Welcome to Issue 57 of the Secondary Magazine. Hope you have had a good Easter and are preparing yourselves for that mad lead up to the examinations. While it is certainly 'sticking plaster' time for Year 11, our lower school pupils can still be enjoying the wide variety of mathematical experiences that we can provide now that SATs are no longer a consideration. Enjoy the summer term.

Contents

From the editor – textbooks

How have you responded to the wealth of new resources available to support the new GCSE specification we will start to teach in September. This article considers a recent report from King's College London, and the mathematical performance of our pupils in mathematics.

Up2d8 Maths – and the winner is…

The fortnightly Up2d8 Maths resources explore a range of mathematical themes in a topical context. The Academy of Motion Picture Arts and Science held the 82nd of its annual Academy Awards ceremonies on 7 March 2010. This year's event was held at the Academy's permanent home, the Kodak Theatre in Hollywood, and was hosted by Steve Martin and Alec Baldwin with an audience of nearly 43 million.

This resource looks at the common characteristics of the winners of the best actor and actress awards (for example, 88% of the winners of best actor have been above average height), and poses the question – which of the teachers in your school is most likely to win an Oscar?!

The Interview – Richard Crook

Did you know how pupils from low income families get overtaken in learning by their wealthier peers during the summer holidays? Richard, who works in children's services, gives us his perspective on some uses of mathematics.

Focus on…generalising

John Mason has said: *"A lesson without the opportunity for learners to generalise (mathematically) is not a mathematics lesson"*. Read this quote in context and discover some other ideas about generalising from Leibnitz, NRICH and others in this issue.

An idea for the classroom – linear clock

Although I know that time is a linear idea, I still visualise time as the hands on my watch turning round. This linear clock stimulates pupils to think about the passing of time and involve themselves in proportional reasoning.

5 things to do

What do St George's Day, a 'bake and brew', Felix Klein and Sue Pope all have in common? Nothing! Apart from being featured in this issue's 5 things to do.

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

Have you run a workshop for parents in your school? You may want to read about some of the successes and lessons learned from our subject leader.

From the editor – textbooks

Over the past few weeks I have been absolutely inundated with emails, phone calls and packages from publishing companies inviting me to view their new range of resources to accompany the revised GCSE specifications which we will start to teach in September 2010.

It was my Dad who first said to me, after I had been teaching for a couple of years, "I don't know why you keep buying new text books because you are still teaching the same mathematics aren't you?". As a keen young teacher I tried hard to impress him with the colour illustrations and relevant contexts which I thought might inspire my pupils but was forced, eventually, to admit that he was right – there I've said it! Mathematics is full of big ideas and concepts which don't change – that's what is so powerful about mathematics.

I was interested to read an article in *The Independent* on 29 March, *'Quality of school books hit by changes. Constant tweaking of maths syllabus mean textbooks are 'less coherent' than in Asia'*, and even more intrigued to read the headline *'Are poor quality maths textbooks letting English pupils down?'* on the King's College website.

The main findings of the report, taken from the King's website, are:

- *England's improvement in international rankings of maths attainment between 2003 and 2007 does not necessarily mean an improvement in all areas of maths education. Year 9 performance in algebra is still below the international average.*
- *use of textbooks for teaching maths in English schools is low. English textbooks use routine examples and are less mathematically coherent than those used in other countries.*
- *mathematics education outside school – shadow education – can contribute to high standards, but can also have an adverse effect on pupils' wider social development.*
- *there is no link between achievement and enjoyment in maths education. Pupils in countries that perform well in international surveys do not necessarily enjoy maths more than those who perform less well.*
- *pupils from high-performing countries often have low confidence in maths.*
- *countries that perform well in maths have not reduced the difference in attainment between pupils from different socio-economic backgrounds.*
- *there is no evidence that pupils who participate in pre-school mathematics learning are likely to perform better at maths than those who don't.*
- *differences in maths performance between countries do not necessarily reflect differences in standards of teaching. The degree to which the questions used in international surveys match the curriculum content of a particular country is a more significant factor than the standard of teaching.*

The website also states that;

"Cultural factors play an important part in teaching methods and pupil attitudes, and the researchers warn against trying to identify aspects of maths education that appear successful in other countries and importing them into the UK school system."

There are so many points raised here that I am not going to try to respond to all of them, but I do want to ask some questions:

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- what drives the mathematical experiences we provide for pupils in our schools? Textbooks, GCSE specifications, QCDA Key Stage 4 programme of study or our school scheme of work?
- does my textbook use routine examples?
- what does 'mathematically coherent' mean in the context of my school?
- what would our Year 9 algebra performance be like and why?

This looks like the basis for a good discussion item at our next department meeting. What do you think?

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.

The Academy of Motion Picture Arts and Science held the 82nd of its annual Academy Awards ceremonies on 7 March 2010. The first of these ceremonies was held on 16 May 1929, at the Hotel Roosevelt in Hollywood. The cost of guest tickets for that night's ceremony was $5. Fifteen statuettes were awarded, rewarding artists, directors and other personalities of the filmmaking industry. This year's event was held at the Academy's permanent home, the Kodak Theatre in Hollywood, and was hosted by Steve Martin and Alec Baldwin, with an audience of nearly 43 million.

The activity gives students the opportunity to make and justify predictions based on probabilities from a BBC analysis of past winners of the best actor and best actress Oscar. Students are shown the results of the BBC analysis, are shown this year's winners and are asked to compare them to the 'expected' results from the analysis. Students are asked to discuss what's the same and what's different about this year's best actor, Jeff Bridges, and the 'typical' winner, and also to discuss whether it's likely or unlikely that Sandra Bullock (born 1964) was the winner of the best actress award.

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 this Up2d8 Maths resource - in PowerPoint format

The Interview

Name: Richard Crook

About you: I work in the field of children's services. For the last ten years this has been in mental health services and more recently in schools. I am a Dad to two girls and recently got married.

The most recent use of mathematics in your job was... presenting some statistics from Outliers by Malcolm Gladwell that show how pupils from low income families get overtaken in learning by their wealthier peers during the summer holidays.

Some mathematics that amazed you is... research in the US found a strong correlation between height and income. According to the evidence, an inch in height is worth an extra $789 per year in salary.

Why mathematics? To be able to annoy pushy sales reps by asking what their APR is.

Your favourite/most significant mathematics-related anecdote is... the wise man who, as a reward, asked his emperor for one grain of salt on the first chess board square, and two on the next, and four on the next etc...

A maths joke that makes you laugh is...
*Q:* Did you hear the one about the statistician?
A: Probably.

Something else that makes you laugh is... remembering back to when my younger daughter got excited about getting older - "Dad, I can't wait till I'm on the second number line!"

Your favourite television programme is... Top Gear.

Your favourite ice-cream flavour is... Rum and Raisin.

Who inspired you? Sir Ken Robinson.

If you weren't doing this job you would... be fundraising for Shoe4Africa.

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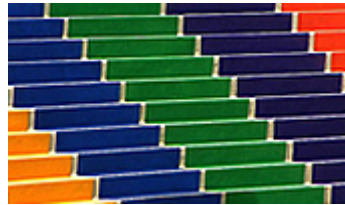
Focus on…risk and chance

- "Spotting patterns can be an important first step - understanding why the pattern works and explaining why it is appropriate to generalise is the next step, and often the most interesting and important." Read more in this short article from NRICH.

- "A lesson without the opportunity for learners to generalise (mathematically) is not a mathematics lesson. Mathematics is fundamentally about becoming aware of and expressing generality. No-one expects young children to memorise all two-digit additions and subtractions. Rather learners are expected to reconstruct a collection of general methods which will enable them to carry out not only all two digit additions and subtractions, but any additions and subtractions. So even the youngest of children are expected to generalise." From the Mathemapedia entry A lesson without….

- "Let us see whether we could, by chance, conceive some other general problem that contains the original problem and is easier to solve." – Leibnitz.

- To encourage learners to generalise in the classroom strategies such as Easy-Hard-General, Particular–Peculiar–General, and Another & Another can be useful. If you have a go with these strategies why not post a comment on the relevant Mathemapedia entry, or let us know by posting a comment on this page?

- The Early Algebra Project at Tufts University in Massachusetts, has identified a set of Number Sentences that teachers used to help students articulate mathematical generalisations.

E X A M P L E S	$78 + 0 = 78$; $23 + 7 = 23$ *
"When you add zero to a number, you get the number you started with."	
E X A M P L E S	$96 - 96 = 0$; $74 -$ ____ $= 74$
"When you subtract a number from itself, you get zero."	
E X A M P L E S	$96 \times 0 = 0$; $43 \times 0 = 43$ *
"When you multiply a number times zero, you get zero."	
E X A M P L E S	$65 \times 54 = 54 \times 65$; $94 \times 71 = 71 \times$ ____
"When multiplying two numbers, you can change the order of the numbers."	

  *denotes a false number sentence
  Source: National Center for Improving Student Learning & Achievement in Mathematics and Science. (2000). Building a Foundation for Learning Algebra in the Elementary Grades

- This page from Cut The Knot starts. "Mathematical discovery is seldom a single step process. Often it's indeed the case where answering a more general question is easier than finding an answer to a specific one. Later, on this page, we'll see a collection of examples that I'll be updating from time to time…"

.www.ncetm.org.uk

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

An idea for the classroom – linear clock

You don't really get a good perception of this resource from a screenshot, so you will need to go and get the 'live' version from the TSM Resources website. After you and your pupils have looked at this image for a few seconds, you may want to start asking some questions, or invite the pupils to ask some questions, to start thinking about.

I started with the question: "What is moving?"

My Year 7 pupils were happy to tell me that the top row, or seconds, was moving. They then quickly followed that by saying 'the minutes' and 'the hours' with the rapid realisation that everything (except the green line) is moving.

So how fast are they moving? It may be easier to ask how much faster one row is moving than another. For example, 'how much faster are the seconds moving, than the minutes?'
This was easy. The seconds and the minutes are represented by equal sized blocks and there are sixty seconds in a minute, so it was obvious that the seconds were moving 60 times faster than the minutes.

But what about this question:
'How much faster are the minutes moving than the hours?'
So if the minutes and hours were represented by the same size blocks, the hours would move 60 times faster than the minutes. But the hours are represented by bigger blocks – what difference does that make?
We needed to make a measurement at this point and decided that the block representing the hour was 2.4 times bigger than the block representing the minutes

To help structure our thinking we used the following diagram:
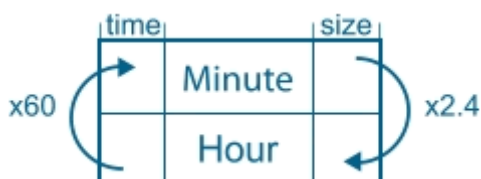
Pupils were then quick to suggest questions which allowed the comparison of different rows of the clock. Do tell us if this resource enabled some good proportional reasoning to take place in your classroom.
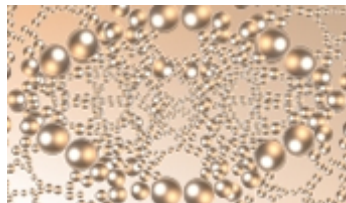
5 things to do this fortnight

- In Liverpool on 22 April, senior representatives from the three leading awarding bodies OCR, AQA and Edexcel, will give parallel presentations on recent core A-level papers, with time allowed for questions from the floor. This will be followed by a plenary session in which Sue Pope, Programme Manager for Mathematics at the Qualifications and Curriculum Development Agency (QCDA, formerly part of QCA), will talk on curriculum and qualifications developments.

- Another of the Gresham College lectures takes place on 4 May. This one is inspired by Felix Klein, one of the great 19th Century geometers, who discovered in mathematics an idea prefigured in a Buddhist myth: the heaven of Indra contained a net of pearls, each of which was reflected in its neighbour, so that the whole Universe was mirrored in each pearl. Klein studied infinitely repeated reflections and was led in his imagination to remarkable forms with hitherto unknown symmetries.
  In the 1980s a group of mathematicians embarked on the first computer exploration of Klein's vision, and in doing so found further extraordinary images of their own. In this lecture you can join one of the group, Caroline Series, on the path from basic mathematical ideas to simple algorithms, whose repetition creates delicate fractal filigrees which are only now beginning to be explored fully.

- Are you thinking about Functional Maths? The Functional Skills Support Programme has produced a number of resources to support the development of functional skills from a classroom level up to SLT. This document offers a progression for teaching and learning functional skills.

- With the exams getting closer it's sometimes useful (though not necessarily easy!) to take a step back and think about something else for a bit. How about whether an infinite number of monkeys typing at random on an infinite number of typewriters will eventually produce the complete works of Shakespeare? This article from Plus magazine offers food for thought.

- Friday 23 April is St George's Day. What better way to celebrate than with the Children's Society bake and brew?! Have a cup of tea and a slice of cake *and* raise money for a good cause!

Diary of a subject leader

Real issues in the life of a fictional Subject Leader

In the past, I have been fortunate to have the opportunity to support parent workshops in other schools. Last week it was time to do that in my own school. I have run quite a few parents events in my own school, but they have always been aimed at Year 10 or 11 and are part of a wider school function or have had a very direct emphasis on supporting students and parents with revision before examinations.

The idea for Year 7 was a little bit different. Attendance to subject parents' evenings is not a forte of our school – less than 25% of Year 11 parents came in last month. As teachers we find that frequently parents have an unrealistic idea of what is possible within the constraints of a school, and what students are capable of achieving – at this point I am remembering a current Year 11 student.

Last year his Mum came into school carrying two very dusty volumes of a somewhat dated text. She was livid that the level of maths he was doing at school was so poor, and she demanded that we teach him certain pages of her text - to our horror - second-order differential equations. My right hand reached for the holster where I keep a loaded Cats predictor. It fired out a 4% chance of doing better than an F at GCSE. My relief was short-lived as I began to realise I was going to have to explain these predictions to a women who thought a lad who was challenged by Grade F work should be solving second-order differential equations. The chance of explaining a probability distribution based on a very sizable sample was not looking good.

Well, I wrote a brief letter and included the prediction sheet and sent it all off to the parent in mind and waited. We've not heard since, but neither has said parent attended another parents' evening!

What I learned from that was that building informed relationships with parents is essential to improving the way students work in my school – hence the Year 7 parent workshop. The workshop happened, some funny incidents, and some awkward pauses to summarise perhaps some EBI's and WWW's

Even Better Ifs:

- I had been able to attract more parents - 16 out of 60 attended
- our reception and hall displayed some students' work that would allow parents to be inspired and just be occupied whilst waiting to start. I'm sure there was an era when the dark wooden panelling was considered fashionable. I can't place it though!
- the caretaker had the hall ready at the start time of 2pm rather than starting to set up at 2pm
- all parents were willing to try an activity – most did, but some point-blank refused to even give some logic problems a go.

What Went Well:

- brilliant attitude of the Year 7 students
- the willingness and patience of 80% of the parents
- support and flexibility of my team of teachers.

Would I do it again? I felt less satisfied with this event than many others. Three separate parents came to speak to me at the end, and they were so supportive and appreciative of the event, and of us making the effort to engage with them. So, if only for those two parents, yes I would do it again. Will I ever reach second-order-differential woman? Basing the probability distribution on this event as a baseline, not a chance!