, KS3, KS4 *Hands-on/ Practical*

D8 – Did they crack it? – Paul Stephenson

We'll go through a dozen picture puzzles which have appeared as fillers in recent MTs. What strategies did your children use? What strategies did you use? What strategies have you only just thought of? All the apparatus in the photographs will be available. The pictures, each on a flip-chart page surrounded by your ideas, will then be displayed in the workshop for further contributions.

Advisory, KS2, KS3, KS4 *Hands-on/ Practical*

E • Single Session • Wednesday 09:00-10:30

E1 - NRICHing mathematics in Secondary Classrooms - Alison Kiddle

At NRICH we want to encourage students to work and think like mathematicians. We have always offered engaging rich tasks for students, and we have recently improved our teacher support materials so that busy teachers can find suitable resources quickly and easily. This session will offer delegates an opportunity to try out some new activities from the NRICH Secondary collection, to explore the opportunities they offer for deepening mathematical understanding, and to consider how they can be integrated into the school curriculum.

KS3, KS4 *Interactive Discussion*

E2 - Post 16 mathematics provision from September 2017 - Mick Blaylock

This session will consider what high quality mathematics education might look like from September 2017 in light of the Adrian Smith report and the current context of changes to GCSE content and grades, compulsory GCSE resits, the introduction of Core Maths and new A levels in Mathematics and Further Mathematics. The session will include consideration of how Core Maths can be introduced in a school or college setting, based on lessons learnt from Early Adopters and the first set of Core Maths examinations and results.

Advisory, KS4, KS5, Tertiary *Hands-on/ Practical, interactive Discussion, Lecture/Talk*

E3 - How many ways can you look at a square root? - Bob Burn

Arithmetically, geometrically, impossibly, decimal, continued fractions, Pell's equation, Heron, Newton et al. Bring a calculator. We will be exploring some of these possibilities.

KS4, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

E4 - What should learners be mastering in the primary classroom? - Jeffrey Goodwin

There is an emphasis on the idea of mastery following exchanges between UK and Shanghai teachers. This session will touch on some of the implications for the curriculum but the main emphasis will be on considering what primary children should be mastering on their mathematical learning journey. Much of the current discussion is around curriculum content; which is important but not sufficient. This session will work on classroom tasks and look to identify the mathematical thinking that is essential if learners are to have a mastery of mathematics.

Advisory, KS1, KS2 *Interactive Discussion, Lecture/Talk*

E5 - Real World Mathematics: Applying primary mathematics to global issues - Hannah Brenton

This session is part of a wider, collaborative project between Think Global and the Royal Statistical Society focussing on applying mathematics teaching to complex global problems. This session will facilitate discussions around how to make mathematics matter to pupils by embedding mathematics in real global issues, such as climate change and poverty. It will explore the current mathematics curriculum, developing links to current affairs and social justice issues whilst providing pedagogical approaches to hook mathematics onto real world contexts. It will highlight key quality resources for participants to take away and share in their schools.

KS1, KS2 *Hands-on/ Practical, interactive Discussion*

E • Single Session • Wednesday 09:00-10:30

E6 - Geometry, data handling and problem solving with the aid of Autograph; 11-16 - Douglas Butler

Join this session to learn and share ideas to widen opportunities for their students to work with visualisations and multiple representations of mathematical situations, using Autograph. Teachers need to become familiar with Autograph and discover how best to incorporate it in their work - including how to intervene effectively as their students experiment. This session will introduce the Autograph user interface through several KS3 and KS4 lesson plans, including geometry, data handling and problem solving. Online resources will be explored: Autograph tutorials from other users, and the ability to save your own work as an applet. Delegates should bring a laptop, mouse and power lead. Software will be provided.

Advisory,KS3,KS4 *Hands-on/ Practical, Interactive Discussion*

E7 – Groups in further mathematics - MEI - Keith Proffitt

Groups is a great topic for introducing underlying structures and connections in mathematics. It is a playground for formal proof, starting with four simple axioms. And it has real-world applications in the study of molecules, information theory and solving Rubik's cube. We shall look at ways of teaching some aspects of the topic, including with some practical activities and, if time, with technology.

KS5, Tertiary

E8 - Inviting families on the journey - Alexandra Fitzsimmons

Want to give families inspiring memories of mathematics? To make mathematics social, human and creative beyond the classroom? Maths on Toast is a charity that specialises in bringing mathematics to families. In this session, we will both reflect on the challenges families face in getting involved with mathematics, and use our resources (many of which are available for free) to talk about what we believe can make mathematical learning journeys where families feel welcome and inspired. Come prepared to talk, cut and stick!

Advisory, KS1, KS2 *Hands-on/ Practical*

E9 - Statistics in Further Mathematics - MEI - Stella Dudzic

We shall look at simulation of distributions in statistics, using a spreadsheet. It is a powerful technique in its own right and a topic in MEI Further Mathematics. It can also be used as a teaching tool in Mathematics and Further Mathematics, including when working with the large data set.

We shall also look at using Geogebra, and perhaps other software, to produce confidence intervals.

Aimed at anyone interested in learning about this Further Mathematics topic, or considering teaching this unit in the new MEI specification.

KS5, Tertiary

E10 – A Learning Walk in the revised AS syllabus– the Statistics element– Audrey Curnock

We will take a new look at Statistics which forms part of the revised new AS Mathematics for teaching from September 2017. We will explore in detail "Hypothesis Testing" which has been proposed for many of the new syllabuses – providing examples and materials for the revised syllabus.

KS5 Interactive Discussion

E11 – Reflections and challenges of a maths for ESOL mentor within the FE sector – Kevin Norley

In adopting an auto-ethnographic methodology, this paper reflects on experiences and challenges brought about by subject-specific mentoring within a distinctive learning environment (mathematics for ESOL classes for 16 to 18 year olds) through the stages of the mentoring process over an academic year. The paper discusses the value and importance of feedback within different contexts, and argues that it is through demonstrating given numeracy methods and techniques, exposing them to given research from practitioners, and making them of aware of specific language issues relating to ESOL learners, that mentors are best able to develop their mentees' subject-specific teaching skills.

KS4, KS5, Tertiary *Lecture/Talk*

EF • Double Session • Part 1 Wed 09:30 - 10:30, Part 2 Wed 11:00 – 12:30

EF1 - Mathematics and Drama - Tony Cotton, Helen Toft and Helen Williams

The three workshop leaders have experience across all phases of education. From Early Years to Teacher Education. They will explore how drama can be used to teach mathematics. You will be expected to be active but you will not be expected to 'act'.

Advisory, EYFS, KS1, KS2, KS3, KS4, Tertiary *Hands-on/ Practical, Interactive Discussion*

EF2 - Sand-Scapes - John Mason

Participants will be invited to engage in a mathematical journey which begins by pouring sand into and around holes, which raises questions about and illustrates some geometrical constructions, and ends with Euler's relationship V - E + F = 2.

KS3, KS4 *Hands-On, Interactive Discussion*

F • Single Session • Wednesday 11:00-12:30

F1 - Curious nets and interesting polyhedra - Tandi Clausen-May

In this hands-on session we will use ATM MATs, Polydron tiles, apples, oranges, paper and scissors to explore a range of polyhedra and their nets. Come prepared to 'make and do' some (possibly unexpected) mathematics!

KS2, KS3 *Hands-on/ Practical*

F2 - NRICHing Fractions – Fran Watson

In response to the recent shift in landscape of fractions within the primary curriculum, this session will offer the chance to review and re-energise your thinking. We will work on a variety of rich mathematical tasks from the NRICH website (nrich.maths.org) to support you and your learners, and will explore some of the challenges that can arise from the subject knowledge or the setting.

Advisory, KS1, KS2 *Hands-on/ Practical, Interactive Discussion*

F3 - Fractions that ADD to 1 - George Connell

Investigating sets of three fractions that add to 1. Using a hexagon composed of 24 triangles in three varying colours we are able to create some wonderful patterns and progress to a greater understanding of equivalent fractions and manipulation of fractions. Practical resources are available to implement this strategy in class.

KS3, KS4 *Hands-on/ Practical, Interactive Discussion, Lecture/Talk*

F4 - Alternative Assessment Ideas - Becky Lovelock

A comparison between the types of assessment used in Australia and the UK, including discussion of what we should assess and how in order to best benefit our students. Ideas and resources will be provided of assessment ideas and how to implement them in your classroom.

KS3, KS4, KS5 *Interactive Discussion*

F5 - Using manipulatives to enhance understanding in KS3 mathematics - Michael Anderson, National STEM Learning Centre

Join us to consider the support available from the National STEM Centre when developing the use of manipulatives to enhance understanding in mathematics at KS3. Manipulatives (counters, interlocking cubes, Cuisenaire rods, dominoes, multi-base blocks etc.) have long been used to aid understanding in primary mathematics - in this workshop we will explore hands-on ideas for use when teaching secondary concepts that include factors, multiples, prime numbers, factorisation and more.

KS3, KS4 *Hands-on/ Practical*

F • Single Session • Wednesday 11:00-12:30

F6 - Calculus, data handling and problem solving with the aid of Autograph; 16-19 - Douglas Butler

Join this session to learn and share ideas to widen opportunities for their students to work with visualisations and multiple representations of mathematical situations, using Autograph. Teachers need to become familiar with Autograph and discover how best to incorporate it in their work - including how to intervene effectively as their students experiment. This session will introduce the Autograph user interface through several lesson plans for AS, Core Maths and A level, including calculus, data handling and problem solving. Online resources will be explored: Autograph tutorials from other users, and the ability to save your own work as an applet. Delegates should bring a laptop, mouse and power lead. Software will be provided.

Advisory, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

F7 - Modelling with Algorithms - MEI - Keith Proffitt

The MEI replacement for Decision Mathematics starts off with the usual network algorithms. Later in the course, some of these are re-formulated as linear programming problems (LP). These can be solved using technology, so more realistic problems can be tackled. We shall look at LPs, and how to use the technology. Aimed at anyone who is confident with Decision 1 topics, and wants to learn about or consider teaching the LP and technology aspect of Modelling with Algorithms.

KS5, Tertiary

F8 - Investigating mathematical learning journeys - Catherine Foley

In order to best support children's mathematical learning journeys we need first to understand their beliefs about mathematics as a subject and themselves as mathematicians. My doctoral research focused on exploring girls' growing mathematical identities through a range of practical, accessible and evidence-based tools such as scrapbooking, digital photography, concept mapping, metaphor elicitation and creative interviewing. By focusing upon what these methods revealed about girls with similar attainment but contrasting mathematical identities and possible implications for their future mathematical engagement, this session will provide hands-on opportunities to explore different approaches to investigating children's mathematical lives.

KS1, KS2 *Lecture/Talk*

F9 - Ideas for teaching matrices, transformations and vectors in Further Mathematics - MEI - Richard Lissaman

In the new A level there is a closer link between matrices and transformations as well as with the geometry of lines and planes. How can we use graphing software to get these ideas across? We shall use Geogebra and Autograph. Aimed at anyone wishing to teach the pure part of AS or A level Further Mathematics.

KS5, Tertiary

F10 - Napier's Chessboard Abacus: 'more of a lark than a labour' - Steve Russ and Meurig Beynon

This is basically a bit of practical fun for both students and teachers. It is a method of doing multiplication, division and taking square roots simply by moving counters on a chequer-board. It appears in Napier's 'Rabdology' (1617) and is a nice application of an unusual binary representation where the presence of a counter is a '1' and the absence is a '0' so it also gives practice in conversion between number bases. There will be practice with boards and counters and with an unusual computer implementation illustrating what we believe is a new way of using computers for learning mathematics.

KS2, KS3, KS4 *Hands-on/ Practical, Interactive Discussion, Lecture/Tal*

F11 - MArt using art images to promote connections and reasoning in number theory – Sally Bamber

This mathematics art project uses number theory without numbers, so that coloured images are used as a vehicle for promoting connections and reasoning in number theory. Ultimately, MArt has the potential to deepen learners' understanding of number theory by reasoning from known facts and stimulating reasoned dialogue with the production and presentation of art images. Initially, this project has been used in KS2 and 3 classrooms, but has potential to be expanded to mathematics learners in many contexts within a pleasurable, challenging and inclusive classroom.

KS2 and KS3

G • Single Session • Wednesday 14:00-15:30

G1 - Lazy Teaching using Learners as Teaching Aids - John Suffolk

Developing further work from last year and earlier to work with ideas from the participants using learners as the teaching aids - this is fun and appeals to those whose learners have kinaesthetic energy - fancy words for running around in the classroom and learning mathematics at the same time.

KS2, KS3 *Hands-on/ Practical*

G2 - So you think you know about a cube? - Dave Hewitt and Luke Richards

We find it continually fascinating how something so 'familiar' to us - a cube - can still be the source of new questions and surprises. In some ways the cube is an example of those things which we consider to be so familiar to us that we might make the error of feeling we 'know' all there is to know about something. Teaching holds the joy of returning to what might be familiar territory and still finding new insights and avenues to explore with our students. We will spend the session exploring a cube through one or all of the following: visual imagery, handling of physical cubes and the manipulation of virtual cubes via technology. We expect there to be a lot of discussion and hopefully some new insights gained along the way.

Advisory, KS2, KS3, KS4 *Hands-on/ Practical, Interactive Discussion*

G3 - Mathematical and Functional Problem Solving - Lucy Kilgariff

A look at strategies for explicitly teaching problem solving. How to teach a range of strategies for problem solving and how to encourage students to start to employ these strategies themselves. Discussion of how to incorporate problem solving into medium and long term planning.

KS3, KS4 *Hands-on/ Practical, Interactive Discussion*

G4 - Make Sense of Functions with Mapping Diagrams: From Algebra Basics to Calculus. - Martin Flashman

A mapping diagram (MD) is an alternative to a Cartesian graph that visualises a function. Like a table, it can present finite data, but it also can work continuously and dynamically with technology. Participants will learn how to use MDs to make sense of linear functions and basic function concepts. Examples will connect MDs with graphs to make sense of differential and integral calculus with both estimations and theoretical results. Background and examples are available at Mapping Diagrams from A(lgebra) B(asics) to C(alculus) and D(differential) E(equation)s. http://users.humboldt.edu/flashman/MD/section-1.1VF.html and at geogebra.org.

KS3, KS4, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion/ Lecture/Talk*

G5 - Mathematics at Play - Janet Stramel

Children love to play games. In this session, participants will explore how to use games to become fluent in the fundamentals of mathematics, reason mathematically and solve problems. The focus will be on number sense, computation and estimation.

EYFS, KS1, KS2 *Hands-on/ Practical*

G • Single Session • Wednesday 14:00-15:30

G6 - Using Hands-On Activities in the Mathematics Classroom - Becky Warren

The NRICH Hands-On Maths Roadshow is a collection of engaging activities that are taken into schools to promote creative approaches to mathematics, strategic thinking and to stimulate mathematical curiosity. Many of the tasks open up the possibility of further exploration. This session will take some of the tasks and look at ways in which they might be used in the classroom to pique interest and then be developed to support students in improving their reasoning skills, broadening their knowledge and making connections between different areas of mathematics.

KS2, KS3, KS4 *Hands-on/ Practical*

G7 - Web resources which can enhance teaching and learning - Douglas Butler

Join this session to learn and share ideas about overwhelmingly numerous digital resources that reside on the web. This session will help you to find them and discuss how best to incorporated them in your lesson plans. We will find data, images from Google Earth, simulations, tutorials, texts and blogs. Then we will look at the best of the professional sites (eg NRICH), and amateur sites (eg Mr Barton Maths). Finally we will look at ways to create your own resources and share them, using screen recording software, a must. Delegates should bring a laptop, mouse and power lead, and/or a tablet

Advisory, KS3, KS4, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

G8 - Mechanics: a close look at two Further Mathematics topics - MEI - Stella Dudzic

We shall look at how dimensional analysis can be used to suggest a model for different situations. We shall consider how Newton's laws and energy principles apply when a particle moves in a circle. What about centrifugal forces? Do they exist? Aimed at experienced M1 mechanics teachers who want to extend into teaching Further Mathematics.

KS5, Tertiary

G9 – We're Stuck! Resilience through theatre - Kaya Stanley-Money

In 2014-16, theatremaker Sarah Punshon collaborated with family mathematics charity Maths on Toast, producers China Plate and several schools to develop a piece of theatre that would challenge children's (and adults') perceptions of getting stuck, and going wrong, in mathematics. The resulting piece was described as adventure, laughter, clowning, maths, didacticism - a triumphant combination (Exeunt). Come and find out more about the show and about what it taught us about inspiring children to persevere and to believe in the power of their own brains to grow.

KS2, KS3 *Interactive Discussion*

G • Single Session • Wednesday 14:00-15:30

G10 - Recurrence relations – a new pure topic in Further Maths - MEI - Richard Lissaman

The Fibonacci sequence is a well-known sequence defined in terms of a recurrence relation - subsequent terms are defined as a function of those already known.

We'll look at methods for solving various recurrence relations – i.e. finding terms as a function of their position in the sequence and some real world applications. This session will assume knowledge of recurrence relations from standard A level Mathematics.

KS5, Tertiary

G11 - Enriching the key stage 4 curriculum - Cath Costello and Theresa Baker

In a bid to enrich students' mathematical learning journey through the new GCSE syllabus, we have split the content into broad themes such as Art and Mathematics and Politics, Society and Mathematics. Students attend a hands on lecture at the start of each theme and take part in a group task at the end. This session will outline our approach, give you the opportunity to try out some of our tasks and encourage you to consider how a similar approach might (or might not) be helpful in your own school. We should also greatly appreciate your feedback and any ideas you have for developing this approach.

KS3, KS4

Interactive Discussion

G12 – Optima Maths: When teaching is right, learning is effortless - Helen Wall and Jonathan Solity

Optima is a psychological and educational research consultancy, dedicated to raising academic standards through the impact of psychological theory and instructional principles on the teaching and learning process. Optima interventions are based on 20 years of school-based research with pupils from low-income families in some of the lowest-attaining schools in the country. In this session we share the research and results behind Optima Maths and demonstrate how instructional psychology can have a dramatic impact on the teaching of mathematics in the primary classroom.

KS1, KS2 *Interactive Discussion, Lecture/Talk*

G13 – Improving mathematical resilience and engaging disaffected Y10 L.A students through problem solving - Jenny Maraspin Sarah Everitt

The story of the progress of a class of year 10 students all with prior attainment of less than level 4. A joint research project between the Swanage School and Bournemouth University implementing an action research based approach to the effects of 'Nudge Theory' on accelerating learning and building mathematical resilience and understanding through problem solving. We are aiming to publish findings.

KS4 *Lecture/Talk*

H • Single Session • Wednesday 16:00-17:30

H1 - Ways of being in the mathematics classroom - Danny Brown

This session presents findings from a two-year departmental project to become more aware of teachers and students 'ways of being' in the mathematics classroom. We have combined the work of mathematics educators such as Caleb Gattegno and John Mason, together with ideas from further afield (e.g. from sociology, philosophy, ...) to create some principles and actions that we have found useful. We have attempted to analyse these ways of being using video. This session will present the process we have gone through - and which anyone can go through as a model for developing departmental practice - followed by a discussion.

Advisory, EYFS, KS1, KS2, KS3, KS4, KS5, Tertiary *Interactive Discussion, Lecture/Talk*

H2 - Where next? Enriching and exploring mathematics. Classroom ideas from the Royal Institution (Ri). - Zoe Griffiths

This session will give delegates classroom ideas that challenge students and enrich their mathematical experiences, and can be used in the delivery of the new curriculum. Tasks link to particular curriculum topics but explore them in new contexts/perspectives, rather than accelerate content. They could also be used in Maths Clubs. The session includes a hands-on task that explores students' understanding of place value through investigation of other number bases, and a series of tasks themed around Pascal's Triangle that build on students' knowledge and understanding of special numbers, fractions, area of shapes and perimeter of shapes.

KS2, KS3 *Hands-on/ Practical, interactive Discussion*

H3 - The role of mastery, problem solving and conjecturing as part of a learning mathematics journey. - Barbara Allen, Tom Cowan, Gerard Hayes, Angie Mcconnell and Charlotte Webb, Jeffrey Goodwin

The group will discuss what makes a mathematical problem and we will consider how we can develop tasks for the classroom to include not only skills and procedures but also reasoning and problem solving. There will be opportunity work on mathematics tasks during the session, as well as time for sharing ideas and discussion about how similar tasks can be implemented in the classroom. This session is suitable for both primary and secondary practitioners. There will be a booklet of free resources for use in the classroom.

KS2, KS3, KS4, KS5 *Practical, Discussion*

H4 - Revisiting Mathematics in Retirement with the U3A - David Martin

Mathematical learning journeys do not end at three score years and ten. David is the national subject advisor for mathematics and statistics for the University of the Third Age (U3A, www.u3a.org.uk). The organisation forms part of the spectrum of lifelong learning, enabling members to reengage with education, including mathematics, in retirement. From Maths for Fun to post A level, with sessions held in community rooms and people's homes, face to face and on-line. David will share the role of the U3A in Mathematics and Statistics, and intersperse the session with tasks he uses in his own Maths for Fun group.

Advisory, EYFS, KS1, KS2, KS3, KS4, KS5, Tertiary *Hands-on/ Practical, Lecture/Talk*

H • Single Session • Wednesday 16:00-17:30

H5 - A charming journey into recreational mathematics and elegant proof - Daniela Vandepeer

Mathematics itself is a journey with problems to solve, lessons to learn, solutions to discover and think about, but most of all, experiences to enjoy. The session covers an eclectic mix of hands on examples and tasks that can be used in the classroom. At the same time, there will be opportunities to reflect and discuss pedagogical approaches to support such resources.

H6 - Making Numbers: using manipulatives to support developing number sense - Sue Gifford, Jenni Back and Rose Griffiths

Manipulatives can play a key role in supporting children in understanding tricky ideas about numbers. An issue for teachers is to develop ways to use manipulatives so that they become tools to support numerical thinking and help to reveal children's understanding. The team will share some of the findings and resources developed by the recent Nuffield funded research project.

KS1, KS2, KS3 *Interactive Discussion*

H7 - Tablet apps which can enhance teaching and learning - Douglas Butler

Join this session to learn and share ideas about using tablets in the classroom. We will first look at the user interfaces of the two main players (IOS and Android), then look at the best of the apps that are currently available for mathematics. We will then take a closer look at Desmos, a very popular and versatile app that runs on all devices, with separate teacher and student environments: teachers can keep an eye on student scores, and students can share graphs around the world.

Advisory, KS3, KS4, KS5, *Hands-on/ Practical, Interactive Discussion*

H8 - Your school/college FM offer: the decisions you need to make - MEI - Keith Proffitt

This session will consider the issues involved in planning to teach MEI Further Mathematics. What resources, CPD and support are available? What order should the topics be taught in?

KS5, Tertiary

H9 - Mathematics and Philosophy for Children (P4C) - Rod Cunningham

Work in the fields of mathematics education and Philosophy for Children (P4C) has led to the realisation that P4C skills of argument, reasoning, community enquiry and dialogue help the acquisition of key mathematical concepts. This workshop will explore mindset, maths, questioning and community. It will focus on a number of themes such as: fairness/average/equality; pattern/structure of number; shape/space/perception through examples of activities which can be modified and used across the age-range. It will highlight questioning and transferrable thinking moves.

Advisory, EYFS, KS1, KS2, KS3, KS4 *Hands-on/ Practical, interactive Discussion*

H • Single Session • Wednesday 16:00-17:30

H10 - Using technology to investigate differential equations - MEI - Richard Lissaman

A great way of starting to teach first order differential equations is to use tangent fields; Geogebra and Autograph generate these. This gives a visual representation of what is happening. In the MEI Further Pure with Technology unit this idea is taken further to consider technological approaches to analytical and numerical solutions to differential equations.

Aimed at anyone interested in using technology to introduce differential equations, or who is considering teaching the MEI Further Pure with Technology unit.

KS5, Tertiary

H11 - Three Ways with Displays - Clarissa Grandi

A session outlining three different ways to use displays in the mathematics classroom: to stimulate students' interest in mathematics; to support students' learning of mathematics; and to use as a vehicle for collaborative mathematical art activities. Attendees will be introduced to a selection of free, ready-made mathematics classroom display resources and ideas, and will also be given the opportunity to design their own. The second half of the session will involve a collaborative mathematical art display activity.

KS2, KS3, KS4, KS5 *Hands-on/ Practical, Interactive Discussion, Lecture/Talk*

H12 – A journey through 2D geometry: linking the Van Hiele theory to practical classroom activities – Sian Thomas

The Van Hiele theory of geometric thought describes the different levels of understanding through which students progress when learning geometry (Van Hiele 1984). We learn through experience, communicating and reasoning. This practical session will give you the opportunity to develop deeper thinking and understanding through subtle variation of tasks and ideas. The geometric activities are 'low threshold, high ceiling' (LTHC), and mixed ability teachingis advocated, leading to mastery and correct use of mathematical vocabulary. Learning through the concrete use of tangrams and pattern blocks will be facilitated throughout. This session is directly related to the expectations of geometry in KS1 to 3.

Advisory, KS1, KS2, KS3 *Hands-on/ Practical, Interactive Discussion*

H13 – Making sense of routines and procedures – Tandi Clausen-May

School mathematics is full of rules, telling us 'how' to do things, e.g. add, subtract, multiply and divide fractions, find areas and volumes, multiply out brackets, ... But simple, home-made materials can help to explain the 'why' of these procedures, enabling our pupils to understand, and so to remember, the underlying concepts.

Advisory, KS2, KS3 *Hands-on/ Practical*

I • Single Session • Thursday 09:00-10:30

I1 - Mathematical Learning Journeys. Identifying the obstacles. Diagnosing mathematical learning difficulties - Steve Chinn

The talk will be based on my book, 'More Trouble with Maths: A complete manual to identifying and diagnosing mathematical difficulties' (2nd end. 2017). Evidence from the data used to standardise the screener test from the book suggests very low success rates with basic arithmetic in the UK (Is the population really woefully bad at maths? ATM (2013) MT 232: 25-28). Teaching and diagnosis should be inextricably linked. This session will look at a test protocol designed to diagnose difficulties with the foundation skills of mathematics. It will also touch on the problems associated with dyscalculia.

Advisory, KS1, KS2 *Lecture/Talk*

I2 - Different Problem - Same Answer! - John J. Burke

Wouldn't it be nice if pupils didn't copy from one another? A selection from over 40 resources will be presented whereby each pupil has a problem with different parameters to that of his/her neighbour. But each answer is the same, making it easy for the teacher to check. There is a wow factor (how can all the answers be the same?) and pupils will want to find out why, which leads them to want to prove it - voluntarily! Every solution is documented. Come and try out the resources - bring a memory stick.

KS3, KS4, KS5 *Hands-on/ Practical*

I3 - Transforming students into independent mathematicians. - Melios Michael, Tara Withe and Tom Quilter

A session providing teachers with many ideas, strategies and resources that lead to lesson plans that enrich students with the skills to problem solve and reason. Some of the interactive resources identify students' weaknesses, turn assessments into learning tools for students to build on to their mistakes and provide targeted questions on their gaps in knowledge. Resources from this session are inspired by the Central Maths Hub workshops, Pearson's Active Learn and Pinpoint Learning Platforms all of which have been applied in our school and made a massive impact. Participants will leave the session with many free resources, a list of highly recommended websites, new teaching ideas and have an opportunity to try PinPoint and Active Learn services. The session aims to support teachers to prepare students from KS3 and KS4 to meet the expectations and demands of the new GCSE.

KS3, KS4 *Hands-on/ Practical, Interactive Discussion*

I4 - Underground Mathematics in the classroom – Underground Maths Team

Underground Mathematics is a website which offers creative resources to help support and inspire teachers and students of Key Stage 5 mathematics. We are aiming to make studying mathematics at this level a richer, more coherent and more stimulating experience for students and teachers alike. Our resources are organised by content along the lines of our tubemap, but the site can also be navigated by ways of thinking, such as visualising, or convincing and proving. In this session we will explore different ways to journey through our site, and how our resources can help you provide opportunities for your students to make connections between areas of mathematics.

KS5 *Interactive Discussion*

I • Single Session • Thursday 09:00-10:30

I5 - Investigating the effect of the concrete-pictorial-abstract approach to teaching negative number - Jai Sharma and Doreen Connor

This workshop will explore how a concrete-pictorial-abstract approach to teaching negative numbers can impact on both confidence and fluency. A small-scale research project was conducted with low-attaining year 10 students, which involved designing and delivering a learning unit based on elements of the mastery approach. Key features of the unit are: more time devoted to less content; depth of understanding; consistent representations and vocabulary. We would like to discuss whether the approach is effective in promoting fluency, depth of understanding, and confidence. How can this approach be developed further, both for negative numbers, and other concepts?

KS2, KS3, KS4 *Classroom/Interactive Discussion*

I6 - Investigating Web Patterns - James Calleja

I would like to present participants with a mathematical task that involves making and testing conjectures about a particular web pattern. The task promotes inquiry-based learning and is suitable to show mathematical connections. Participants will be asked to work in groups of three. Each group will be encouraged to make explorations, discuss their mathematical ideas and finally share and explain their work with the other groups .

KS3, KS4 *Hands-on/ Practical*

I7 - Google Docs for the busy Mathematics teacher - Douglas Butler

Join this session to learn and share ideas about Googles suite of cloud€-based software that has many new possibilities in the mathematics classroom. All documents can be shared and edited collaboratively, and all can be created and edited on tablets as well as computers. This session will look at features of Google sheets, slides, forms, drawing€ and maps that could be useful in mathematics teaching. For example you can create a test in a form and collect results in a Google sheet. Also the spreadsheet has interesting new ways to present data, including the dynamic scatter diagram facility from Gap Minder. Delegates should bring a laptop, mouse and power lead, and/or a tablet

Advisory, KS3, KS4, KS5, Tertiary *Hands-on/ Practical, Interactive Discussion*

I8 - Geometry and Calculators in the primary classroom - Michael Hall

Geometry is now part of the primary national curriculum. Calculators could be seen as not part of the primary national curriculum. These sessions will look at geometry and calculators in relation to the three key aims for mathematics: fluency, reasoning and problem solving. The sessions aim to be a collaborative and activity based journey, during which we will explore creativity and structure, confidence and competence, and the 'what?' and the 'how?' of generic approaches to problem solving. Do the three key aims help learners to appreciate and understand geometry? Does geometry help learners to develop reasoning skills? What CAN the calculator contribute to learning? As with any journey of exploration there are likely to be unexpected moments, surprises and shocksalong the way. The first session will be more about geometry and the second more about calculators. The sessions are largely independent of each other so you can attend one or both.

I • Single Session • Thursday 09:00-10:30

I9 - How many numbers are there? - Nigel Derby

We look at Cantor's theory of the infinite, the cardinality of sets and the fact that there are more real numbers than can be counted. We will also discuss Cantor's Continuum Hypothesis. The tone is kept light. The session will involve hands-on activities and, hopefully, discussion. The intention is that teachers could take away ideas for a similar discussion with their bright and interested A-level students. It is a subject outside the curriculum but which, in my experience students find intriguing and stimulating.

KS5, Tertiary *Hands-on/ Practical*

I10 - Inspiring pupils' learning journeys by developing problem-solving skills through your assessment - Heather Scott

We will look at ways of developing pupils' problem solving skills by doing a variety of problem solving activities alongside exploring different assessment strategies to promote mathematical thinking. This will be a practical session where participants will have the chance to do some mathematics at the same time as looking at practical ways of assessing pupils' successes and achievements. We will also take time to think of ways of developing our own classroom practice to give pupils more time to reflect on their own mathematical learning journeys. (All of the materials and resources will come from my classroom and students.)

I11 - Taking The Next STEP with NRICH - Ems Lord

In this session, delegates will explore NRICH's exciting new STEP support programme for Year 11 and Year 12 students. NRICH's STEP support programme offers free, challenging mathematical problem-solving tasks for your students. The session will include opportunities to try out a range of these free tasks designed to build confidence in advanced problem solving skills, especially useful for those students considering university courses that require a mathematics entrance examination. Delegates will be encouraged to consider ways that schools can maximise the potential of NRICH's STEP Support in the classroom, including its potential for supporting less confident students to consider studying mathematics at a higher level.

Advisory, KS5 *Interactive Discussion*

I12 – Yes, but why? Teaching for deeper understanding in mathematics – Edward Southall

A workshop to demonstrate the ways in which algorithms can be explored with students to understand why they work, not just how to use them. From the column methods for addition, subtraction and division to manipulating prime factors and fractions. Algorithms will be deconstructed and ways to assess student understanding of them will be explored.

KS2, KS3, KS4 *Hands-on/ Practical*

I13 – Moving on from a 'chalk and talk' approach - Heather Davis

For many reasons, teachers are reluctant to use a fully divergent, investigational and problem solving approach in their classroom. We will look at ways to tweak your current practice to open up questions, and engage learners in thinking for themselves to make sense of mathematics. The question changes from 'Why would you do it this way?' to 'Why wouldn't you do it this way?'

KS3, KS4, KS5 *Interactive Discussion*

I14 – Using (standardised) data to demonstrate the impact of teaching and learning strategies - Mirkka Jokelainen

In this session we will look at yearly standardised data and how to use it to demonstrate the impact of different teaching and learning strategies, and for your own professional development. Does Shanghai or Singapore mathematics improve results in your school? What is the impact of textbooks? Is 'Maths Mastery' working? What CPD is particularly helpful? When different strategies and new methods are implemented with a view to improving learning outcomes in the long term, it is useful to be able to demonstrate the impact in your class/school. This ensures best practice can be applied and extended, and the methods that aren't having the desired effect can be re-evaluated. Evidence of impact can also help justify spend.

Advisory, KS2, KS3 *Lecture/Talk*