Secondary Magazine Issue 52

National Centre for Excellence in the Teaching of Mathematics

Welcome to Issue 52 of the Secondary Magazine. With half term in sight and the light lasting just a bit longer in the evenings, we hope this issue will help you to turn your back on those long dark midwinter days and look forward to the light of spring. Happy reading.

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From the editor – What's so great about maths?
Lenny Henry's recent Radio 4 programme provides a focus for us to think about the mathematical experiences of pupils and how this affects their attitudes to the subject.

Up2d8 Maths – VAT rise
The fortnightly Up2d8 Maths resources explore a range of mathematical themes in a topical context. On 1 January 2010, VAT returned to 17.5% after being reduced to 15% on 1 December 2008. The Government cut the VAT rate to try to boost shopping in the recession. Now some retailers say that they will absorb the VAT increase rather than passing it on to consumers. This resource invites pupils to tackle the widely-held misconception that an increase from 15% to 17.5% is the same as an extra 2.5p in the pound.

Focus on…Escher
The work of M C Escher has always had a place in my classroom, intriguing and delighting pupils. Find out more about this 20th century Dutch artist.

An idea for the classroom – Symmetry pictures
Bringing real life into the mathematics classroom can motivate pupils and help them to understand how mathematics is relevant to them. These symmetry pictures aim to stimulate pupils' interest and provide the focus for some mathematical discussion.

5 things to do
Whether your thoughts are on Big Bangs or pancake tossing, our '5 things to do' should provide something of interest.

Diary of a subject leader – Real issues in the life of a fictional Subject Leader
Our subject leader looks at the different components involved in improving learning in mathematics. Is it just employing the right staff or do they then need some assistance to have an impact on learning?

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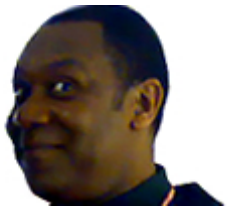

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From the editor – What's so great about maths?

I've just been 'coping' with our house's response to 'the big freeze'. Nothing dramatic, just inconvenient really. A dripping tap wouldn't normally cause major problems, but a dripping tap and -12ºC overnight is a different matter, which has resulted in a sink full of water going nowhere! There's nothing for it but a bit of U-bend unscrewing and hot water down the waste pipe etc...

I thought I'd try to divert my mind away from this problem as I was working on it – 'if only I'd replaced the washer weeks ago' etc – so I put on the maths episode from Lenny Henry's What's so great about…? series. The blurb on the website said "Lenny, like so many in the UK, has always found maths tough going, but was he simply badly taught or has he got some sort of number blindness?" Just the stuff to accompany the plumbing!

Is it surprising to hear that a well-known comedian and actor who oozes charisma, self-confidence and general well-being can have an insecurity about mathematics? Lenny talks with other people who share his mathematical insecurity about his experiences at school and remembers particular lessons where he was given 'a box full of problems' to do which he never finished.

Lenny's lessons sounded pretty dull – a fact he shared with Lynne McClure (from the Institute of Education). Lynne talked about the TIRED acronym –

Tedious
Isolationist
Repetitious
Elitist
Depersonalised

- which describes mathematics lessons that I sat through at school – and you? Lynne contrasted pupils' experiences of English and maths homework – being set an essay which you can always have a go at, however badly, and a page of mathematics problems which sometimes seem hard to start, and how this seems to colour pupils' images of mathematics.

The contributors to the programme talked about making mathematics more engaging for pupils (not necessarily always fun but certainly engaging). They also highlighted the importance of children being given opportunities to solve problems rather than repeat procedures.

As ever, I listened to this programme, thinking about possible responses from my pupils – what would they say if someone asked them 'What's so great about maths?' Would they be enthusiastic, able to talk about lots of interesting lessons, remember positive relationships between them and their teachers, or would they give 'TIRED' examples, possibly quoting their XXX lessons. What would your pupils say?

And by the way – the U-bend is clear, just frozen in the outside waste pipe. Nothing a bowl of hot water can't cure. Roll on summer!

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.

On 1 January 2010, VAT returned to 17.5% after being reduced to 15% on 1 December 2008. The Government cut the VAT rate to try to boost shopping in the recession. Now some retailers say that they will absorb the VAT increase rather than passing it on to consumers. This resource invites pupils to tackle the widely held misconception that an increase from 15% to 17.5% is the same as an extra 2.5p in the pound

Having been introduced to the situation of a rise in VAT back to 17.5% in January 2010, students are asked to comment on John's explanation that this is 2.5p in the pound. They are then asked to consider who are the winners and losers in this situation. Does the Government generate a significant amount of income from this tax rise? Would this extra amount of tax deter consumers from buying a new Wii say?

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.

Focus on…M C Escher

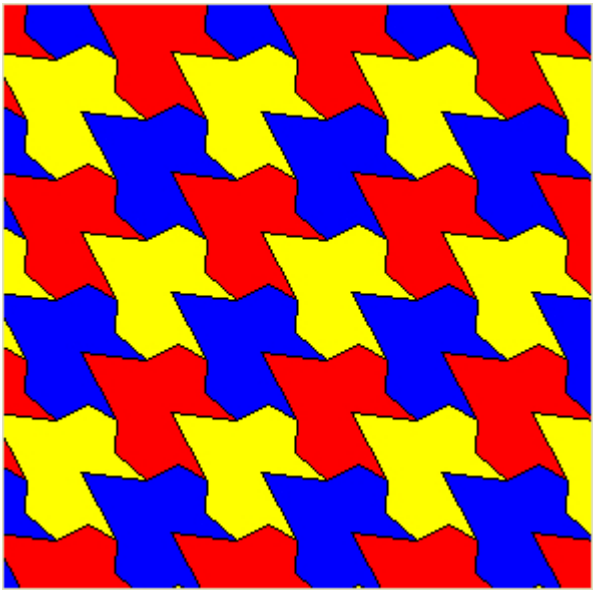
- Maurits Cornelis Escher (1898-1972) is probably one of the world's most famous graphic artists. He was born in Leeuwarden, in the Netherlands. When he was five years old the family moved to Arnhem where Escher spent most of his youth. He made 448 lithographs, woodcuts and wood engravings and over 2 000 drawings and sketches in his working life.

- A short video of an interview with M.C. Escher is available from the website www.mcescher.com. It can be viewed in three parts: part 1, part 2 and part 3.

- Escher is famous for his pictures of impossible spaces and impossible objects. His first impossible work was a woodcut Still Life and Street, completed in March 1937.

- In 1922 Escher visited the Alhambra, a 14th Century Moorish castle in Granada, Spain. He was inspired by the tiling images and became fascinated by the regular division of the plane. Although he had not previously been academically successful, he was also inspired by a paper sent to him by his brother. This paper, by George Pólya, introduced him to the 17 Wallpaper Groups, which inspired him to develop a mathematical approach to expressions of symmetry in his art works.

- How can you make your own Escher-like tessellations? The Tessellations.org website gives simple step-by-step instructions and the Shodor website has an interactive tessellation creator.



- Inspired by discussions with H.S.M. Coxeter, Escher explored ways of representing infinity on a two-dimensional plane. Escher's works Circle Limit I–IV demonstrate this work. In 1995, Coxeter wrote, "Escher got it absolutely right to the millimeter."

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An idea for the classroom – symmetry pictures

When I interview groups of pupils, they often tell me that mathematics is something that is 'done to them' in classrooms and bears little relevance to real life. So when there is an opportunity to include some 'real life' into our mathematical activity let's grasp it firmly! On a recent trip 'north' I stumbled upon two views which I captured with my camera and want to share as a starting point for some mathematical discussion.

The first picture is a shot taken at Salford Quays, Manchester, the site of the former Salford Docks, which has benefited from a large urban regeneration project.

The second picture is a recreation of an Elizabethan knot garden at Little Moreton Hall, Cheshire, a fantastic, moated Elizabethan Manor House.

For ease of use, these pictures can be downloaded in a PowerPoint.

How would I use these in the classroom?

- allow pupils some time to look at the images, individually and then both together on the third Powerpoint slide
- ask pupils to note down 'at least five' or 'as many as you can' points of similarity and difference between the two pictures
- give pupils some questions to discuss
- why did a modern-day architect design these buildings to give a symmetrical view?
- why were the Elizabethans intrigued by knot gardens?
- why has the knot garden been re-created?
- write down some other uses of symmetry they have recently noticed
- for homework, ask pupils to take pictures involving symmetry and post them on a shared network area or a Flickr page.

I am sure you have some good ideas which you could share with us here.

5 things to do this fortnight

- There's a series of Maths Inspiration events taking place across the country throughout March, looking at subjects as diverse as *The Maths of Juggling*, *The Maths of Breakfast* and *The Maths of the Rock Guitar*, and speakers include our interviewee from a couple of issues back, Matt Parker. These sessions are suitable for Year 11 and sixth form students. The first event takes place in Liverpool on 25 February and there are further events in Winchester, Newcastle, Leeds, Bath and Nottingham.

- While not exclusively a Maths event, The Big Bang Fair in Manchester from 11-13 March is an opportunity for students to make connections and experience science and engineering. You (and your students!) can:
    - be wowed by experiments, explosions, simulators and shows – you might even meet a celebrity or two
    - quiz scientists and engineers about their jobs and discover the perfect career for you
    - chat with finalists of the National Science and Engineering Competition and get inspired to enter next year.

- The Big Bang Fair is at the very beginning of the National Science and Engineering Week (NSEW). There are online events as well as regional activities - you can find out more from the NSEW website.

- The Arctic Sea ice has been retreating and thinning for many decades under the influence of global warming. To measure the thickness in winter and summer Royal Navy submarines have been sailing under the ice with upwards looking sonars, more recently using multibeam sonars which give full 3-D view of the ice underside.

  In his lecture Global Warming and the Melting of the Arctic Ice, organised by the Millennium Maths Project and to be held at the Centre for Mathematical Science in Cambridge, Professor Peter Wadhams will discuss how these data are collected, how they are analysed, and how they are interpreted to give scientists key parameters which are needed to understand the decay rate of the ice..

- Tuesday 16 February is Shrove Tuesday, so get your trainers on and get to Olney in Buckinghamshire where the first pancake race is said to have taken place. No one is quite certain how the Pancake Race at Olney originated – one story tells us of a harassed housewife, hearing the shriving bell, dashing off to the Church still clutching her frying pan containing a pancake. Another that the gift of pancakes may have been a form of bribe to the Ringer, or Sexton, that he might ring the bell sooner; for the ringing of the church bell was the signal for the beginning of the day's holiday and enjoyment.

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Diary of a subject leader

Real issues in the life of a fictional Subject Leader

In the past, I have been in that very unenviable position of having to 'defend' the school when parents are questioning quality of teaching, or a decision we have made. This is always hard, particularly so when parents question the competence or skill of a teacher. And sometimes it is just nobody's fault. I remember an excellent teacher starting maternity leave. "The replacement", as parents began calling him, didn't stand a chance. He was actually a very good teacher, and in the fullness of time joined our team full-time and was highly regarded and liked. It was just that initially he was different. Nevertheless, it opened my eyes to just how vulnerable a team and school can be if they are unable to recruit good teachers. Later on, there were times when anyone vertical with a heartbeat was my only choice, and, yes, difficult meetings with parents inevitably followed.

Most recently, I have been in the position of having a full team of excellent teachers, yet other aspects constrain our work. Having a very small amount of non-contact time for myself and other TLR holders in the team makes us feel as though we lurch from week to week. I don't think we do really, it just feels a bit pressurised and 'seat of pants'. We finish at 3pm, yet for nearly all of the Fridays in last term I can't remember leaving before 5pm, but the rest of the car park was empty at 3:30pm. We are likely to have a budget deficit along with just about every other school in my authority, so finances are really tight. I have a reduced budget, text books are three or four changes out of date, and photocopying has to be reduced or stopped.

I am extremely lucky in that the teachers in my team are very experienced and really with me in improving learning in mathematics. The school made a very conscious decision to pay to recruit the best possible teachers. However, now we have them they feel constrained and limited by resources. I happened to have a chat with an AST who works in a few schools who have funded positions to improve learning in mathematics lessons. She feels likewise, and wonders whether attracting "better" teachers through AST posts or similar is sometimes seen as a quick-fix by school leaders. She likened it to owning a Steinway grand piano and having to squeeze it into a Kensington 'pied à terre'/broom cupboard. It had me thinking about what I expect from my team, and what is expected of us.

Having spoken to my team, they are actually quite frustrated as they feel they know what would make a difference and are able to deliver that if they were given the context and resources. A case in point is reducing the number of classes in Year 10 from six to five. When this combines with our timetable constriction, we have ended up with a group that has mostly higher-tier with a few foundation students and then, timetabled at a different time, a group of mostly foundations with a handful of higher. I think this could actually cost us a few percentage points and definitely have a significant effect on our CVA. Yet, when I look at what the school is doing with Year 11 to try and improve results, a very significant effort is invested in actions that may at best increase results by just 1%.

The reason is simple – lack of proper strategic planning, or perhaps lack of consultation and awareness as to the impact of strategic decisions. I think I made a good case at the time, but the financial constraints were overbearing in the decision-making process. I don't think I could have done much more without putting down some ultimatums. What I am doing more, is proactively informing leaders what could be done strategically to improve results, and give some impression of how much more influential those strategic decisions are, compared to me running revision classes every spare minute. They made the correct decision in appointing teachers that had the capacity to deliver change, yet all too often I fear it is then an unconscious attitude of 'job-done', whereas really it is only the start.

At the bottom of every conversation I have, is an attempt not to abuse my position of being a core subject leader by constantly promoting English and Maths as being more important – it degrades the work of everybody else. It is just a little ironic therefore that, after two days of school closure due to snow, tomorrow the head teacher is opening the school for Year 10 and 11 only, and has declared that the hastily re-written timetable will focus on revision in English and Maths. I guess what goes around comes around!