Welcome to Issue 42 of the Secondary Magazine. It feels as if we never had a holiday doesn't it? The term is still quite fresh and most of the pupils still have that 'new uniform' look about them. What about your classroom? Have you got some new pupil work on the walls? Have you taken in all those sets of books for the first time and made some friendly yet formative comments? We hope this Issue will inspire you for September!

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National Centre for Excellence in the Teaching of Mathematics

From the editor

Had a good holiday? I was quite surprised when I got back to see a few changes in my village. There's a lovely thatched cottage – it's a real chocolate box cottage, roses round the door, hollyhocks in the garden. They've painted it pink! How ridiculous. A subtle cream would look nice, or an 'off white' perhaps, but pink? That just spoils it – distracts your eye from the thatch. If only they'd asked me…

I braved the dreadful weather last week to go down to the beach with a friend and her children. The beach was great – not quite blazing sun but plenty of sea, sand and ice-cream. The journey was hell. Don't you hate it when there is someone else in the car who'd rather be driving... mind the cyclist, watch out he's turning left, why don't you park there, there's a 30mph limit along this bit…

Are you beginning to see a connection here? I expect that there has been some of this as you have returned to school for the new year. Have you seen what they have done to the sports hall/ the car park/ Emma's classroom? They could have saved a lot of money by: painting it/ knocking it down/ buying a new one. They really: are made of money/ have no common sense/ need to ask us teachers what we think.

There are plenty of occasions in everyday life when we are very quick to offer our opinions on a range of topics but usually only to our partners or the dog. When we are asked for our professional views or our participation in events which may influence educational policy, are we as quick to give our opinion?

It could be argued that one of the best ways to influence the future of mathematics in the UK is to become involved in new developments and one of the newest ideas is now featured on the Qualifications and Curriculum Development Agency (QCDA) website - the new pilot of a linked pair of mathematics GCSEs which will be available for first teaching (in pilot centres only) from September 2010. You can read the details on the QCDA website, but it is worth noting that:

> "The philosophy behind the creation of the linked pair of GCSEs is to provide learners with a rich experience of mathematics, enabling them to understand its importance in analysing problems related to both the real world and to mathematics itself."

It would be hard to argue against this philosophy, so I look forward to seeing further details of the new qualifications. If you would like to get involved, you can:

> "We will be running a number of focus groups, aimed at different stakeholder groups, over the coming months. If you would like to attend one of these groups please let us know by emailing your full name and contact details, as well as the particular stakeholder group you represent (eg schools, higher education etc) to GCSE2010@qca.org.uk. We will add your name to our list and invitations to the various events will be sent out nearer the time."

Will I see you there?

Up2d8 maths

The fortnightly *Up2d8 Maths* resources explore a range of mathematical themes in a topical context. The resource is not intended to be a set of instructions but rather a framework which you can personalise to fit your classroom and your learners.

This Up2d8 resource uses the context of Anthony Gormley's One & Other project to create 'an astonishing living monument' by filling the fourth plinth in Trafalgar Square, 24 hours a day for 100 days. Students are asked what they would do if picked to spend an hour on the fourth plinth in Trafalgar Square. They are then asked to consider two well-known songs and think about how they could be extended to occupy the time on the plinth.

This resource is not year group specific and so will need to be read through and possibly adapted before use. The way in which you choose to use the resource will enable your learners to access some of the Key Processes from the Key Stage 3 Programme of Study.

Download the Up2d8 Maths resource - in PowerPoint format.

The Interview

Name: Jean Brennan

About you: I am the director of learning (mathematics) in an inner-city school in London.
I love sports, and animals. I have some dogs (I am not going to tell you how many) and I have two horses, one retired and one that I ride when I get a chance. I am passionate about mathematics education and believe that we owe it to society to make state education the best it can possibly be. I have one daughter, who is also a teacher of mathematics. Oddly enough, I was actually a student at the school I now work in (many years ago). I have worked in several schools, two in Dublin and four in London, I have taught girls only, boys only and both together, all enjoyable. Teaching can be a very stressful career and the ups and downs are significant. However, it is very rewarding work and I cannot see myself doing work outside of mathematics education.

The most recent use of mathematics in your job was... How much time have you got?! I have been working on a new Year 7 mathematics curriculum that has rich activities and links with other subjects, culture and the community.

Some mathematics that amazed you is... I love the connection between mathematics and art. I suppose it is reasonable to assume that as most natural forms have a connection to the Fibonacci sequence, then this type of ratio must be stimulating to the brain and pleasing to the eye, and I find that idea interesting – particularly when I listen to debates about creation. However, I am fascinated by fractals and the idea of chaos theory.

Why mathematics? I did not realise this when I was younger, but it has always been mathematics! I had the normal diet of school mathematics and the work always seemed easy but took second place to physics, mainly due to an incredible teacher who made the concepts obvious and natural. When I started teaching, I began to appreciate the connections between mathematics and life, and that is when my love of the subject really started. I love a challenge – the more difficult the problem, the more determined I am to solve it, and the day-to-day challenges of teaching mathematics provide me with plenty.

Your favourite/most significant mathematics-related anecdote is…
Things kids say at school often make me smile. It's hard to remember one off the top of my head, but a silly one is, when I asked a class about Pythagoras and one of them replied, "He's a Greek guy who liked playing with tiles."

A maths joke that makes you laugh is… Mathematics is no joke but things I might smile at in the classroom are: A sine curve goes off to infinity, or at least to the end of the blackboard!
Lottery: A tax on people who are bad at mathematics.

Something else that makes you laugh is…
> There are holes in the sky
> Where the rain gets in
> But they're ever so small
> That's why the rain is thin.
> -   Spike Milligan.

Your favourite television programme is… I love Bones and all the CSI programmes, and I never miss The Street. I also love The X Factor.

Your favourite ice-cream flavour is… I am not a lover of ice-cream but if pushed it will be vanilla.

Who inspired you? Throughout my life lots of people have inspired me and they probably do not know it. There are many writers/mathematicians who inspire me every time I read their work. The list would probably be too long to put here.

If you weren't doing this job you would… I tried a few jobs before teaching and could not stand them so I would probably be unemployed! More seriously, I have a soft spot for animals in need, so if I ever had money I would run an animal shelter that could double up as an educational site, particularly for inner-city school kids.

Focus on…topology

- [Wolfram Alpha](#) defines topology as *the branch of pure mathematics that deals only with the properties of a figure X that hold for every figure into which X can be transformed with a one-to-one correspondence that is continuous in both directions*. [Wikipedia](#) describes it (maybe more simply) as *a major area of mathematics concerned with spatial properties that are preserved under continuous deformations of objects, for example deformations that involve stretching, but no tearing or gluing*.

- Homeomorphism could be thought of as the most basic topological equivalence in which a shape can be continuously bent and stretched to give an apparently new shape but with the same topological properties. Letters which are homeomorphic can be found on [Wikimedia](#).

- The term Topology was first used in print by the German mathematician [Johann Benedict Listing](#) in 1848, though by then he had been using the word informally for up to 10 years before this. Listing's spelling (Topologie) was changed to the more familiar topology when the word was used in the journal *Nature* in 1883.

- One of the earliest and best known topological problems is the [Seven Bridges of Königsberg](#). Königsberg (now [Kaliningrad](#)) has seven bridges over the river Preger and the problem asks if they can all be traversed in a single trip without doubling back, with the journey ending in the same place it began. [Euler](#) showed that this was impossible in 1736 Euler realised that, in order to make the journey without doubling back, a traveller in the middle of the journey must enter a land mass via one bridge and leave by another, meaning that land mass must have an even number of connecting bridges. If the traveller, at the start of the journey, leaves one land mass, then a single bridge will suffice and upon completing the journey the traveller may again only require a single bridge to reach the ending point of the journey. The starting and ending points then, are allowed to have an odd number of bridges. But if the starting and ending point are to be the same land mass, then it and all other land masses must have an even number of connecting bridges. Since all of the land masses of Königsberg have an odd number of connecting bridges and the journey that would take a traveller across all the bridges, one and only one time during the journey, proves to be impossible.

- The Alvin Ailey Dance Theatre in New York have created a piece, [Memoria](#), which explores topology. One reviewer said, on exploredance.com, *"The structure I saw in* Memoria *was a mathematical function known as a topology. A topology is a geometrical set that can be stretched in space without being torn apart. For instance, if one started with a donut with one hole, the donut could be made larger or smaller, twisted or reshaped from circular to elliptical and it would still be the same topology even though at first glance each variant might look very different. On the other hand, if one punched a second hole in the donut, it would no longer be the same topology.*

  "Memoria uses three dancers as points of reference. The triangle formed by the dancers reverses orientation, compacts and shifts, but is never torn apart. There is a section with a solo and a duet, but then the triangle reasserts itself. The other dancers form a second set that moves around and between the first set. Sometimes the sets use different movements and sometimes similar movements. The sets are also delineated by different costumes."

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A Department for Children, Schools and Families initiative to
enhance professional development across mathematics teaching

National Centre for Excellence in the Teaching of Mathematics

An idea for the classroom – MARS

Having been inspired by Malcolm Swan's work in the resource Improving learning in mathematics: challenges and strategies, I was interested to find details of another project which involves his work. MARS (Mathematics Assessment Resource Service) is a joint project between Michigan State University, University of California at Berkeley and the Shell Centre at Nottingham University. On the website, there are some sample assessment tasks which interested me. I have described two tasks here but do go and look at some of the others on the site.

Here is an idea for a task using supermarket trolleys
Pupils are familiar with the trolley and will have had experience getting a trolley, pushing it round the supermarket and stacking it in the car park. Using this familiarity, pupils can then try to solve problems like:
'Create a rule that will tell you the length of storage space (S) needed when all you know is the number of supermarket carts to be stored.'

Another task is about chocolate polyhedra.
You have a mould shaped like a cube which you half fill with chocolate, but you then leave the chocolate to solidify in different positions, for example suspended by one of the vertices.

What are the shapes of the chocolates that are produced?
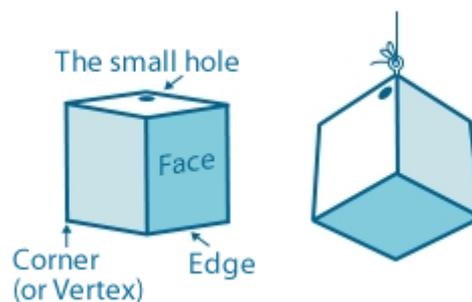
There is a short version and a long version of each task on the MARS website, which includes some pupil solutions and some answers – for this task the pictures would seem to be useful, unless you are willing to try some practical work…

5 things to do this fortnight

- On 2 November, Gresham College is hosting Mathematics, motion, and truth: the Earth goes round the Sun at Barnard's Inn Hall. The reality of the Earth's motion, as proclaimed by Copernicus, quickly proved contentious. Accepted by Kepler, disputed by theologians (Lutheran and Catholic alike), veiled in suggestions of mere convenience, adopted and explained by Newton as a consequence of universal gravitation, parent of the notion of force – What is involved in accepting as true that the Earth goes round the Sun? This lecture traces these debates from the early 1600s to the time of Poincaré. More details are available on the Gresham College website.

- Lesson Study means many things to many people, but generally it describes a process where teachers plan, teach and develop lessons collaboratively. Lesson Study is a key feature of the way many teachers in Japan work, and has now been adopted in American and, more recently, in some English schools.
  The NCETM is planning a national NCETM Lesson Study Project which will begin with a launch seminar for 15 schools or colleges on Wednesday 14 October 2009. Applications to join the project must be in by 21st September.

- Have you analysed your exam results yet? A number of the exam boards have a free tool which gives a question level breakdown, such as Edexcel's ResultsPlus and AQA's Enhanced Results Analysis. These tools not only allow easy identification of students who might benefit from a retake, but also allow you to see which areas of the curriculum your Year 11s found most challenging which might allow you to review the teaching and learning of these topics with your new Year 11.

- How do you feel about Functional Skills? Have a look at this video and booklet from the QCDA [formerly QCA] which gives case studies and details lessons learned from the pilot centres.

- How will you be celebrating the 943rd anniversary of the Battle of Hastings? Hastings Week takes place from 10 to 18 October 2009.

Diary of a subject leader
Real issues in the life of a fictional Subject Leader

With a combination of joy and sadness, I am moving on and leaving my present post as subject leader. I have secured a job in a larger school, providing me with an opportunity to lead a bigger department, teach A Level and further my experience.

Inevitably, such a move prompts me to reflect on the successes and frustrations over the past years. Much has changed. The most notable is the shift towards a process-driven curriculum, forcing many of my staff to reflect upon their own practice. In addition, the loss of SATs, coursework and the intermediate tier has made us ask further questions and look for alternative approaches.

On a personal level, I am no longer the naïve, inexperienced head of department who arrived at the school some years back. Careful management of people and resources was required in order for the department and its staff to develop successfully. I think back to crass decisions that I made and failed initiatives that I implemented with some embarrassment but little regret. I am a great believer in the cliché that mistakes need to be made in order to make progress. I just hope I did not make too many at the expense of others.

So what am I taking to my new post? One thing that has become increasingly apparent to me in recent is years is the power and influence a head of mathematics can have within a school. This does however come with increased responsibility. I now understand that the department must function as a team and that it is the role of the subject leader to encourage contributions from all towards a shared vision. I now understand and have experienced how strong and effective leadership can raise standards.

I will inevitably make mistakes in my new post, especially at the start. This time however, I am approaching the job with a different outlook. I feel that I now understand what the post is and what it entails. No longer am I one of the young teachers laughing and joking in the staffroom. I have become one of the middle-aged, 'seen it – done it' mob which once seemed a long way into the future. I am still not entirely sure as to when that transition happened, but I know it did.