



## Welcome to Issue 102 of the Secondary Magazine (incorporating FE)

So how has the new term gone so far? Have you kept those new resolutions generated in the summer holidays? This issue has an [Editorial](#) and [A resource for the classroom](#) which might appeal specifically to NQTs and those working with NQTs in mathematics, but also includes features for all as the new term settles down.

### Contents

#### **From the editor – Look after your NQTs**

As the new school year starts, it might be appropriate to consider the answer to this question. Would all of your department give a similar answer? Why not ask them?

#### **A resource for the classroom – Starting and settling**

The NQT year is an exciting, busy period in the life of a teacher. How are your NQTs settling in? How can you help them and how can they help you?

#### **Focus on...Research**

Have you read any mathematics education research recently? In this issue, the latest informal proceedings from BSRLM are highlighted, alongside other ways to access research into mathematics education.

#### **5 things to do**

The NCETM's role in preparing teachers and FE lecturers to teach GCSE post-16, Ofsted, NRICH at Key Stage 5, Twitter chats, and octopi all feature in this issue.

#### **Tales from the classroom**

So how do you cope when something that you do intuitively has to change? In this *Tale*, we consider the value of repeating topics to develop understanding whilst trying to ride a bike that has its back brake 'wired' on the right.

#### **Image credits**

Page header - [The man with the golden brake](#) by Kai Schreiber, [some rights reserved](#)



## From the editor: Look after your NQTs

As you read this, it is likely that there are some newly qualified teachers in your department. How will you help them adapt to life at your school, teaching mathematics? Of course, your school will have all the necessary induction and assessment procedures in place, but how will you, as a colleague, inspire and excite these new colleagues as they start their professional life?

In your department, you will all have different strengths; John's the one who can always solve those tricky mechanics problems whereas Peter has just the best way to explain how to work with negative numbers perhaps. How will your NQTs become aware of these strengths? Do you collaborate as a department? What will be the strengths of your NQTs? How will you find out just how good Mark is at mental arithmetic or discover that Sally is a genius with GeoGebra? And how will you use these skills and develop your colleagues' roles in your department?

Having the opportunity to collaborate with experienced teachers is an excellent form of professional development for an NQT, and NQT mentors often report that they understand their own practice so much better having played that role. You may have a similar ability or age class to an NQT – how about working together on some collaborative planning? Or perhaps the NQT could come and watch your lesson, just informally, to aid their development?

Are you a member of a professional mathematics organisation? Passing on journals and links to websites would be useful. A [list of professional organisations](#) is featured on the NCETM website, as well as information about the [mathematics subject associations](#).

Another feature on the NCETM website to support NQTs might be the Communities: there are regular conversations taking place across a range of communities but you might like to start by trying the [Maths Café](#) or the [Secondary Forum](#).

The NCETM microsite, [Mathematics resources for Teachers in Training](#), includes a [Talking Heads](#) section which features some NQTs at the end of their first term in post, replying to some different questions, including:

- [What is the best advice you've been given about teaching?](#)
- [What's the biggest challenge you have faced so far?](#)

These video snippets are easy to listen to and may just strike a chord with the NQTs in your department – please make sure they see the site! One of the snippets reinforces that NQTs bring a range of different perspectives to teaching; they have much to learn from more experienced members of staff and also much to give.

Enjoy your NQTs, learning from their talents as they are learning from you.



## A resource for the classroom – settling and starting

At the beginning of the year, when you are establishing routines with new classes, it can be useful to develop a set of activities that pupils become familiar with. Once pupils understand what is required of them, they can easily come into the classroom and engage in some meaningful problem solving without needing direct teacher input – you can then be greeting your class or sorting out any other issues that arise at the beginning of a lesson. These activities will usually take up a small amount of lesson time but may be the way to ensure that all pupils are ready to learn in your classroom.

Here is a selection of possible activities that can be modified to suit a range of abilities and topics.



[Arithmagons](#) can stimulate some rich discussion and debate. Initially pupils need to understand the rules – described on the attached website – and then the arithmagons could additionally be used in the context of decimals, negative numbers, fractions, algebraic expressions etc. The puzzles are more challenging if you give values on the edges and ask pupils to work out the vertex values.

Alternatively you could consider an arithmagon that works by [multiplication](#) and the added depth that this provides in all the contexts mentioned above. And using [irrational numbers](#) extends the use of the arithmagons to another level.

Don't think that you need to do all the work in providing these puzzles. Once pupils understand the context, they can generate and set puzzles for each other in the way described in [Issue 97](#).



Once you understand how to construct a [Magic Square](#), you can easily generate another set of puzzles for pupils to solve in a variety of contexts. There seem to be a wide variety of ways on the internet to construct a magic square but this always works for a 3 x 3 magic square.

Take nine consecutive terms of an arithmetic progression, for example:

1 <sup>st</sup> number	2 <sup>nd</sup> number	3 <sup>rd</sup> number	4 <sup>th</sup> number	5 <sup>th</sup> number	6 <sup>th</sup> number	7 <sup>th</sup> number	8 <sup>th</sup> number	9 <sup>th</sup> number
0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9

Now place those numbers in the magic square in the positions indicated on the left:

8 <sup>th</sup> number	1 <sup>st</sup> number	6 <sup>th</sup> number
3 <sup>rd</sup> number	5 <sup>th</sup> number	7 <sup>th</sup> number
4 <sup>th</sup> number	9 <sup>th</sup> number	2 <sup>nd</sup> number

1.7	0.3	1.3
0.7	1.1	1.5
0.9	1.9	0.5

Now you can decide which numbers to rub out to create the right level of challenge.

Don't be put off – you will soon be able to generate magic squares very quickly!

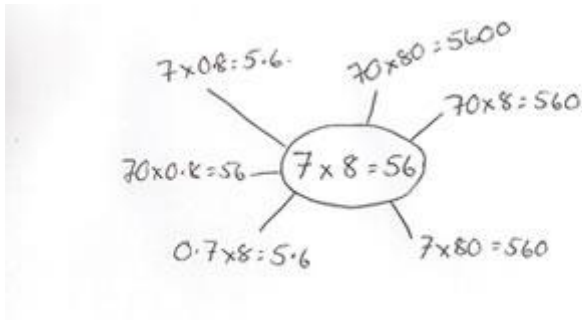


Another favourite is the use of a spider diagram to generate new facts from known facts.

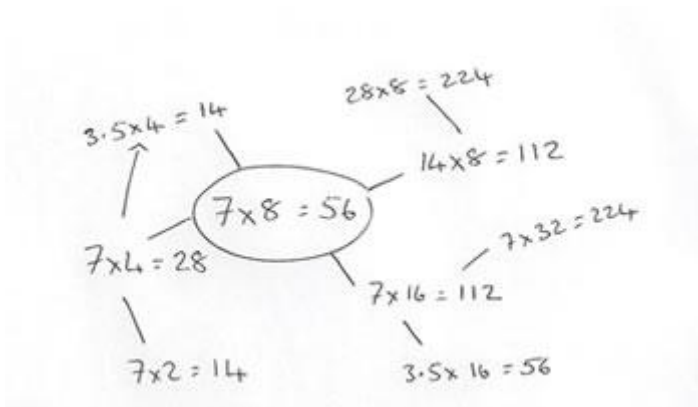
For example: a starting point of

$$7 \times 8 = 56$$

Might result in:



or:



And finally: ask pupils to list all the numbers from 1 to 20 (say), then give them a set of numbers they can combine using mathematical operations, to make each of those numbers (from 1 to 20). You may like to give them numbers associated with the date – so if the date was 2 September 2013 you could give 2, 9, 10 and 3, in which case your list may start to look something like:

$$1 = 10 - 9$$

$$2 = 2$$

$$3 = 10 - 9 + 2$$

$$4 = 10 - 9 + 3$$

$$5 = 10 - 2 - 3$$

$$6 = 2 \times 3$$

etc

It is probably not a good use of time to go through every solution but ask pupils to suggest some interesting combinations – for example if someone had used 23 to generate 8 , that might be worthy of comment (or you may say that isn't allowed – it's up to you!).

If you have some favourite settling and starting activities – please tell us about them.

**Image credit**

Page header: [The magic square at La Sagrada Família](#) by [Jan Hammershaug](#), [some rights reserved](#)



## Focus on...Research

The [British Society for Research into Learning Mathematics \(BSRLM\) website](#) states:

*BSRLM is for people interested in research in mathematics education and provides a supportive environment for both new and experienced researchers to develop their ideas.*

BSRLM holds three one-day conferences a year, which give researchers an opportunity to present their current research. Here you can view the [Proceedings of the Day Conference held at the Sheffield Hallam University on 02 Jun 2013](#).

Twelve topics were covered at the June conference, and to give you a flavour, we mention two here.

The use of lesson study as part of mathematics CPD is described in the paper [Working group report: lesson study in research and CPD in mathematics education](#) by Rosa Archer, Sue Pope, Alice Onion and Geoff Wake (University of Manchester, University of Manchester, King's College London, and University of Nottingham). The paper considers how the Japanese lesson study model was used with ITE students in Manchester and as part of the Bowland Lesson Study Project.

You may also be interested to read [Exploring the challenges for trainee teachers in using a Realistic Mathematics Education \(RME\) approach to the teaching of fractions](#) by Sue Hough and Paul Dickinson (Manchester Metropolitan University). This paper considers how a group of SKE trainees with a mainly procedural understanding of fractions, developed their conceptual understanding of the topic and answers the research question:

*What are the issues related to trainee teachers adopting a more conceptual approach to the teaching of fractions in terms of their classroom practice and in relation to their beliefs about teaching?*

What will you do now?

- read one of these paper or another from the latest proceedings of BRSML?
- look at the [NCETM Research Gateway](#), which allows you to search for mathematics related research papers.

Previous NCETM Secondary Magazines have also featured research. Have a look at [Issue 85](#) and [Issue 99](#) that features articles about the BSRLM.

### Image credits

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## 5 things to do



The NCETM is to play a key role in a [new programme](#) to help prepare more teachers and lecturers at FE colleges, and other organisations in the sector, to teach GCSE mathematics. The initiative is part of a wider, Government-funded programme to raise levels of attainment, in maths and English, of those 17 and 18-year-old students who do not get a Grade C or above in these subjects by the end of Year 11. To address this, starting this autumn, the NCETM will work in partnership with the Centres for Excellence in Teacher Training (CETTs) to establish high quality CPD provision for teachers of mathematics in the FE sector. This will enable teachers who are already involved in numeracy or functional skills teaching to enhance their knowledge so that they can teach GCSE effectively. [Find out more](#), including details of how you can take part.



The NRICH website has a [collection of resources](#) suitable for the Key Stage 5 curriculum. These are grouped under Core 1 & 2 resources, Core 3 & 4 resources, Further Pure Resources, Stage 5 applied topics and Mathematical Processes at Key Stage 5. You might like to have a look at the [Tangled Trig Graphs](#) to get you started.



A [recent report](#) from Ofsted suggests that too many able children are underperforming in non-selective state schools. What is the picture in your school?



Join the [NCETM Twitter chats](#) #mathscpdchat every Tuesday from 7pm to 8pm.

Each chat is centred on a specific theme, always relevant to maths professional development, and steered by a moderator from the maths education community. We welcome all suggestions for discussion themes, and offers of volunteer moderators. These can be emailed to us at [info@ncetm.org.uk](mailto:info@ncetm.org.uk), or tweet us at either [@mathscpdchat](#) or [@NCETM](#). We hope you will join us.



And finally – [this](#) might make you laugh?



## Tales from the classroom: "A(r)g(h) – we've done this before"

Out on the bike prepping for a charity ride, I was wishing my own bike was better... I'd been forced to borrow a bike, as my own was rapidly ailing and I was quite concerned whether it would last the full 100km. The bike I was fortunate enough to borrow was dramatically better than my own - a bike I can only ever dream of owning. All sounds good except for one issue - it was "wired" in the "continental style". Simply put, the right hand operates the rear brake, and the left the front. Opposite to what would be considered normal, and most importantly to me - opposite to my "normal."

With just a week before the big ride, my training plan was all about conserving energy and not over-doing the training. However, I knew I had to get on top of this "opposite braking". I made my little mantra of "right-rear" and went out for a few short rides on routes I knew really well with the sole focus of practising braking. It was a complete contradiction to normal. Braking more than required, reducing speed "unnecessarily", and of course using more of the right hand rather than my conventional left. Surely with this braking thing being the sole focus of the ride, it wouldn't take long to switch to the continental style... To start with it was simple, nothing to it. Hacking along my most familiar routes I drifted into thinking about a comment a student had made to me back in early May.

Our lesson had started in what is probably a very familiar pattern:

*"OK guys... I've done the question-by-question analysis of the last past paper and there are a few topics that we all need to work on. And today the first of those – Plotting a Quadratic!"*

*"Argh" was the instant reply from Ellie. Raised eyebrows and smile from myself, thinking here we go again...*

*"No Sir, Ah not Argh." reproached Ellie clearly reading my body language... "When we did this before I just about got it, but then it went - but it was better than the first time..."*

*"Oh, that's good then, but you said 'the first time' – how many times do you think we have done it."*

*"At least four" came a shout.*

*"Well - you can count, so we've not completely wasted our time together!" my obvious retort.*

This memory now clicked with a comment from one of my colleagues about Schemes of Work and what resource to use with which year group, so we don't repeat. I've always had a very free attitude with that. We have very few text books in our department, and those we have are more than a decade old. We tend to use our own resources and then share instantly - if we find a resource that works with one class and can be used with another year group, then we tend to do that straight away. We don't file it away and "bring it out for them next year". My colleague's concern about repetition is justified - and could be an Achilles Heel for our style of working. However, if they don't know it, they may well need to do it again. Hence Ellie's comment and my misplaced assumption. I guess this issue impinges on two key areas of concern as a teacher. Firstly the relationship with your students is critical, and secondly is your taught curriculum their learnt curriculum?

As a young teacher I was always petrified of repeating topics and the ensuing negative response from my students if I unknowingly fell into this hole. As I've matured I think I've come to realise that depth of understanding can come in at least two ways; a clarity of vision through a concept, or repetition to learn the different parts of a concept that eventually result in an ability to see the whole concept. In my early years I was always looking for a golden bullet for every topic. Now I spend more time repeating and reinforcing.



The change to more weight on repeating and reinforcing has changed how I use a Scheme of Work to prepare for an examination. I now tend to spend a shorter time covering most topics, and then use frequent detailed formative assessment to “re-do” the Scheme of Work for a second or third time.

Anyway, whilst musing this in the saddle I suddenly had the realisation that the brake lights of the combine harvester in front of me were not lit - not because it wasn't braking, but because they weren't working! I came to an uncontrolled sliding halt centimetres from a heavy, solid green wall of metal!

I thought I really knew which hand operated which brake, “right-rear” as I had told myself a hundred times. However, to really learn it I think I will need more practice.

*The author is a mathematics teacher working in the South West*