



Welcome to Issue 90 of the Secondary Magazine (incorporating FE)

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From the editor – Lifelong learning

Having been teaching for nearly 30 years (ouch!), this term has given our editor a new insight into pupils' understanding of decimal numbers which is shared in this article.

A resource for the classroom

Although the Olympic Games will be history by September, you can continue to use the context of sport to motivate pupils with the Sports Day Mystery – an ideal activity to start the academic year.

Focus on...group work in mathematics

This issue contains the second in a series of *Focus on...* articles looking at an aspect of pedagogy in mathematics. What does good mathematical learning look like? What role does group work play in your classroom? Here are some suggestions for incorporating group work into lessons.

5 things to do

Here are some mathematical activities for the summer - the perfect time of year to create a Maths Trail. You may need a supply of train tickets for an excursion into the infinite, or you could catch up online with the John Cage Centenary Prom.

Tales from the classroom

How do pupils in your school apply their mathematics in other subjects and what does your department do to make this easier for them? Our Tale in this issue explores the idea of numeracy or mathematics across the curriculum which may be relevant to your school.

From the editor – Lifelong learning

I had a genuine breakthrough in my understanding last term. It has been such a revelation to me that I'm still talking about it. I think I've told all my *maths friends* and quite a few other people as well. I do get the feeling that a lot of them are nodding benignly while thinking 'poor fool' but I'm not sure if this is due to the blindingly obvious nature of my revelation – in their eyes – or to my evangelism in communicating it!

So are you ready to join the throngs of smiling, nodding people? Here goes.

Since reading [Key understandings in mathematics learning](#), I have been thinking about exactly what stops some pupils making progress in Year 7. This term has seen some focussed intervention with pupils who joined Year 7 having achieved a low Level 4 at the end of Key Stage 2; we spent a lot of time looking at decimals (we used the [Understanding and Ordering Decimals](#) card sort from [What Makes A Good Resource](#)). Pupils were having considerable problems working with decimal numbers that had two decimal places like 3.25 or 5.64.

In order to get them 'unstuck' - and I know I have done this countless times in the past - I said 'think of it as money' and wrote a £ sign in front of the numbers making them £3.25 and £5.64. Hey presto! As if by magic these numbers were suddenly real amounts pupils could work with, order, add, subtract etc. So now they understood decimals, we could work with numbers with three decimal places? How wrong can you be! 3.254 and 5.643 came out of a different stable completely.

I then chose the number 9.58, being Usain Bolt's world record time for the 100m, and asked the pupils to use whatever apparatus they wanted to show me the number. Here is one of the images created:



After some extensive questioning, I realised that this pupil had no sense of how the multiplicative nature of the number system extends to decimals – and more especially using £9.58 made them think that this was nine pounds and fifty eight SINGLE pennies (not 5 tens and 8 pennies). So adding a third decimal place still made no sense whatever.

OK, so now you have joined the smiling nodding people I know.

I had used a short cut (that might be useful for some Year 11 students the week before an examination) which gave the pupils no added understanding but merely allowed them to work with a subset of decimal numbers. Idiot that I am! So out came the Base 10 apparatus and time was spent with many more experiences of place value in an attempt to promote understanding, however unwilling the pupils were to 'play' with something they felt was a bit beneath them.

This experience has made me question many things that I say to pupils in the classroom and I haven't had such a buzz from my teaching since I begun to understand why pupils find perimeter and area difficult – but that's another story...



A resource for the classroom – Sports Day Mystery

At the risk of spoiling your holiday, it is about now that I begin to start thinking about activities for the start of the Autumn Term. I know that I want to start off the academic year as I mean to go on; for me this means that I want pupils having to start thinking as soon as they come to their mathematics lessons. New exercise books and clean tables should be a spring board to enable active learning in the classroom (if you read the [Tales from the Classroom](#) in the last issue, this activity would come in the 'curious, confident learners' section of the Venn Diagram).

With this in mind, this *Resource for the classroom* is a sports day mystery that I will use with various Key Stage 3 classes.

The scenario is outlined on two of the cards but in essence is that Chris, Joe, Lee and Mel are competing at their local sports day, and pupils need to work out who entered which event, which House they represent and their time.

For my most independent classes (and that may well include the classes I taught last year who are used to my way of working), I will ask them to work in pairs, give them the [sheet of clue cards](#) to cut up and let them solve the mystery. I may appoint a couple of observers to go around the class and try to pick out some key points that helped pairs of pupils make progress, that they can feed back to the class later.

For slightly less independent classes I will need to give some instructions:

- work in pairs
- cut up the clue cards
- solve the mystery.

For these classes (and many others) I will probably stop them after a few minutes, when all the cards are cut up and they have read them, to talk about the problem and how they are attempting to solve it, if there is any card that is particularly useful etc.

For my least independent classes I will include some suggestions or a conversation about how they are organising themselves, what do they do with the cards they have finished with, how do they present their results.

Do [let us know](#) how your pupils get on with this mystery.

Downloads

- [Sports Day Mystery - clue cards](#)
- [Sports Day Mystery - solution.](#)



Focus on...group work in mathematics

Talking to pupils in mathematics classrooms, there are some pupils who clearly dread mathematics when it has the image of being a subject that you do on your own and largely in silence. Pupils say that they like being able to work collaboratively, and that it helps their understanding of new concepts to be able to talk things through with another pupil. Having pupils working in groups can change the dynamic of the mathematics classroom and changes the nature of the teacher's role in the room: getting the right balance of facilitation, support and challenge is a skilled job. Here are some suggestions to encourage group work in your classroom.



The [NRICH](#) website has [practical suggestions for groupwork](#) which includes assigning roles to different members of the group. Facilitator, recorder/reporter, resource manager and understanding co-ordinator are clearly defined.



The NCETM departmental workshop [Group Work](#) could give you some ideas for using group work in your classroom



The Bowland mathematics professional development materials include a unit, [Fostering and managing collaborative work](#).



Download the SMILE publication, [Revision for GCSE through Groupwork](#) from the National STEM Centre eLibrary. The materials have been written in topic areas and are sets of differentiated cards. Pupils can work in groups using the cards as part of a collaborative learning experience. The resource suggests different models for using the cards.



5 things to do



Make a [Menger sponge](#), like these pupils at Cullompton Community College, Devon, who are making their Menger sponge out of used train tickets. The Menger sponge is a sort of three-dimensional fractal: as its volume becomes smaller and smaller, the surface area gets larger and larger:



Create a [Maths Trail](#). As part of the 50th anniversary of the [Institute of Mathematics and its Applications \(IMA\)](#) it is hoped that there will be a set of regional maths trails.



Link some school mathematics to real world applications. The MEI Mathematics in Work competition 2012 asked students spending a year in industry to illustrate how they use school mathematics in problems encountered in the workplace. These exemplars can be accessed on the [MEI website](#). One exemplar is an [application of trigonometry](#), which might help to answer the 'Why are we doing this Sir?' questions in the classroom.



Book your place on the South West Mathematics Network's [Annual Conference](#) to be held on 14 September at the University of Exeter. The title of the conference is *Working Algebraically 5 - 19*, and the keynote speaker is Professor Anne Watson.



If you missed the John Cage Centenary Celebration Prom ([Prom 47](#)), you can catch up via the BBC's iPlayer for the next few days. It featured exclusively the work of [John Cage](#) (1912 - 92), and includes two of the [Number Pieces](#): 101 (a piece for orchestra of 101 musicians) and Four2 (the second work for four performers).



Tales from the classroom

What is numeracy? What does it mean to be numerate?

These are questions I've been thinking about at the tail end of the year, as the rain falls. I've been asked to work on and develop numeracy across the curriculum which is, I must admit, not something that I'm particularly looking forward to. It has the feeling of doing lots of work in order to simply tick a box on an action plan. I'm determined to make it something worthwhile.

Is numeracy just another way of saying 'is good at their tables' or 'can add up and take away without a calculator'? Does being numerate *exclude* the use of a calculator?

I was talking to a friend the other day who talked about *numerosity* which is, I think, a made-up word (certainly my spell-checker doesn't recognise it and Google isn't very helpful either). Talking to him about this I realised that his word meant more to him than just being good at sums.

Numerosity is, for him, about having a sense of number, having a feel for numbers. The famous story about [Ramanujan and Hardy](#) is an extreme example but I think this is what he means.

For me numeracy is about two threads. There is the bit about knowing your tables and number bonds, having flexible and efficient calculation strategies, but there's also the bit about knowing when to do these things with the numbers, understanding the problems, understanding the thinking behind the calculation.

Isn't being numerate more than just knowing that seven times eight is fifty six? Isn't being numerate also knowing *why* seven times eight is fifty six?

Am I getting numeracy muddled with mathematics? Are they different? Maybe numeracy is a subset of mathematics? What mathematics do other subjects use? What numeracy skills do they develop? Again, I come back to the distinction between working with numbers and thinking mathematically.

Some subjects use mathematics overtly. Science, geography, design technology, but I think that most, if not all, subjects use mathematical thinking. I'm trying to think of a colleague who'd say 'you know – I wish some of my students would think less rigorously and less methodically. What I want in my lessons is some illogical thinking!' I can't imagine it!

So my strategy for getting the staff (even the drama department!) to get involved in 'developing a range of skills, including... mathematics' is to focus on the thinking behind the numbers. I intend to claim a few ways of thinking as being mathematical (think of the skills used in solving a Sudoku) and aim that every member of staff knows that, in working on these in their lessons, they are developing mathematics. Whether that's the same as developing numeracy I need to think on some more.