Secondary Magazine Issue 49

National Centre for Excellence in the Teaching of Mathematics

Welcome to Issue 49 of the Secondary Magazine. Are you enjoying all the 'jingle bells' and 'glorias' or is it a bit of 'deep and crisp and even' that you are eagerly awaiting? Whatever your passion, have a relaxing holiday – and celebrate New Year in style.

## Contents



*Up2d8 Maths will be back in the next issue*

## From the editor – Excellence in Mathematics Leadership microsite

The NCETM portal seems to be growing fast – the latest addition is the fantastic Excellence in Mathematics Leadership microsite.

Sometimes at the end of a long day, reading more 'stuff' just requires too much effort so it was very entertaining to watch some of the clips on the Talking Heads section. Different people have been asked to speak into the camera on four different talking points:

- the best piece of advice you have ever been given
- the one thing that every school should have
- my top tip for a new mathematics leader
- a turning point in my career.

As I was watching these clips (which are nice and short), I found myself wondering what I would have said?

There are some other sections within the microsite. It categorises the four core responsibilities of a subject leader, such as:

- **Developing a common purpose and a shared culture**
  Promoting and creating a shared vision for why mathematics is important, what you want for your pupils and what you all want to achieve in your school/department through the mathematics curriculum
- **Planning for improvement**
  Making an honest appraisal of what you are good at, what needs to be worked on and planning actions and developments accordingly
- **Working and developing together as a team**
  Developing and sustaining a culture of sharing teaching ideas, encouraging professional development and working together to develop practice
- **Having efficient and well-organised systems**
  Setting up and maintaining good, efficient systems for the management and organisation of resources and data together with the documentation of agreed policy and practice.


These core responsibilities are linked to some key elements – but not in a one-to-one correspondence! Investigating each Key Element seems a bit like entering the tardis – there are features of effective practice, case studies, links to other items on the portal, excerpts from Mathematics: understanding the score and prompts to encourage reflection.

If that wasn't enough, each of the core responsibilities also contains a wealth of useful material. The site suggests that you "look through and discuss (with your line manager/senior leader and your teaching colleagues) the list of example statements and decide which best fits your stage of development" – there are four stages with prompts for moving up to the next level and some 'stories of change'. It is helpful to be able to read about other people's journeys in trying to change your own practice.

There is absolutely no way that you could even begin to appreciate all these materials in one visit – that isn't meant to sound daunting, just to say how amazing this site is!

Having sat back and watched the Talking Heads, I'm now going to think about how I could use some of these materials with the post holders in the department, and the mathematics line manager, to deepen our shared understanding of how we work well to achieve the very best for our pupils.

Why not tell us how you are using the materials?



## The Interview

**Name:** Matt Parker

**About you:** Originally a maths teacher, I now go all around the UK giving talks about maths. It's my goal to make more people more excited about maths.

**The most recent use of mathematics in your job was...** I enjoy being able to use what is called "recreational maths" in my job. So I recently got to develop puzzles for Maths Week Ireland that went in the *Irish Times*.

**Some mathematics that amazed you is...** I've recently been amazed by cyclical numbers (such as 142857). These are numbers where being multiplied by another number only causes the digits to be cycled around. I have no idea why they work, but I plan to find out.
For example: 142857 x 4 = 571428

**Why mathematics?** I like mathematics because you focus all of your creative energy at a puzzle until you get an answer that you didn't expect yet makes perfect sense.

**Your favourite/most significant mathematics-related anecdote is…**
I once received a charge from my mobile phone company because I didn't top up when my credit had reached a 'negative value'. My credit was actually exactly £0.00 and so I sent them a letter explaining that while zero is a perfectly good number, it cannot be considered to be either positive or negative (complete with citations to mathematics papers). They refunded me the money.

**A maths joke that makes you laugh is…**
One day a bar received a call from f(x). "Excuse me" said f(x), "could I reserve a table for 7 o'clock this evening?"

"I'm sorry" replied the barman, "we don't cater for functions."

**Something else that makes you laugh is…** When I get bored on a train, I pick up a sudoku and just start filling in random numbers. If I look like I'm concentrating, it really begins to annoy everyone who's watching over my shoulder. Once I get someone hooked, I go wild and just fill in a whole row of 7s. Then I put a 12 in one square.

**Your favourite television programme is…** Futurama.

**Your favourite ice-cream flavour is…** Coffee.

**Who inspired you?** My Dad got me involved in maths from a young age and my maternal grandmother was a teacher and is partly responsible for me becoming one as well. Professionally, an Australian comedian called Adam Spencer inspired me. He combines some brilliant media work with being a mathematician.

**If you weren't doing this job you would…** be extremely bored! I looked into becoming an actuary because the pay is really good, but I get too much enjoyment from sharing my love of mathematics with other people.

## Focus on...12

- There are 12…

  …items in a dozen
  …inches in a foot
  …different pentominoes
  …pairs of ribs in the human body
  …signs of the zodiac
  …face cards in a pack
  …men that have walked on the moon
  …pence in a shilling before 1971
  …ounces in a troy pound.

- 12 is the smallest number with 6 divisors and is the first number that can be written as a product of its prime factors in the form $p^2q$.

- 12 is the first abundant number - that is, it is the first number where the sum of the factors of the number is greater than double the number. Since every multiple of an abundant number is also an abundant number, all multiples of 12 are abundant.

- $12 = 2^2 + 2^2 + 2^2$

- $12^2 = 144$ and $441 = 21^2$

- A regular dodecagon is constructible with just ruler and compass.

- The most efficient way to pack spheres of equal size is to have each sphere in contact with 12 others (Kepler's conjecture). This is known as the kissing number, the maximum number of spheres that can touch an identical sphere.

- 12 is one of just two known sublime numbers. That is, it is a positive integer with a perfect number of factors (it has 6 factors) and whose factors sum to a perfect number (1+2+3+4+6+12=28)

  Can you work out the other sublime number?*

- Just what would you have received on each of the 12 days of Christmas if your true love was also a maths teacher? Have a look at Snapper 7 in this document and find out!

** the only other known sublime number is*
*608655567023837898967037173424316962265783077335188597052832486051279169126 4*

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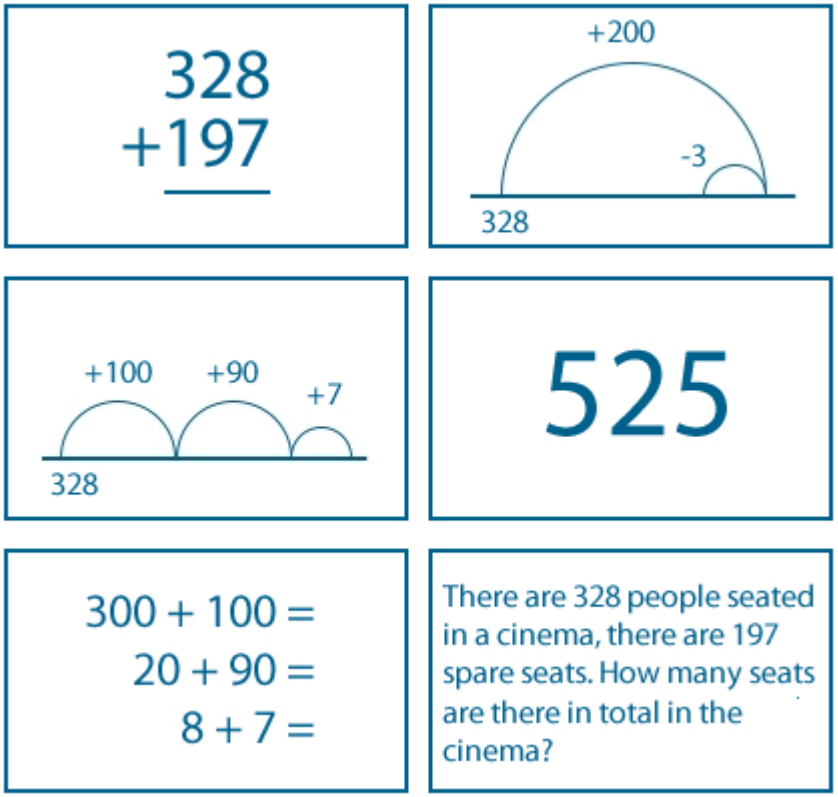
# An idea for the classroom – images of addition and subtraction

Have the excellent resources in Improving Learning in Mathematics ('the Standards Unit Box') prompted a change in practice in the mathematics classroom? I am no longer surprised when I see pupils engaged in a card sort or other activity which encourages them to think and reason as a normal part of their mathematics lessons.

I know that I started to use 'multiple representation' types of activities from 'the Standards Unit Box' because they seemed a bit different, pupils seemed to enjoy them and there was a good learning atmosphere in the classroom. After a while I began to realise that the activities were more than a diversion – pupils were actually learning in a different way and I could use these types of activities as integral parts of my teaching rather than bolt-on extras.

While we seem to be good at using a 'multiple representation' type of activity for pupils to see different representations of a mathematical idea when the idea is 'hard', perhaps we don't always think of using them for something more mainstream – so here is an activity which encourages pupils to sort through different images of addition and subtraction calculations.




How would I use this in the classroom?

- pupils can 'sort out' the cards, they seem to get the idea of putting them into groups quite quickly
- the cards have been written to cause some 'confusion' which pupils need to resolve in order to deepen their understanding
- for me, the purpose of the activity is the process that the pupils go through, not the finished product, so there are occasions when nothing further happens to the cards however…

- some pupils can make a poster of their finished groups
- other pupils may make up a new set of cards for a given calculation (you may want to differentiate here by choosing an appropriate calculation for particular pupils)
- each pupil may stick one group of cards in his/her book and write an explanation of why they are grouped together
- you may want to write a written comment about that pupil's work.

Do tell us how you got on.

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## 5 things to do this fortnight

By the time you read this it's likely to be 2010! This is a special 5 things to do which is very much focussed on the changes happening in 2010.

- What are the accredited qualifications for your current Year 9 students as they move into Year 10? This website might help you to clear up any questions.

- You might be thinking about Functional Maths and trying to gather the information you need. If you're considering entering students for a separate Functional Maths qualification (remember that it's built into the new GCSEs from September) then this document from QCDA gives an overview of all of the awarding bodies and the models of assessment that they're piloting.

- Are you involved in the linked pair of GCSEs pilot? You can find out more about the proposed second pathway which will be based on a linked pair of GCSE mathematics qualifications. The first teaching will be in pilot centres from September 2010. You can find out more from this factsheet.

- How will teaching and learning change with the new assessment models? You might be thinking about the way that you teach particular topics?

  M155MEE says that she has *been discussing the merits of teaching division, by chunking (using repeated subtraction) vs short/long division, with the year 6 teachers in school.*
  *I don't like either of these methods. What are your thoughts?*

  The discussion that this post in Maths Café provoked has so far covered division methods, moved through the distinction between teaching division and teaching how to divide, touched on what decimal the ratio 2:3 represents and, at the time of writing, is focussing on what do we mean by multiplication?
  What do you think? Is multiplication 'rapidly counting up groups of objects' or is there more to it than that? How do you help your learners to develop their understanding of multiplication and division? You could contribute to the discussion or maybe you might like to take the discussion to a department meeting as the prompt for a conversation about how to develop practice in the classroom.

- Have a very happy new year! Relax and celebrate in style but, if you fancy something a little more invigorating, why not head to Saundersfoot in Pembrokeshire?!

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# Diary of a subject leader

## Real issues in the life of a fictional Subject Leader

OK, it's so nearly there. I have three kids under five, so the festive season has a particular importance in my home. Fortunately, my wife is aware that I find it all a bit too much. Seeing relatives is great, but I do feel that come 2 January I'm just about ready for a holiday!

I have a Local Authority monitoring visit the second week back in January – it is part of a programme in which my school participates. I know that part of the visit will be watching a bit of learning, chatting with a few students, getting a feel for what is happening. Alongside this will be a review of the inevitable action plan. As the rest of the school appears to be winding down (or winding-up, depending on your age) towards the festive break, I find myself looking through the plan, and searching for evidence.

Although the provision of evidence is necessary, it can be tiresome. We try really hard to make the evidence part of our normal practice. For example, if we have an interactive lesson that doesn't require any writing in a book, we would normally get the students to write a brief review in their books the next lesson, perhaps five minutes, so that all know the activity has happened. We knew we were likely to have an inspection last year, so we learned to be prepared. The inspection did come and since then we have largely managed to maintain a state of readiness. Yes, we will have a moment of panic, but we all know we can easily pull through that panic! Getting the evidence is OK.

What has 'snuck-up on me' however, is a realisation that actually I really need to have half of the actions in my plan completed. The half term between Easter and Whitsun will be written-off to examination preparation; after Whitsun it is almost too late to start. I always see that half term as a good time to experiment with ideas that might be part of next year's plan.

Well, needless to say, I don't think I have half my actions done. I have definitely started more than half, but I could not say that if I had started all, they are all half way there. The first team meeting back will need a 20-minute session where we evaluate our current position. I think I will cut up the plan and on a large sheet of paper have three columns to place each action in. Perhaps I could title the columns "Never – sometime –always!" I will save some of that wrapping paper, and write on the back of that – it will still get recycled, just a few weeks later than the rest of the wrapping paper!

Enjoy the break.