Secondary Magazine Issue 33

Welcome to Issue 33 of the Secondary Magazine. This is that critical time of year for your Year 11 students. As you prepare those last-minute revision sessions and prepare to say farewell to another group of pupils, we hope this issue will give you some wider mathematical ideas to consider.

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From the editor: Continuing Professional Development

Have you had some good Continuing Professional Development (CPD) recently? What did it look like? What is the best form of CPD for you? I had the opportunity to rethink some ideas on CPD last week as I joined a group of teachers to visit schools in the state of Kansas, USA.

Teachers in the USA have to re-license every five years, and as part of this process they have to present evidence of professional development, which can include university courses or in-house professional development activities. Teachers told us that they have professional development periods built into their weekly timetable, when they can engage individually and in small groups with the school's ongoing programme.

I was fortunate enough to join a group of teachers as they completed a 'Learning Walk Bingo'. Teachers, armed with a grid like the one below, visited colleagues' classrooms and recorded what they saw.

Objectives	One paper (SIP Strategy)	Problem Solving (SIP Strategy)
Co-operative learning (what structure did you observe?)	Something GREAT	Vocabulary Strategy (indicate the name or process)
Differentiated Instruction (how was it differentiated?)	Compare/contrast chart	Thinking Map (Bubble Map or Circle Map)

After a 20-minute learning walk, the teachers came back and had a professional conversation, sharing the strategies that they had observed, which were plentiful. This session came after some input which had focussed on some of the pedagogical strategies on the grid. I felt extremely privileged to be part of such focussed discussions about teaching and learning – the very essence of our professional interest.

There is a danger that, having identified something which seems impressive in its own context, one tries to import this idea into a different environment without understanding some of the background factors which contribute towards its success. With this in mind, what can we learn from this experience?

Amid all the hustle and bustle of a day at school, it is the activity that happens in a classroom with pupils that is at the heart of our business; the interaction between a teacher and a group of pupils that enables teaching and learning to take place, and that is the reason we are there. What forum do we have to talk about those particular episodes?

As teachers, we have skills and capacities which we do not always recognise and identify. What opportunities do we get to identify and explore our professional strengths and weaknesses?

Many of us have opportunities to attend a CPD event which can be memorable – we then need to translate the outcomes of the event into our own classroom practice if it is to have an impact on our pupils' learning experiences. What opportunities do we have to make sense of the input we receive, and how do we share our new ways of thinking with our colleagues?

What does good CPD mean for you? Why not tell us about it?

.www.ncetm.org.uk

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

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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.

A successful Formula One team relies on many factors working in harmony with each other; these include the skill of the driver, the car's aerodynamics, engine power, tyres and a degree of luck. Nevertheless, no matter how advanced any of these factors are, in order to win the team must employ the optimum race strategy and outwit their opponents. This Up2d8 resource takes Ross Brawn, race strategist and owner of the Brawn GP team, as its inspiration, with students being asked to use trial and improvement strategies to win the race.

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.

Click here to download the Up2d8 maths resource - in PowerPoint format.

The Interview

Name: Anne Watson

About you: I was a mathematics teacher for many years and now I help train new mathematics teachers and also find out how people can learn mathematics with more interest and understanding.

The most recent use of mathematics in your job was... thinking about how amazing trigonometry is: that you can work out so many things if you understand its basic ideas – ratio, rotation, angles and how to write it all down.

Some mathematics that amazed you is... that trigonometry tells us about everything that comes in waves: sound, light, radio and – well – waves! Surf - n - trig.

Why mathematics? It's got the lot – mystery, surprise, elegance, power, sometimes a satisfactory conclusion (but not always) and cliff-hangers. It has good raging arguments, and its own language. It doesn't hurt too much most of the time, and it has the 'ever after'. Although maths makes weapons, it can also make peace, green technology, fairer distribution.

Your favourite/most significant mathematics-related anecdote is... I heard someone say that it is amazing that our minds can comprehend that infinity is in the smallest possible thing, and in the largest possible thing.

A mathematics joke that makes you laugh is... (overheard on a train) Granny to grandson aged about four: "What's two and two? Look, look at my fingers, what's two and two?" (Granny goes on like this for about five minutes.) After a time, grandson: "Bunnies".

Your favourite television programme is... *Antiques Roadshow* – at my age it's the only outing I get.

Something else that makes you laugh is... a jam sandwich is better than nothing. Nothing is better than champagne. Therefore a jam sandwich is better than champagne.

Your favourite ice-cream flavour is... choco, nutty, fudgy, toffee, crunchy whatever.

Who inspired you? Georg Pólya.

If you weren't doing this job you would... hide under the duvet, I love my job.

Focus on...division

The sign for division, ÷, is called an *obelus* and was first used as a symbol for division in 1659 in *Teutsche Algebra* by Johann Rahn. Some think that John Pell, who edited the book, may have been responsible for this use of the symbol. The *obelus* had been used by some writers to represent subtraction and this use continues in some parts of Europe, including Norway.

The word *obelus* comes from the Greek word for a sharpened stick, spit, or pointed pillar. Originally, this sign was used in ancient manuscripts to mark passages which were suspected of being corrupted or spurious.

It is quite natural for young children to associate 'making smaller with dividing because sharing things out or breaking into groups naturally uses smaller numbers. However, it can cause confusion when division is extended to other types of numbers. It is unhelpful if the teacher reinforces that locally valid generalisation, because when the notion of number is extended, it will no longer be true, and may mislead learners into making errors. Read more about this in Mathemapedia.

What happens when you divide by zero? A professor at Reading University claimed that he had the answer in 2006, though this proved to be controversial in the mathematics community! Read more from the BBC website.

To find out if a number is divisible by 7, take the last digit, double it, and subtract it from the rest of the number. If the result is divisible by 7, then the original number is divisible by 7. For example, to test if 406 is divisible by 7, consider the last digit, 6, and double it to give 12. Taking 12 from the rest of the number gives $40 - 12 = 28$. Since 28 is divisible by 7, then 406 is also divisible by 7.

Conceptually, division describes two distinct but related settings. *Partitioning* involves taking a set of size a and forming b groups that are equal in size. The size of each group formed, c, is the quotient of a and b. *Quotative* division involves taking a set of size a and forming groups of size b. The number of groups of this size that can be formed, c, is the quotient of a and b.

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An idea for the classroom – perimeter

In Issue 31, I talked about an article in 'Mathematics Teaching' 211 – November 2008 written by John Mason. Included in the article are some activities which are 'designed to promote work on the awareness which underpin perimeter and area'.
Following on from John's ideas, I was inspired to do some more work on perimeter.
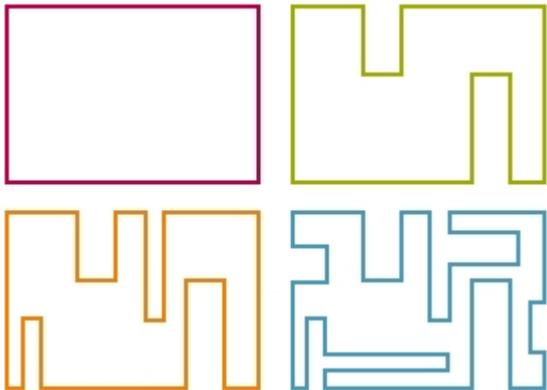
The resource shows a rectangle.
If you know the length and width of the rectangle it is possible to work out the perimeter. If the length and width are a and b, the perimeter is 2a + 2b. Similarly, if indents are made to the rectangle, the perimeter can still be expressed in terms of a and b.

The resource goes on to show progressively more complicated shapes, each derived from the previous one, whose perimeters can be expressed in terms of the original length and width.

Having used the shapes on the resource, students can be asked to draw their own rectangle and progressively modify the shape, at each stage determining the new perimeter in terms of the original. Using your own starting point and making your own modifications is an integral part of the activity rather than a 'bolt on' for those that finish quickly.

Good questions to ask pupils would be:

- How does your new shape relate to your original shape?
- Is the width of the indent important?
- Is the length of the indent important?
- Can you draw a shape whose perimeter is *4a + 2b*, etc?
- Can you draw a shape whose perimeter is *3a + 2b*, etc?

Although pupils calculate the perimeter of the shape, the main focus is to use mathematical reasoning to justify the decisions the pupils make in order to perform the calculations.

Have you got a nice activity to reinforce pupils' understanding of perimeter? Why not tell us about it?

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5 things to do this fortnight

- Have you contributed to the QCA's consultation on A level maths? QCA has worked with subject experts and representatives from the mathematics community, including teachers, subject associations, universities and awarding bodies, to develop draft criteria for consultation. The criteria set out the required knowledge, understanding and skills for AS and A levels in mathematics to help make sure these qualifications prepare learners for progression to higher education and employment. The consultation closes on 9 July.

- On 18 May Marcus du Sautoy is contributing to Bristol's Festival of Ideas with A Mathematical Odyssey Through Everyday Life. He'll show how mathematical inventions are fundamental to life and work; how prime numbers are the key to Real Madrid's success, discovering secrets on the internet and the survival of insects in North American forests, and much more!

- Have you read the report from Ofqual reviewing the standards in GCE Maths from 2004 and 2007? The report was released a couple of months ago and looks at the period when A level maths went through a number of significant changes, most notably the change in the balance of pure to applied mathematics.

- How can you find time to get everyone to try to explain something to someone? Do you relate to this?! The first of the mathematics GCSEs is only a couple of weeks away, so maybe reading this Mathemapedia entry about Speed Teaching Revision is the answer?

- Did you know that Norway has been last in ten Eurovision Song Contests? This year's contest takes place on 16 May. Get your pizza order in early and cheer Eurovision: Your Country Needs You winner Jade Ewen as she takes to the stage in Moscow.

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

My heart sank as I spoke to a mother and her daughter during a parents' evening last month. She is a hardworking student yet struggles in maths, mainly due to a lack of confidence in her own ability. This was confirmed as she expressed her dislike for the subject, a viewpoint which was then echoed by her mother. Why is it that some adults will openly admit that they 'can't do maths' as if it's some kind of achievement?

I left contemplating how we could turn this around and overcome the stigma with which maths is sometimes viewed. Since many of the parents' preconceptions were formulated while they were at school, we as a department wanted to invite them into maths lessons, allowing them to experience not only the kind of work their children were undertaking, but also for them to see that maths teaching was not necessarily as they had experienced in the past.

After presenting the idea to the senior leadership team, it was agreed that the maths department would run a workshop where parents would be invited to both attend and participate. Year 7 seemed an obvious place to start, providing parents with an opportunity to familiarise themselves with both the school and the types of activities encountered within lessons. All department members contributed to the activities, all of which were chosen specifically to encourage both parent and child to work collaboratively in developing problem-solving strategies.

Once we had set a date, the organisational focus changed to the practicalities of the event. We needed to consider the various stages of running the workshop, from the moment the parents entered the school premises to the time they left. Fortunately we got on with the admin team, as their organisation, time and assistance became vital.

As the parents arrived at the school, they were escorted to the workshop to join their child. Some looked terrified. The uptake was promising, with just under half of the students having a parent present. Our aim was to get both child and parent talking about maths by undertaking accessible problem-solving activities and it was not to be about learning 'new' maths. After a hesitant and nervous start by some, the room soon buzzed with noise and mathematical conversation. Phew!

The feedback received at the end was very positive. Many parents and children seemed to appreciate the opportunity to work together and arguably view each other in a new light. The event was a success and possibly the first of many, providing the need for such an occasion continues. Somehow, I suspect it will.