Secondary Magazine Issue 41

National Centre for Excellence in the Teaching of Mathematics

Welcome to Issue 41 of the Secondary Magazine. Didn't the holiday go quickly? Are you feeling refreshed and ready to return to this fascinating and important profession? We hope that the Secondary Magazine will continue to stimulate, entertain and, at times, amuse you in the coming year.

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From the editor – new year's resolutions

Welcome back to school! How was the holiday? Do you feel suitably refreshed and energised? Are you ready to start again – what are the things that you do at this time of year to prepare yourself for the coming year? I almost miss the past when, at his time of year, I would have a new mark book, copy out my class lists neatly, put in all those dates, homeworks and tests, and generally set myself up for the year with those lovely, clean pages. Now everything is on the computer, which is more efficient, saves me time, allows me to import, export and manipulate to my heart's content – but perhaps isn't so satisfying!
Something that I do continue to indulge in, is setting myself new year's resolutions – this is the beginning of the academic year, when I can start with that clean sheet of paper and go back to my guiding principles before my head becomes so confused with all the hurly burly of day-to-day life in school.
So for the academic year 2009-10, here are my resolutions:

1. Spend time building up good relationships with pupils
2. Make sure my pupils are active learners with a relevant curriculum
3. Question new initiatives – how will they make a difference to my pupils?
4. Engage in personal CPD activities
5. Get a life!

I think I'd better explain a few of these, so here I go…

Spend time building up good relationships with pupils
I can remember quite vividly, a time when I taught in an inner city comprehensive, when a large Year 11 lad made quite an entrance into my classroom, sat down and proclaimed 'I 'ates maths'. Without even thinking about it, I replied, 'But you don't hate me so get your book out and make a start' – which he did. Without wanting to sound flippant, having good working relationships with pupils is at the very heart of my professional practice. It is a fundamental cornerstone in setting up that climate for learning in my classroom where pupils feel comfortable, which then helps them to take (educational) risks and further their learning. Making connections with them on a personal level can oil the wheels and completely change the classroom dynamic to one in which high quality learning can take place. So I will ask them about their holidays, bore them with mine (see this issue's An idea for the classroom) and talk about mutual interests – it's amazing how much you can find out in those few minutes as they are arriving and leaving the classroom!

Make sure my pupils are active learners with a relevant curriculum
I had a conversation with a new colleague last term that has stayed with me through the holiday. He said that pupils sometimes feel that mathematics is something that is 'done to them' whereas he wanted pupils in his classroom to 'do mathematics'. The image of the XXX lesson must become a thing of the past in my classroom, so that pupils are actively engaged in the mathematics that sits within a relevant context.

Question new initiatives – how will they make a difference to my pupils?
There is a danger that this makes me sound radical but read on. There are plenty of new initiatives in education. We tend to polarise into two camps – those that readily embrace everything new and those that run a mile in the opposite direction! Because I have a strong idea of what good learning in my classroom looks like, and a developing sense of how my actions make these good learning opportunities happen, I want to be able to make a connection between the new 'thing' (functional maths, new GCSE,

pair of linked GCSEs, PLTs etc.) and the learning that will take place in my classroom. I find it less overwhelming if I can see a new initiative as a special case of a general principle.

Engage in personal CPD activities

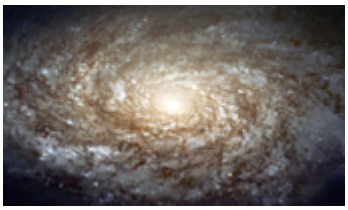
How is it OK for me to expect my pupils to be active learners if I am not one myself? I need to continue to charge my professional batteries throughout the year, not just every August! What will I do? There are lots of possibilities. I could:

- read the Secondary Magazine every fortnight
- make a post in one of the NCETM forums
- contribute to departmental development
- join a school-based learning group
- undertake an action research project
- become a chartered mathematics teacher

Get a life!

I have enrolled for that yoga class. Every Wednesday at 7.30pm I will be saluting the sun and posing as a tree. It is really important to me that I am not solely defined as a mathematics teacher.

Why not share your resolutions with us here?



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.

Astronomers have recently discovered a star that is 13 billion light-years from Earth. The light seen from this star is estimated to date from around the time the universe was created. The size of our universe can be difficult to comprehend. This Up2d8 puts these distances into context, allowing students to visualise the relative distances involved.

Students are introduced to the story. In order to put such large numbers into context, they initially examine the relative distance between planets within our solar system. They then calculate the time it takes for light to travel from the Sun to Earth and other planets. This will provide a reference point when considering how far a light-year is and the distance from the recently discovered star to Earth.

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: Romey Tacon

About you: Romey works for the Numicon Project as Training Director, having been involved in the original research that formed the basis of the Numicon Project, which is still work in progress. Romey started teaching in 1982, originally as an art specialist, but then became involved in mathematics as a subject leader and then a leading mathematics teacher.

The most recent use of mathematics in your job was... Working out return mileage from Lewes to Thurrock.

Some mathematics that amazed you is... Several years ago my class of six-year-olds decided to find out how many seeds there were on a dandelion clock. They eventually counted the seeds on three, each of which had 180 seeds.

Why mathematics? It's vital for our young people to have real career choices.

Your favourite/most significant mathematics-related anecdote is…
Last term on training, a teacher asked why there isn't a Numicon Shape for zero…my three-year-old granddaughter asked the same questions a couple of days later.

A maths joke that makes you laugh is…
I love hearing children say 'I can count to 100 – one, two, miss a few, ninety-nine, one hundred'. A sign that they are beginning to get really confident in their counting!

Something else that makes you laugh is… Have I Got News For You.

Your favourite television programme is… Coast.

Your favourite ice-cream flavour is… Not a fan of ice cream, but recently I did enjoy a delicious apple sorbet with calvados.

Who inspired you? The HMIs running one of the five-day courses (sadly discontinued). This one was in Chichester in the 1980s and was about giving children direct experiences – in the natural world and through music and creating magical environments, which inspired children to achieve the most amazing work across the curriculum. The course was a life-changing experience for me – shaping the path of my teaching by opening my eyes to the power of children's minds and their ability to create beautiful images.

If you weren't doing this job you would… Learn to speak better French and sail to France a lot to use it.

Focus on...maths tricks

- Predict the answer to a calculation using randomly generated numbers using this process: invite a member of your audience to select any three-digit number (we'll work with 652) and reverse the digits to make a second three-digit number (such as 256). Subtract the smaller from the larger (652 – 256 = 396). Use the digits from the answer and reverse them to make another three-digit number (693). Finally add the answer to its reversal – the answer will always be 1089 (396 + 693 = 1089).

- Kaprekar's process allows for the result of a repeated subtraction to be predicted. Take any four digits (we'll work with 2, 4, 5 and 8) and rearrange them in ascending and descending order to make two four-digit numbers (2458 and 8542). Subtract to get a new four-digit number (8542 – 2458 = 6084) and use the digits of this number to repeat the process (arranging the digits in ascending and descending order gives 0468 and 8640, 8640 – 468 = 8172). Continue repeating and eventually the answer will be 6174 (8721 – 1278 = 7443; 7443 – 3447 = 3996; 9963 – 3699 = 6264; 6642 – 2466 = 4176; 7641 – 1467 = 6174).

- Predict a randomly selected number using this method. Select any size set of digits (five or six digits is usually manageable, maybe use a phone number without the code. We'll work with 602073). Rearrange the digits to make a second number (730026) and subtract the smaller from the larger (730026 – 602073 = 127953). Now invite your audience to select one digit from their answer 127953 and to read out the remaining digits (1, 2, 7, 9 and 3) to you. To predict the missing digit, sum these digits (1+2+7+9+3 = 22) and subtract from the next multiple of 9 (27 – 22 = **5**).

- To demonstrate how incredibly quickly you can add a set of digits together, ask a member of your audience to create the first 10 terms of a Fibonacci-style sequence using two starting numbers of their choice (we'll work with 3 and 7 which gives the first 10 terms 3, 7, 10, 17, 27, 44, 71, 115, 186, 301). You might like to sneak a look at the seventh term while they're working or wait until they have completed the whole sequence. Either way, while setting them the task of summing the 10 terms of the sequence you can write down the answer by multiplying the seventh term by 11 (71 × 11 = 781 = 3 + 7 + 10 + 17 + 27 + 44 + 71 + 115 + 186 + 301). Multiplying a two-digit number by 11 can be done very quickly by writing the first digit and the last digit with a space between them (so, for 71 × 11 write 7_1) and filling the space with the sum of the two digits (7+1 = 8 so the answer is 781).

- Impress your audience with your ability to summon the mathematical spirits! Invite a member of your audience to memorise the bottom card of a deck then ask them to put the deck on the table and to turn over the top three cards (we'll assume that these are a three, a jack and an ace). Now invite your audience member to start with the number on the card and to deal cards from the top of the deck until they get to 15 (so, for the three they'll count out another 12 cards, for the jack they'll count out four cards and for the ace they'll count out 14 cards). Keeping the three initial cards on the table they should now place all of the cards that they've just counted out on the bottom of the deck.
  Now ask your audience member to sum the three initial cards (three, jack (11) and ace) that they chose (3 + 11 + 1 = 15) and to deal out that many cards and to place them on the bottom of the deck.

Now ask your audience member what their card was, let's say it's the king of clubs. When they tell you, you (and maybe your audience) will summon the mathematical spirits by chanting "king of clubs come forth, king of clubs come forth…"
Although it may appear that nothing has happened, invite your audience member to turn the first card of the deck face up, then the second, then the third and then the fourth. The chosen card will come fourth/forth.

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An idea for the classroom – the Norwegian supermarket

Having recently spent some of my summer holiday in Norway, I was intrigued by the receipts that I received at the supermarket. With no knowledge of the Norwegian language and little familiarity with the currency there seemed to be a few discrepancies that I wanted to understand.

Part of sharing my holiday with pupils (see From the editor – resolution 1) in school is sharing this dilemma and asking pupils to help me make some sense of the situation. Is this functional mathematics? I am planning to give them the sheet of four receipts and ask them to tell me what they notice. What is it that is puzzling me?

For some classes I may need to prompt them to notice that each receipt has a line just before the total:

What does this mean?

It must have something to do with 'rounding' – and if you then add up the amounts of the items, do they sum to exactly the amount charged? Perhaps there is some rounding, up and down, that takes place. I then realised that there are no coins that are less than 0.50 Norwegian kroner – how might that affect the rounding decisions?

My husband said something to the effect of: "That's silly. Why do they price items at amounts that you can't actually pay?"

I think this will be the question that I will put to my classes and invite them to write a short paragraph explaining their ideas. What do you think they will say?

5 things to do this fortnight

- The Royal Statistical Society hosts its annual conference from 7 to 11 September 2009 in Edinburgh. An exciting and wide-ranging conference programme is planned which, together with an excellent host city, promises to make RSS 2009 Conference a very successful event. As well as an impressive line-up of speakers and topics on the programme, the conference dinner will offer another enjoyable social occasion to mark the Society's 175th anniversary.

- The TES Education 2009 exhibition takes place on the 2 and 3 October, providing a great free opportunity for you to learn from the experts at almost 60 inspirational CPD seminars, and see, test and compare thousands of educational resources from almost 300 suppliers.

- Are you involved in the Diplomas? The fourth national conference on Delivering Diplomas: Engagement and Collaboration takes place in Birmingham on 1 October. There will be keynote speakers from FE, secondary, employers and the QCDA, as well as a group of first year Diploma students from Hanham High School, Bristol, showcasing and discussing their work.

- On 27 October, Gresham College is hosting Brilliant-cut diamonds and other tricks of the light at the Museum of London. Simple mathematics reveals how to cut diamonds so as to create the most brilliant effect through the refraction, reflection and dispersion of light. We also look at some of the unusual effects of reflection and refraction that have been used to create illusions, and reveal why your right hand becomes your left hand when seen in the mirror but your face is not turned upside down.

- Do you like cheese? If the answer's yes, then make sure that you're in Cardiff on 26 and 27 September for the Great British Cheese Festival. The Great British Cheese Festival is to cheese what Wimbledon is to tennis, so make sure you put it in your dairy diary.

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Diary of a subject leader

Real issues in the life of a fictional Subject Leader

What is the most significant date in the academic calendar? For some it will be the end of the summer term, the day when the stresses and strains of the past 11 months are temporarily forgotten. For some it will be the start of the autumn term and the anticipation of what another year may bring. For me it's results day. I get a great sense of satisfaction when the results are good and am always proud of individual successes, yet I am inevitably reluctant to join in on the students' celebrations as they collect their brown envelopes. The satisfaction for me comes from the analysis and number crunching!

This is somewhat puzzling, as I've never considered myself as a statistician. Manipulating data has never been my strength or even considered a pleasure. So why do I wait in anticipation for these results?

As much as I would like to say that the headline figures are not important, I know they are. The number of A* to Cs does matter and the profile of mathematics has risen as a result. As I'm presented with the individual grades, the C+ figure will have already been calculated, but what will not be as transparent is the story which lies within the results. Where did the students over/under achieve? Did we get the tier of entry right for the pivotal groups? Were the intervention strategies employed worthwhile? Have the students made sufficient progress across key stages? Did 'Joe Hatch' get his act together in the end and manage to pull it out of the bag at the last minute?

I would sit in front of a computer while some willing volunteer read out the grades and I typed them into a spreadsheet. I would make comparisons with their predicted/target grades and work out crude class residuals, all supported and represented using tables, graphs and charts. I guess the real buzz came from knowing that no one else in the school would be doing this, or at least not to this level of detail. I felt empowered and a little sad! I would then email the findings to SLT with suggested action points attached, setting the agenda for the timetabled meeting with the curriculum deputy mid-way through September.

I am using the past tense as this year all analysis of results is to be done for us! My efforts will no longer be required. Nevertheless, the same questions will still need to be asked, with planned action to follow. Although my time will be saved, a bit of me will miss it. Perhaps I just need to move with the times?