



Welcome to Issue 30 of the Secondary Magazine. Now that the clocks have gone forward and British Summer Time has started, it really feels that spring is in the air. That also means that our GCSE countdown is close to running out. Don't run out of steam yourself; enjoy the Easter break and take some time out to read this latest issue.

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How do you work with colleagues in the science department in your school? In this article, we consider how to respond to a request from the science department to enhance pupil understanding in both mathematics and science.

Up2d8 Maths

The fortnightly Up2d8 maths resources explore a range of mathematical themes in a topical context. The back pages seem to show a constant stream of Premiership managers coming and going, sometimes after just a few months in charge. This resource uses the departure of Luiz Felipe Scolari, the ex-Chelsea manager, as a context for students to explore the way that data can be manipulated and interpreted.

The Interview – Vic Ebdon

Vic describes how his role as Head of Strategic Planning in a Local Authority is dependent on the mathematics that underpins much of his thinking.

Focus on...polygons

Being aware of polygons, their structure and their properties will improve our understanding and awareness of our environment. Have a look at some of the interactive tools or remind yourself of the 'dead parrot' joke in this issue.

An idea for the classroom – Dominos

Playing dominos is having a comeback – especially in mathematics classrooms! Have a look at this week's resource which gives links to the excellent *Tarsia* software which allows you to create your own dominoes, and also provides an idea to extend pupil thinking.

5 things to do

Getting ready for the Grand National? Planning your Easter break? There are some ideas here to help you plan ahead.

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

How do you assess your pupils? Why do you assess your pupils? What information does the assessment give you? What do you do with that assessment information? In this issue, our Subject Leader considers these questions to make sense of the new APP guidelines for mathematics.



Mathematics and science

I'm running some physics training later this month and have a request to explain the best way to teach the algebra of re-arranging equations with three variables like speed/distance/time or density/mass/volume. Could you give me the thinking on this from a maths perspective? I know the 'triangle' is not popular - but still used a lot by science teachers.

I was really pleased to get this email recently from a colleague in the science department. What a nice opportunity to start a dialogue with a colleague about the relationship between science and mathematics. I wonder what pupils think that relationship might be? In the importance statement for mathematics it says that:

Mathematics is fundamental to national prosperity in providing tools for understanding science, engineering, technology and economics.

It is clear that there is interdependence between mathematics and science, so the opportunity to make connections both within and between them is invaluable. Various 'Numeracy across the curriculum' initiatives have completed curriculum audits and made colleagues from both subject disciplines more aware of the demands from each subject, but can you imagine the experience of groups of pupils as they encounter mathematics within science? Does it make sense to them? Do they see the connections? Pupils seem to find it hard to make links within mathematics so it is necessary to make some of these links explicit – making connections explicit across the two subjects is even more fundamental to enhancing pupil understanding.

The recent Ofsted report [Mathematics – Understanding the Score](#) says:

secondary pupils...know the difference between being proficient at carrying out techniques and understanding the underlying mathematical ideas. They recognise that they often learn methods by following teachers' illustrative examples and working through many exercises, obtaining correct answers without really understanding why.

I worry that using 'the triangle' will only re-enforce pupils' experience of achieving correct answers without understanding – and will that benefit their learning of either mathematics or science?

So how will I answer my colleague?

As we know, algebra is generalised arithmetic and so my response will be to refer my colleague back to some arithmetic and the 'facts for free' scenarios.

If I know that $2 \times 5 = 10$, what else do I know?

$$5 \times 2 = 10$$

$$10 \div 2 = 5$$

$$10 \div 5 = 2$$

The main task is to give pupils the opportunity to become totally familiar with the relationships between this family of number facts, and then extend this to another family of number facts which are not so intuitive.

For example, if $24 \times 35 = 840$
then $35 \times 24 = 840$
 $840 \div 24 = 35$
 $840 \div 35 = 24$

Having got to grips with some specific facts, I can start to generalise:

If I know that $a \times 5 = b$, what else do I know?

$$5 \times a = b$$

$$b \div 5 = a$$

$$b \div a = 5$$

and finally, if $s \times t = d$
then $t \times s = d$
 $d \div t = s$
 $d \div s = t$

It would be appropriate to make some links between pupils' mathematics lessons and the mathematics that they use in science. It would be relatively easy for the mathematics department to spend time in their starter activities to focus on number relationships before and during the time when the science department will be using and needing to rearrange formulae for speed/distance/time or density/mass/volume or acceleration/speed/time. An ongoing dialogue is vital so that these opportunities can be exploited.

If you have collaborated with colleagues in your science department – why not tell us about it 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 which you can personalise to fit your classroom and your learners.

The back pages seem to show a constant stream of Premiership managers coming and going, sometimes after just a few months in charge. This resource uses the departure of Luiz Felipe Scolari, the ex-Chelsea manager, as a context for students to explore the way that data can be manipulated and interpreted. Students are introduced to the situation and then allocated a point of view which they must argue using the data sheets provided. Students may not be familiar with arguing for something in which they do not believe, based on a data set, which adds to the richness of this task.

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: Vic Ebdon

About you: I am Head of Strategic Planning in the Children and Young People's Services Directorate of Devon County Council. Following 10 years in private sector procurement, 20 years in construction, and a failed attempt at early retirement, I joined the public sector to work on capital development schemes for schools. I am now head of the service responsible for school organisation, place planning and schools capital investment – looking forward, of course, to the county starting its *Building Schools for the Future* programme.

The most recent use of mathematics in your job was... in a number of 'what if...' scenarios to assess the likely impact on the requirements for school pupil places between 2011 and 2016 at primary and secondary age level in a new town planned for Devon. Some of the variables that were considered were: the implementation date (economic uncertainty); the rate of development (commercial lending confidence); the socio-economic profile of the likely housebuyers (number of children per household); falling birth rate (national trends), and parental choice (local trends).

Some mathematics that amazed you is... when I 'got' integration and why it might be useful. It was through the graphical 'proof' of the area of a circle (knowing the perimeter) by breaking the circle down into a large number of sectors until the sectors approximated to triangles and then adding all the triangular areas together. I am still amazed by it today – such simple pleasures!

Why mathematics? Firstly, long boring train journeys at a very young age in India where starting at 1 and counting to see how long I could keep going seemed like a good idea – I never got to finish and that was pretty interesting. Secondly, for me there has always been a great satisfaction in arriving at the right answer – a conclusion – which one can do with mathematics and rarely in anything else. Odd really that of these two stimuli, one can be resolved and the other never can...

Your favourite/most significant mathematics-related anecdote is... about the repayment of a debt, long ago, by placing one grain of rice on the first square of a chess board, two on the second, four on the third and so on until all 64 squares on the board had been accounted for. Is this a fable about morality? Should one avoid getting into debt? Was it right for a skilled mathematician to exploit the ignorance of a peasant? Or is it just about the 'power of 2'?

A mathematics joke that makes you laugh is... not really a joke, but try it: not only does it work as a limerick but it is mathematically correct:

$$(12+144+20+3\sqrt{4})7+5 \times 11 = 3^4$$

If you really need the answer...

*A dozen, a gross and a score,
Plus three times the square root of four,
Divided by seven,
Plus five times eleven,
Makes three to the power of four!*

Something else that makes you laugh is... pithy one-liners.

Your favourite television programme is... *Have I Got News For You.*

Your favourite ice-cream flavour is... rum and raisin.

Who inspired you? My late father, through his calmness and dignity (originally mistaken for timidity) in the midst of frantic family life. Mathematical inspiration came originally from Shakuntala Devi. Not only does she have a prodigious talent but she also conveys the real joy of numbers.

If you weren't doing this job you would... be building a zero carbon house for my retirement.



Focus on...polygons

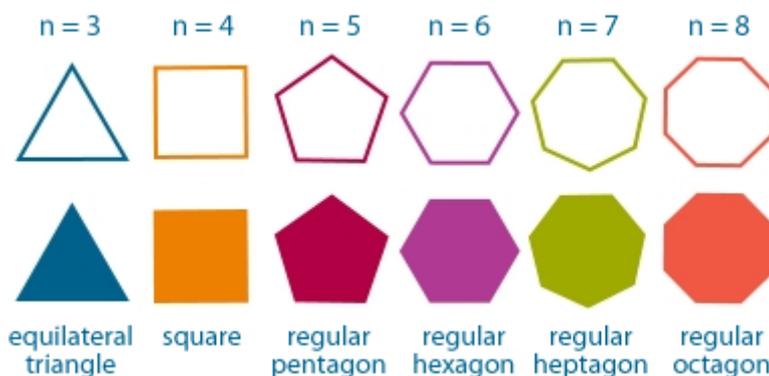
In geometry, a **polygon** is traditionally a plane figure that is bounded by a closed path or *circuit*, composed of a finite sequence of straight line segments (ie, by a closed polygonal chain). These segments are called its *edges* or *sides*, and the points where two edges meet are the polygon's *vertices* or *corners*. The interior of the polygon is sometimes called its *body*. A polygon is a 2-dimensional example of the more general polytope in any number of dimensions. ([Wikipedia](#)).

Download the [Polygon ITP](#) from the National Strategies.

Go to the [polygon playground](#) to use their interactive polygon tool.

Use the interactive tools at the [MathsNet website](#) to get to know polygons in more detail.

What is a polygon? Well, a dead parrot of course!



A regular polygon is an n -sided polygon in which the sides are all the same length and are symmetrically placed about a common centre (ie, the polygon is both equiangular and equilateral). Only certain regular polygons are "constructible" using the classical Greek tools of the compass and straight edge.

The terms equilateral triangle and square refer to the regular 3- and 4-polygons, respectively. The words for polygons with $n \geq 5$ sides (eg, pentagon, hexagon, heptagon, etc.) can refer to either regular or non-regular polygons, although the terms generally refer to regular polygons in the absence of specific wording ([Wolfram](#)).



An idea for the classroom – Dominos

I'm sure you have seen the excellent programme *Tarsia* (you can download it [here](#)), which was much-publicised in the Standards Unit resource *Improving Learning in Mathematics* (you can apply for a copy of the resource [here](#)).



Domino

Pupils seem to enjoy the challenges that their teachers create for them using the software. I tend to start off by giving pupils small sets of dominos (the basic set has only eight dominos) before progressing to a larger set (12, 16 or 24 cards) as some pupils do not seem to be used to the 'matching' idea and it is nice to get a small amount of success quickly before progressing to a more daunting task.



Extended
Jigsaw

When your pupils are comfortable with the dominos idea you could progress to the vast array of jigsaws, which also provide a wide variety of possibilities – why not have a go!

I have been anxious to get the most from the dominos activities and have been looking for ways to extend pupils' thinking once they have completed the exercise. On the worksheet downloadable [here](#), there is a space for pupils to choose two of their dominos and stick (or draw) them onto the worksheet.

Pupils are asked to explain why they have matched these two dominos and then make up two of their own which match for a similar reason. I'm sure that although pupils find it difficult to explain their thinking and generate their own examples, these are just the skills that will extend their thinking. What do you think?



5 things to do this fortnight

Have you read ACME's briefing note about the future of GCSE Mathematics? You can download it [here](#).

Are you starting to think about enrichment opportunities for the summer term? Download the [STEM Directory of Mathematics 2008/2009](#) for details of enrichment and enhancement activities.

Are you registered for the Mathematical Association conference? It runs from 14 to 17 April at Robinson College, Cambridge. More details and a booking form can be found [here](#).

Have you seen the free new ATM resource? The [ATM Conference](#) takes place from 6 to 9 April and this year there's a special event on the Monday night in which you can meet new people whilst finding the relevant maths in pictures that you could take in everyday situations. There's a gallery of images [here](#) for you and your class to practise on.

The [Grand National](#) is on 4 April. Time to do some practical probability?!



Diary of a subject leader

Real issues in the life of a fictional Subject Leader

"APP isn't going away... it's the next big initiative around the corner... I'd like your department to get your heads around it and feed back to me," were the words said to me by my line manager during our last meeting. Having agreed, I then went away to spend time reading the materials.

For years the department has struggled with assessing students' progress. We regularly test their understanding of a range of topics, generating lists of levels and grades that we diligently enter onto the school's network. However I, like many of my colleagues, often doubt the robustness of this data and I'm sceptical with regard to the use of tests as our main form of assessment. I'm continually pushing the AfL agenda, encouraging my staff to use their professional judgement when assessing progress. I'm therefore confident that they do assess regularly, however I'm less confident that they are prepared to use such 'informal' judgements as part of their recorded teacher assessment.

APP looks exciting. It promotes the use of AfL within lessons, it helps track students' understanding and it provides teachers with a clear indication of 'levelness'. As a head of department, I welcome any initiative that encourages my staff to reflect on their own practice and raises their awareness of the impact their teaching has on the learning of the students. It's all too easy to simply plough through the pages of a textbook giving little thought to who really understands and who doesn't.

We were warned by our LA consultant to start small. Taking this advice on board, my second in department and I agreed to track the progress of a small identified group using the assessment criteria provided. The evidence for this judgement was to come from a range of sources, for example written work, tests, questioning and 'gut feeling'. As we both teach equivalent classes within Year 9, the all-important moderation of our assessment is made somewhat easier to manage.

It's early days and as with all new initiatives, its sustainability and manageability are uncertain. Nevertheless, the English department has embraced APP, and they are using it to good effect. My concern is more with the need to change the culture within maths teaching and their reliance on tests as their sole form of assessment. Nevertheless, it's a step in the right direction.