



Welcome to Issue 112 of the Secondary Magazine

The sun is shining and summer is well underway. Although England did not fare well in Rio, there are plenty of other summer treats to savour, such as Wimbledon, the Tour de France, and the cricket, as well as the mathematical delights in this issue. Enjoy the sun.

The NCETM would like to congratulate Professor Sir David Spiegelhalter on his knighthood in the 2014 birthday honours for services to statistics.

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The latest OECD report, An International Perspective on Teaching and Learning, may provoke some thoughts as you prepare for the new school year in September.

Focus on...Maths Hubs

As the Government announce the creation of 32 new Maths Hubs across the country, this article brings you the latest.

A resource for the classroom – trigonometric ratio values

If the values of the trigonometric ratio values for 0° , 30° , 45° , 60° and 90° are firmly imprinted on your brain, can you remember how you learned them? How will you introduce them to your pupils? This resource makes some suggestions.

5 things to do

Mondrian in Margate, recent information from the DfE, the Your Life campaign, a classroom resource, and an optical illusion all feature in this issue.

Tales from the classroom: the King is dead, long live the King!

What do you feel as your Year 11 students leave your school, if only for the summer holiday? This *Tale* recounts how our author gets to grips with his Year 10 group.

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From the editor: Being a teacher

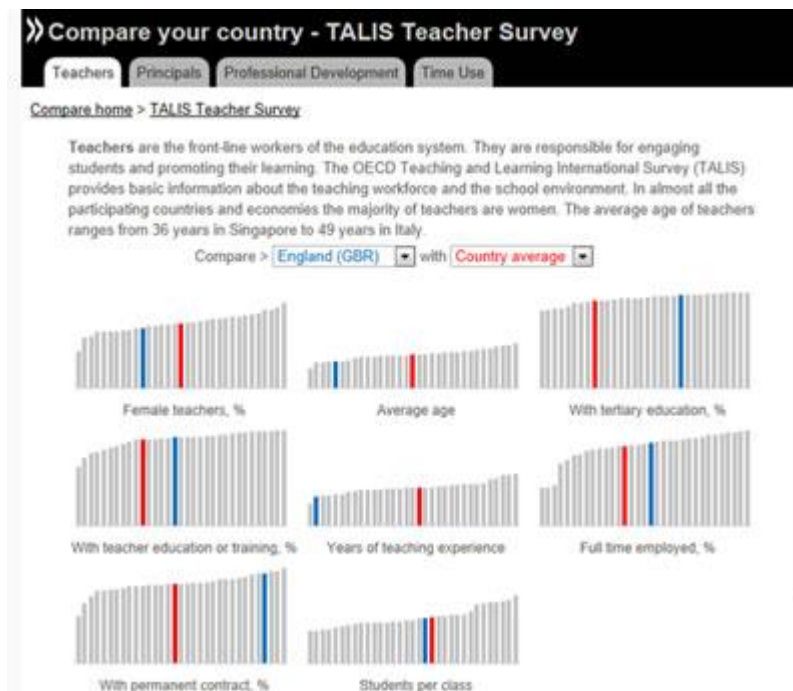
With Year 11 long gone, and the summer holidays just around the corner, the emphasis has changed from getting the very best results for the 2014 cohort to planning for next year. What do we need to do individually, as a department and as a school to provide pupils with the very best learning experiences to prepare them for life after school?

It may seem appropriate that it is in this planning period that the OECD (Organisation for Economic Co-operation and Development) has published a report, [TALIS 2013 Results: An International Perspective on Teaching and Learning](#). Accompanying this publication is [A Teachers' Guide to TALIS 2013](#), which presents information in a way that is easy to read and digest.

The OECD Secretary General's opening paragraph offers some bold statements – how does your own school and your own teaching compare to these statements, and what might you need to do to respond?

The skills that students need to contribute effectively to society are in constant change. Yet, our education systems are not keeping up with the fast pace of the world around us. Most schools look much the same today as they did a generation ago, and teachers themselves are often not developing the practices and skills necessary to meet the diverse needs of today's learners... Recognising that education is the great equaliser in society, the challenge for all of us is to equip all teachers with the skills and tools they need to provide effective learning opportunities for their students.

You may like to see how England compares to other countries by using the [interactive charts](#) at the bottom of the page (you will probably need to scroll down):



There are also some interesting statements about teaching and learning:

Teachers walk into a classroom with an established set of beliefs on how students learn. These beliefs, developed in teacher training programmes and/or through teachers' own classroom experience, shape



how teachers teach. For example, if teachers are convinced that students learn better when they are encouraged to think through and solve a problem on their own, before a teacher intervenes, then they are likely to use more active, student-centred approaches to teaching and learning, such as having students work in small groups, or requiring students to work on a project that takes more than a week to complete.

Some 93% of teachers report that they believe that students should be allowed to think of solutions to a problem themselves before teachers show them the solution.

And professional development:

For teachers, learning doesn't stop once teaching begins. Professional development, at all points in a teacher's career, is necessary to keep up with changing research, tools, practices and students' needs. And there is no better way to communicate to students the importance of lifelong learning than by teachers, themselves, setting the example of being lifelong learners.

Nearly nine in ten (88%) teachers report that they had participated in at least one professional development activity during the 12 months prior to the survey.

You can read the detail in the full report or in the Teachers' Guide.

What will you do now? You could:

- download and read the report or the teachers' guide to the report
- discuss some of the assertions in the report with other members of your department
- consider the implications of the report in the way that you teach mathematics in your own classroom.

Do let us know how this report influences your practice.



Focus on...Maths Hubs

Maths teachers opening their Advent calendars last year had quite a surprise on 4 December: a cheque for £11 million, signed "Liz Truss". On her Christmas list, she asked in return for a network of Maths Hubs to be set up across England, and schools were invited to apply. Over 250 did so, and about 80 were shortlisted for the selection interviews with the Hub-Factor panel of judges of representatives from NCETM, the DfE and the NCTL. On 1 July, the first 32 Hub Lead Schools were announced. Drawn from all across England, from the North Tyneside Learning Trust to Truro and Penwith College, each Hub Lead School will grow a strong network of strategic and operational partners, including:

- Teaching School Alliances, other school clusters and Post-16 providers in the area;
- universities, including staff from the maths teams within education faculties and from maths faculties;
- local stakeholders, such as local authority representatives, and employers with an interest in maths education and independent maths CPD providers;
- people from national partner organisations, such as the Further Maths Support Programme, the Core Maths Support Programme, Mathematics Mastery, and NRICH.

At the vanguard of this alliance, the Hub Lead School will strive to ensure that all schools and colleges in its area have access to high quality support for mathematics education that is relevant to their specific needs. In order to do this, it will:

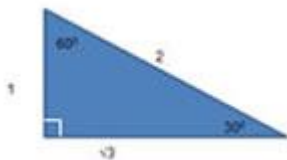
- identify needs and agree priorities for support in their area. This could involve pro-active surveying of schools; responding to requests and referrals; and considering the implications of national evidence;
- co-ordinate a range of high quality specialist mathematics support to address the needs. This could include communicating existing support and extending its reach; commissioning external organisations to provide bespoke support; developing and enabling new forms of support and collaboration;
- critically evaluate the quality and impact of the support provided. This could include gathering immediate, medium-term and long-term feedback from participants engaging with support; and more detailed evaluative research used to test innovations.

At the moment the Hub Lead Schools are developing project plans that will set out how they intend to do this in their Hubs; many are planning launch events in September to share these with their potential Hub partners. If they haven't yet contacted your school, please do [get in contact with them](#). The Hubs don't quite yet cover the whole of England, and there will be three more announced in the autumn to cover gaps in Kent and the Medway towns, Cumbria and north Lancashire, and Northamptonshire.

The first project towards which all the Hubs are contributing is an exchange of teaching ideas between English and Shanghai primary schools. As was first announced in March, two teachers from each Hub will visit twinned primary schools in Shanghai in September, and then the Chinese teachers will come to the English schools for a month. In each phase of the exchange, the teachers will work alongside each other, first planning and then delivering lessons. There is so much that each can learn about and from the pedagogy of the other, and teaching "cheek by jowl" will maximise the rate and depth of the sharing. In future issues we will keep you updated about the Hubs programme, and share with you its findings and recommendations.



A traditional Chinese proverb says that “a nation's treasure is in its scholars”. The England-China Maths Education Innovation Research Project programme is showing that the governments of both countries are committing significantly to ensuring that, when in the future they come to draw from the treasure chest, it is full of 24-carat learners.



A resource for the classroom – trigonometric ratios

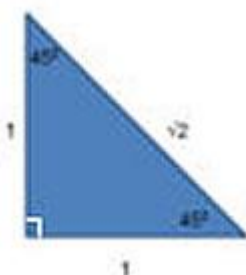
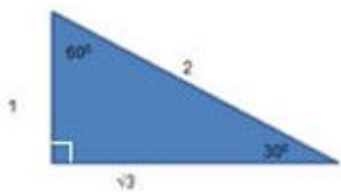
Have you made any adaptations to your scheme of work following the publication of the [Key Stage 4 mathematics GCSE content and assessment objectives for first teaching in September 2015?](#)

Although much of the content is familiar, some of the objectives appear earlier in a pupil's school career than previously. A good example of this is the statement in the Geometry and Measures section which would not previously been included at Key Stage 4:

21. know the exact values of $\sin\theta$ and $\cos\theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° ; know the exact value of $\tan\theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and 60° .

Different pupils need different ways to understand and remember these values. Many teachers would say that they never remember these values themselves because they have a way of working them out so it would be worth sharing this 'way of working it out' with pupils.

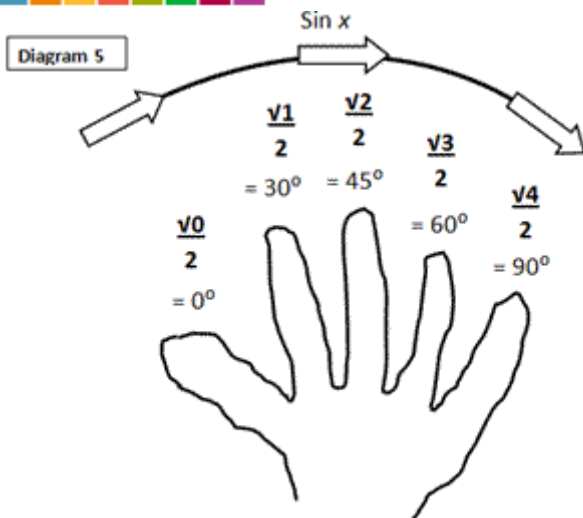
It is important to construct and then display the two right angle triangles that include the angles $30^\circ, 60^\circ$ and 45° :



Pupils can then use their knowledge that

$\sin \theta = \frac{\textit{opposite}}{\textit{hypotenuse}}$ etc, to work out the actual values.

You may be intrigued to see Mike Ollerton's [handy way to remember these values](#) - literally using a hand as a visual aid:



This may appeal to some pupils in your class.

If you have some more good ideas for helping pupils to memorise or derive trig values, please let us know.



5 things to do



If you are in Margate before 21 September you may care to visit the exhibition [Mondrian and Colour](#) at [Turner Contemporary](#). Some of Mondrian's works use colours on a geometric grid. This show explores how his work using grids emerged, as the website states:

His most famous works, the 'grids' use simple lines and the primary colours red, yellow and blue to create a 'universal harmony', separating colour and subject from reality, transforming the material world into something spiritual.



A recent post in Don Steward's [ongoing blog](#) features a set of multiplication squares (originally found on [NRICH](#)) that have links to a Sudoku puzzle in featuring the numbers 1 – 9. Great for developing problem solving skills in the classroom.



The Department for Education has issued information on the new national curriculum to be taught in maintained primary and secondary schools from September 2014. [The four-page document \(PDF\)](#) identifies a range of resources available to support schools implement the new national curriculum.



You may like to consider how you can engage with [Your Life](#). This is an industry-led campaign launched by the Chancellor to inspire more young people to study maths and physics. [Organisations](#) such as Google, Arup, L'Oréal, Microsoft, Ford, BP, BSkyB, Airbus, Balfour Beatty, Laing O'Rourke, IBM, Nestle, Samsung, the Science Museum and the Royal Academy of Engineering have pledged to do more to highlight the career opportunities open to those studying STEM subjects, committing to create over 2 000 new entry-level positions including apprenticeships, graduate jobs or paid work experience posts. [The campaign](#) will talk to 14 – 16 year olds.



As the end of term approaches, you may like to consider [this audio-visual illusion](#).

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Tales from the classroom: the King is dead, long live the King!

"They're over, they're over, they're over, they're over, they're over, they're over, they're over," I shouted with great enthusiasm from the doorway of the maths office to my wide-eyed team triumphant that the last possible Year 11 exam was done and dusted.

Yes, I too - no doubt like you - found the run up to the GCSE maths exams exhausting. Looking back, it's because I've been at it non-stop since exactly a year hence when I could be found standing in the doorway of the maths office shouting, "They're over, they're over, they're over, they're over, they're over..." I must remember to check that nobody other than maths teachers are present in next year's annual celebration as surely it can only be maths teachers who have also been 'through it' that can truly empathise. Well I'm sure each subject has its own perspective.

So with that small burst of euphoria it was off to Year 10. Or is that now Year 11? After all, "The king is dead" so... "Long live the king"!

Well, three days later I had a 'gained free'. And, rather than race around squeezing every last pip out of it, I did nothing. Not absolutely nothing, but the sort of nothing that in school passes for nothing. The 'stuff' that has to happen, but is never allocated time. I un-knotted the cord of my office blinds, revelled in the growing mountain of recycling as I cleared the decks, drank a whole cup of tea then made a second. I then watered the plants, carefully, with fresh water. Such a change from their usual diet of tea slops. I felt great.

And then inevitably as king follows king, it was back to Year 10 (now also known as Year 11). After 20 minutes of teaching, one of my more regular 'sparring partners' very timidly enquired if I was "OK?"

"I'm in fine fettle Sam, but I appreciate your concern." He swung back on his chair.

"OK sir, you can stop now because you are properly scaring us."

An eerie silence encroached on us. I was clearly really scaring them.

The nothingness of that 'gained free' had contained much. They really had gone, yes they had. And having heard the king had died, and now most importantly having had a free lesson doing 'nothing', I'd properly noticed and mourned his passing, I felt ready to hail the 'new king' with enthusiasm. If I hadn't noticed the change in myself, Sam had.

As I patrolled the library yesterday I bumped into Sam, "What's-on Sir" was his preferred address.

"I'm good Sam thanks" was the extent of my linguistic flexibility as I attempted to maintain a casual stance.

"Thanks for that lesson on graphs, I thought it was a bit much that you talked for 53 minutes straight," Sam continued. "I'm sure that's not what they teach you lot in Uni. I thought it was like you talk a little bit then we pretend to work, and then you read some answers that we try to copy, and then we go! But you know, I actually got the whole graph thing for the first time ever... It was like you actually listened to what we did get. I mean really listened. You're not normally that chilled..." Realising his clumsiness Sam began to dig his way out: "Well I mean, yeah, you're chilled as a person, but you're not chilled about the work."

"Stop now before you undo the best praise I've had for quite some time." I suggested, walking away.

Failing to stop, Sam followed. In talking about school and learning Sam was tasting a new elixir, and he was woozy. "And that lesson where we watched cars drive over a pot-hole, that was the best lesson ever. That's way out - that a class of teenagers are all creasing in a maths lesson because they can't believe they are actually laughing at themselves for wanting to watch some weirdo's YouTube vid about cars driving over a hole, and with no soundtrack - but then they're also learning maths?"

"Yep, there sure are some weird people out there Sam. You and me included!" I replied, shutting down the PC in my office as a not-so-subtle cue that it was time to move on.

"True sir, but you know what? I so get the idea of the difference between experimental and theory probability now, and all that relationship [relative] frequency. S'pose weird can work, hey!" Then, with neither demand nor invitation he had sat himself down in my office and was rocking to and fro on my 'chat chair', Sam came to his senses. In lowered register and almost inaudible monosyllabic drawl it was "ByethenSir" and he was gone.

And that was it. (I'll forgive him the relative frequency.) It lifted me like nothing else. Yet there was something in all this. I had made an effort to teach my maths differently, not that I had an epiphany. What was it? I'm not sure it can be unpicked. It does have something to do with being a bit more chilled. Reducing my pace, but not theirs. Perhaps listening to their thirst rather than forcing them to drink - yes definitely resisting that urge to force, force, force. I had attempted to allow them time to ask and think, not overly worrying about the yawns of disengagement from a few, yes trying to hook them back in with questioning, or the well timed 'look'. There is also a nagging voice in my head that says "practical, hands-on, practical, hands-on, practical, hands-on." I don't do it all the time, but I really notice a difference when I do, and perhaps it is that reduced pressure that is giving me the space to do that. I managed a while back with my balancing equations, and I've since played some 'rigged' probability games, both lessons had lightbulb moments for a number of students.

In short I had somehow chilled a little, found a little more tolerance, let go of some angst, and rediscovered that joy of explaining a concept. I was noticeably happy for it. So do I just need to have more faith, and not get so boxed in the system, or, is the pressure of examinations just too pervasive? I think it's a Hobson's choice.

Yes the king is dead, and yes the world continues to spin. And thankfully it does, because I'm really not sure what I would do if it were to stop. I'm happy with it spinning...I just need a moment to stand back and notice I am spinning too, and then hail. "Long live the king".

The author is a mathematics subject leader and assistant principal working in the South West