Welcome to Issue 29 of the Secondary Magazine. With Easter less than a month away, life at school is getting increasingly hectic as the weekly exam countdown enters single figures. We hope this issue will keep you in touch with a wide range of mathematical ideas and activities as the exam season approaches.

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From the editor – What do you do?

I'm sure you have been asked that question at a party or other social encounter. What do you reply? How do your replies contribute to the image of mathematics amongst the wider community?

Up2d8 Maths

The fortnightly Up2d8 maths resources explore a range of mathematical themes in a topical context. In this issue, Up2d8 considers the remarkable role played by palaeontologists in determining the probable size of the massive snake whose remains were recently discovered. Even ophidiophobics will find this intriguing.

The Interview – David Courtney

Are you worried about money? How is the credit crunch affecting you? In this issue's interview, David gives us an insight into the work of a Financial Adviser and the mathematics involved.

Focus on…the helix

The structure of the DNA-helix, the molecule that carries genetic information from one generation to the other is now familiar, but the helix has other fascinating mathematical properties which you can explore here.

An idea for the classroom – tile drawing

Do you enjoy seeing those lovely arrangements of tiles in porches and doorways? This resource provides you with a stimulus to share one of these patterns with pupils and extend their mathematical thinking.

5 things to do

There are some interesting 'things to do' featured in this issue but above all, please remember Mothering Sunday!

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

How are responsibilities in your department allocated? Do you have opportunities to review and reallocate roles in the department according to new initiatives? This diary may encourage you to consider a different way of working together.

What do you do? You're a MATHS teacher!

What is it in our modern society that makes us define and categorise people? I know I do this a lot – I have some 'sorts' of people that I know and when I meet someone new, I am, usually unconsciously, trying to see if they fit one of my existing categories or whether I have the excitement of making up a totally new category just for them! There are plenty of dangers in this 'people sorting' model – possible characteristics and attributes could be assigned to particular individuals because someone else in that category has them!

Have you had those moments at a party or social gathering when you realise someone is doing that to you? 'So what is it you do?', they ask. 'Oh I teach' is the reply. Next comes the primary/secondary debate which is followed by that crucial question 'What do you teach?'. At this point I start to brace myself for the inevitable set of reactions that come when I say that beautiful word 'mathematics'.

- *Mathematics!*
- *You're very brave.*
- *You must be very clever.*
- *I could never do that at school.*
- *I hated my maths teacher.*
- *All that 'let* x *be the number' stuff.*

I'm sure you've had these and many more responses – it's a real conversation killer at a party. I'm very aware that as I utter the 'm' word my interrogators are doing that categorisation thing to me. I'm sure you are familiar with the research done some years ago where students were asked to draw their maths teacher – we didn't come out very well! I haven't seen people actually check my elbows for the leather patches but I'm sure they want to.

A colleague of mine was once asked if he had a creative outlet after doing all that maths all day – he replied that mathematics gave him all the opportunities for creativity that he needed. Oops – a new category here perhaps? But it is our responses to these comments that can have such a big effect in promoting mathematics as we convey our joy and enthusiasm as my colleague did.

Mathematics is a great subject – it deals with things that are fundamentally true. The big ideas underpinning mathematics help us to describe the way the world works. Pupils who get confused or 'don't get' maths have often been taught a set of algorithms (which they forget) and have lost some of the connections between mathematics and the real world. I feel my job as a mathematics educator is to give children learning experiences which help them make sense of the mathematics which is inherent in the world. I keep coming back to a statement from the Non-Statutory Guidance for the National Curriculum published in 1989:

> *The teacher's job is to organise and provide the sorts of experiences which enable pupils to construct and develop their own understanding of mathematics, rather than simply communicate the ways in which they themselves understand the subject.*

What do you think? What is the point of all those x's and y's? Why are you a mathematics teacher? You could share your ideas by making a post 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 you can personalise to fit your classroom and your learners.

A fossil has been found in Colombia which is a vertebra from a *Titanoboa cerrejonensis*. Scientists have been able to use known relationships between the vertebrae and the length and weight of living snakes to estimate that this snake would have been 13 metres long and weighed over 1.3 tons. This activity allows pupils to gain an awareness of how mathematics can help palaeontologists to interpret such discoveries.

Pupils are invited to collect data about the lengths of arms and hands in human beings to investigate proportional relationships. From this they will gain an awareness of how the palaeontologists used knowledge of existing relationships between the vertebrae and length of living snakes to determine the length (and weight) of the snake whose fossilised vertebra has been discovered.

This resource is not year group specific and so will need to be read through and possibly adapted before use. The way 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: David Courtney

About you: David is an advisor within the financial services industry. Following his school education, he entered into the career of finance in 1981. Roles in credit, risk management, assurance and banking, as well as financial planning, have been undertaken.

The most recent use of mathematics in your job was... when using percentages and a pie chart to calculate existing assets and how they are allocated.

Some mathematics that amazed you is... when I became interested in portfolio design and discovering the covariance and correlation of assets and how assets vary according to so many market factors.

Why mathematics? My father and my grandfather used to test me on my multiplication tables and mathematical formulae skills as a schoolboy. I put this to good use most days, it may relate to clients' personal objectives, tax calculations or performance and statistical data. It is fundamental to success.

Your favourite/most significant mathematics-related anecdote is… 'Investing is not a gamble but an educated risk.'

A mathematics joke that makes you laugh is… Q) What do parents scream when their child walks in to the room dazed and staggering?
A) Oh no! You've been taking derivatives!!

Something else that makes you laugh is… the film with Jack Nicholson, *As Good As It Gets*.

Your favourite television programme is… it's an oldie, *The Good Life*.

Your favourite ice-cream flavour is… Blackcurrant – preferably 'Roskilly's' in Cornwall.

Who inspired you? Harry Markovitz.

If you weren't doing this job you would… be an actor.

Focus on...the helix

Wikipedia states that:

A **helix** (pl: **helixes** or **helices**) is a special kind of space curve, i.e. a smooth curve in three-space. As a mental image of a helix, one may take the spring (although the spring is not a curve, and so is technically not a helix, it does give a convenient mental picture). A helix is characterised by the fact that the tangent line at any point makes a constant angle with a fixed line. A filled in helix, for example a spiral staircase, is called a helicoid. Helices are important in biology, as the DNA molecule is formed as two intertwined helices, and many proteins have helical substructures, known as alpha helices. The word helix comes from the Greek word ἕλιξ.

In mathematics, a helix is a curve in 3-dimensional space.

The following parametrisation in Cartesian coordinates defines a helix:

$x(t) = \cos(t)$
$y(t) = \sin(t)$
$z(t) = t$

As the parameter t increases, the point *(x(t),y(t),z(t))* traces a right-handed helix of pitch 2π about the z-axis, in a right-handed coordinate system.

From Wikipedia
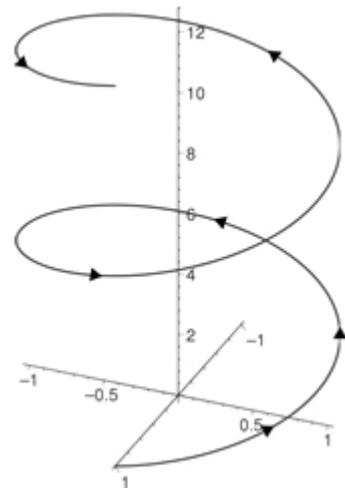
Hedera helix is the Latin name for ivy.

The sentence, "This structure has novel features which are of considerable biological interest" may be one of science's most famous understatements. It appeared in April 1953 in the scientific paper where James Watson and Francis Crick presented the structure of the DNA-helix, the molecule that carries genetic information from one generation to the other.
Nine years later, in 1962, they shared the Nobel Prize in Physiology or Medicine with Maurice Wilkins, for solving one of the most important of all biological riddles. Half a century later, important new implications of this contribution to science are still coming to light.

An idea for the classroom – tile drawing

I was walking through the village last week and noticed a lovely arrangement of tiles in a shop doorway, so I took the opportunity to take a picture of them. It's quite unusual to get a nice self-contained motif like this:
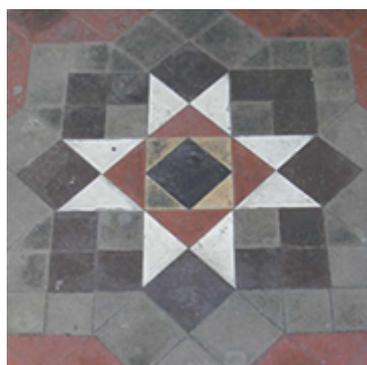
This picture is now a resource that can be used in the classroom, which you can download here.

I've had a set of 30 printed in colour – a luxury perhaps but pupils really respond to having high quality stimuli – and had them laminated so that pupils can draw on them and wipe them clean. There will be some occasions however, when pupils can create their designs on squared paper to keep.

Questions and activities include:

- Tell me something you notice about the pattern.
- Do you like the pattern?
- Why do you like/not like the pattern?
- How many lines of symmetry are there?
- Draw the lines of symmetry on the picture.
- Does the pattern have rotational symmetry?
- What order of rotational symmetry does it have?
- Where is the centre of rotational symmetry? Mark it on the picture.
- Why does the picture give a feeling of 'eight'?
- Draw the picture on the squared paper below.
- Draw a similar picture which has the same symmetrical properties on the squared paper below the tile.

If you decide to use this in your classroom, why not take some pictures of your pupils' work and post them here?

National Centre
for Excellence in the
Teaching of Mathematics

5 things to do this fortnight

Have you booked your place on the ATM conference yet? The Easter Conference runs at Swansea University from the 6 to 9 April. More details can be found here.

Have you read OfSTED's new booklet which follows up their Understanding the Score report? The booklet offers examples of good practice and offers suggestions for how some satisfactory practice could become good.

Have you identified your year 11 intervention students yet? Have you and the English department discussed those students that might achieve their target grade in English but not maths? Or vice versa? The exams are very close now! The Venn diagram tool from the National Strategies' Core Plus materials might help to record these conversations.

Searching for a new way to look at probability? Have a look at the Understanding Uncertainty website which explores the mathematics behind some recent headlines.

Don't forget Mothering Sunday on 22nd March!

Diary of a subject leader

Real issues in the life of a fictional Subject Leader

My second in department is fantastic. She's the sort of colleague on whom you can depend not only to implement initiatives, but also create and develop them. In short, she makes my life at work easier.

Up to now her primary responsibility has been as KS3 coordinator. I was more than happy leaving the leadership and management of Years 7, 8 and 9 within her capable hands, freeing myself up to concentrate on raising attainment at KS4. However, in light of the assessment changes announced back in October, we have both contemplated how her role within the department will change, if at all.

At present she oversees the KS3 scheme of work and assessments, coordinates all planned intervention, implements and drives new initiatives and acts as a filter and/or buffer with matters that occur within the lower school. I am consulted on the 'bigger' issues but day to day events are, thankfully, left in her capable hands. However, my concern is with the imminent changes ahead. Is the exhausting level of intervention still necessary within Year 9? Should we be concentrating on developing the pedagogy in Year 7 in light of the new Programme of Study? Will APP be driving our Teacher Assessment in the future and should we be getting our heads around it sooner rather than later? Suddenly the workload, complexity and demand of coordinating KS3 has become far more challenging.

From experience in running a department, I am very aware of the importance of having a clear vision in order to assess what changes are needed and how they are to be achieved. Consequently, we recently met to discuss and agree our aims and priorities for KS3. The launch of the Key Concepts and Process Skills within the new PoS could not be ignored and if implemented well, the learning experience within Year 7 should be different from that experienced by the older students. We are however, realistic enough to know that change will not happen over night and that developing pedagogy takes time. Nevertheless, teaching and learning within KS3 would continue to be our priority and my faithful second is to lead all developments, including a review of the scheme of work, the sharing of good practice, promotion of the Key Processes and development of assessment procedures.

On reflection, her responsibilities have not really changed yet the dialogue we had was essential in realising this. Although missed by the majority of mathematics teachers, SATs were just another test and in theory their absence shouldn't affect the continuing development of teaching and learning within the department. If anything, it should promote better progression from KS3 to KS4. Only time will tell!