Primary Magazine

Issue 6

National Centre
for Excellence in the
Teaching of Mathematics

Happy New Year and welcome to the sixth issue of the Primary Magazine.
In this issue we explore the mathematical possibilities surrounding World Religion Day, interview Mike Askew, look at the Ancient Mayan number system and plan a mathematics week.

Our Up2d8 Maths focuses on pirates and includes November's hijacking of the Saudi oil tanker, Sirius Star. The fact that the pantomime season is in full flow makes a wonderful lead into pirates, a much loved topic for primary school children! This presentation opens up many opportunities for exploring numbers, data handling coordinates and measures in the classroom, practically and through word problem-solving.

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From the editor
In 2008, according to the data, the proportion of children scoring the 'top mark' in their SATs fell significantly. We look at the possible reasons behind this.

Up2d8 Maths
This issue of Up2d8 is based around pirates. The mathematics is introduced through pantomime and the fictional pirate Captain Hook. It then moves on to Blackbeard and Anne Bonny and why mathematics was very important to the pirates of long ago. The third spread presents a great opportunity for exploring coordinates on a treasure map. The final spread focuses on the problem of present-day piracy in our seas. All provide great opportunities for some exciting mathematics work involving data handling, number, measures and co-ordinates for all ages.

The interview
Our interview is with Mike Askew, professor of mathematics education at King's College London, where he researches the teaching and learning of mathematics in primary schools. He is also a director of BEAM Education, which stands for Be A Mathematician, producing materials and providing training for primary mathematics.

Focus on…World Religion Day
This focus provides a wealth of opportunities to devise mathematical activities based around World Religion Day, with interesting facts and websites to explore with your class. The ideas can be adapted and modified for all years from the Foundation Stage to Year 6 and encourage cross-curricular links between mathematics and RE.

Starter of the Month
Our starter suggestions are based around World Religion Day. The ideas are centred on 2D and 3D shape and their properties including that of symmetry and also repeating patterns. These are suitable for children in FS, KS1 and KS2.

A little bit of history
In this issue we go back in time to the Ancient Mayan number system. This system dates back to the fourth century and was approximately 1 000 years more advanced than the European system of that time. They used a base 20 number system which, it is believed, was because the Mayans lived in a warm climate and rarely needed to wear shoes and therefore 20 was the total number of fingers and toes they could count with!

Something to share - planning a mathematics week

The focus in this issue is planning a mathematics week. The article suggests how to share with staff the 'Who?', 'What?', 'Where?', 'Why?', 'When?' and 'How?' of planning such a week and gives ideas of how to organise a successful event. There are weblinks and suggestions for themes for a possible mathematics week.
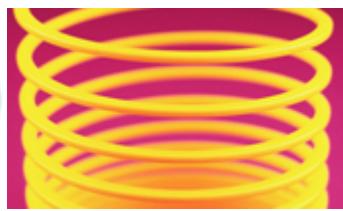
From the editor

In 2008, according to the data, the proportion of children scoring the 'top mark' in their SATs fell significantly. Head teachers suggest it could be because schools are neglecting the brightest pupils and focusing too much effort on getting as many pupils as possible up to national targets standard.

There was a one percentage point improvement in the proportion of pupils reaching level four – the mark expected of 11-year-olds – in English and mathematics.

But only 31% of pupils are reaching level five in mathematics, down from 32% last year. Head teachers said the drop could have been triggered by schools making extra tuition for pupils below the borderline for level four their priority, at the cost of brighter students.

Mick Brookes, head of the National Association of Head Teachers (NAHT), said: "Level four is the gold standard which the government puts a lot of weight on. We know schools run booster classes for pupils who are just below that mark but it doesn't explain why the difference is so marked this year." Professor Alan Smithers, Director of the Centre for Education and Employment Research at the University of Buckingham, said: "The level five results are not as important to schools as level four results. The targets are at level four and that's where all the effort goes."

What do you think? Please add your comments to the Primary Forum discussion.

December saw Sir Jim Rose bring recommendations to change the curriculum from various different discrete subjects into six themes through which the curriculum should be taught. Click here to find out more about the Rose Review.

There have been some mixed views. Many of us welcome the changes, others don't. David Fann, a head teacher and chairman of the Primary Committee of the NAHT is in favour, saying: "Sir Jim Rose's six-strand curriculum, which absorbs traditional subjects into broader-themed areas, is more in keeping with our times. I think that teachers will be excited by it as it will give them freedom to teach a broad and balanced curriculum." Click here to read more from The Times website.

Professor Smithers, a former member of the National Curriculum Council, has a different view, saying: "The proposed themed learning areas are an unnecessary extra layer that will cloud thinking about what children should learn in primary schools." Click here to read more from The Times.

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Up2d8 maths

The problem of present day piracy has made recent news headlines following the hijack in November 2008 of the Saudi oil tanker, Sirius Star. This and the fact that the pantomime season is in full flow make a wonderful lead into pirates, a much loved topic for primary school children! It may be difficult for younger children to understand the reality and implications of such an event, but a brief look at the situation is a great link to the old world pirates of films and books with which they are familiar. This presentation opens up many opportunities for exploring numbers, data handling coordinates and measures in the classroom, practically and through word problem-solving.

Click here to download the Up2d8 maths resource - in PowerPoint format.

The Interview

How mathematics has influenced my life
Interview with Professor Mike Askew

Mike is a director of BEAM and closely involved in BEAM's product development, professional development and research initiatives. He has taught in London primary schools and has written mathematics education materials for various publishers. Mike is also a professor at King's College London, where he supervises PhD candidates, researches and writes. His research work has included commissions from the Teacher Training Agency, Nuffield, and the Leverhulme Trust. He is particularly interested in promoting problem solving and creative approaches to mathematics learning and teaching, and how to foster classroom communities of learners.

Click here to find out more about Mike, and take a look at what BEAM has to offer on their website.

What were your memories of mathematics when you were at school?
I don't remember a great deal about my mathematics at primary school, other than doing page after page of carefully laid out calculations. I was one of the kids who could do these, and I have to say I found a great deal of comfort in them. To this day my notebooks still have squared paper! And it was great to see all of those columns of red ticks. But I was one of the lucky ones who could do it and I realise now that I understood very little of what was going on – this is more like doing knitting than doing mathematics. At secondary school I was one of the first pupils to go through the newly launched SMP 'new mathematics' curriculum. I loved it. All that work on sets and logic was in complete contrast to the drill and practice that I had at primary school and I began to see what mathematics could really be about.

Have you always been a mathematician, or is it an interest that developed during your working life?
I've always been interested in mathematics. The interest that has grown during my working life is in why so many people get turned off it.

How has mathematics impacted on your life?
In so many ways, that it is difficult to answer this succinctly. I like to think of mathematics as the 'poetry' of the sciences, it helps you to see the world in a particular way and to appreciate it through a particular lens – I would feel impoverished without that.

How did you get to where you are today?
As a famous actor once said, through lots of hard work. I think two things were particular turning points. One was working for the Open University at their summer school for a maths foundation course. That was when I first met John Mason, who had introduced investigations into the programme, and it was a joy to work with people on "unstructured" mathematical problems. The other was getting involved with the youth group 7–11-year-olds. I was entranced by their energy and enthusiasm and wanted to know how to channel that into learning mathematics.

What is your most entertaining mathematics anecdote?

Nan Flowerdew, whom I know through the ATM, has to be credited with this. She showed me a piece of work from a seven-year-old. It was an assessment item where the child had been asked to use a 'rule' to measure a line. Along the top of the line the child had written very neatly and very precisely so that it

fitted the line exactly, "be kind to people".

If you could phone anyone from your past to say thank you for what you have learnt who would it be and what would you say?
Actually this wouldn't be anyone to do with mathematics, but Johnny Neptune, a magician and salesman who employed me from the age of fourteen to travel around the northeast of England and sell conjuring tricks. The confidence I gained from this experience has stood me in good stead in all of my teaching.

What do you think could be done to help inspire more young people to enjoy mathematics today?
Take the pressure off judging mathematical performance through so many assessments as exams. Learners need much more time to feel free to just play with mathematics, to experience the joy that can come about through exploring a problem, without the pressure of any need to come up with the right solution or be judged by others.

When was the last time someone surprised you – mathematically speaking?
Very recently, when Rob Eastaway showed a delightful way of using "angles in a semicircle" to find a centre of a circle using only an A4 envelope.

If you weren't working in a career that involved mathematics what would you be doing?
Probably a third-rate magician working the cruise ships.

And finally, if you lived in a world of cubes and spheres, which would you rather be?
Definitely a sphere, no question.

Why?
No corners to hide in.

Focus on World Religion Day

The first World Religion Day was started by the Baha'i community in 1950 and has since grown to become a worldwide annual event. Its popularity has led to planned events of incredible magnitude; countries such as Sri Lanka and Republic of Congo issuing special commemorative stamps, sites offering World Religion Day E-Cards...even appearances on YouTube!

It is celebrated on the third Sunday in January each year, and so falls on 18 January in 2009. The aim of World Religion Day is to foster the establishment of interfaith understanding, by emphasising the common denominators and the essential 'oneness' of the world's religions.

Blessed is he
who prefereth his brother
before himself.
Bahá'í Faith

Hurt not others
in ways that you yourself
would find hurtful.
Buddhism

Do unto others
as you would have them
do unto you.
Christianity

No one of you is a believer
until he desires for his brother
that which he desires
for himself.
Islam

What is hateful to you,
do not to your fellow man.
That is the entire law;
all the rest is commentary.
Judaism

Click here for further details of World Religion Day, poems and prayers from different faiths, and links to other appropriate sites.

So what are the world's major religions? A definitive answer to this question is surprisingly difficult to find, and depends on the source of information. A Wikipedia search claims that there are five large contemporary religions, each with more than three million adherents. These are Buddhism, Christianity, Hinduism, Islam and Judaism. An example of a modern listing is that of the Ontario Consultants on Religious Tolerance, listing twelve long-established, major world religions, each with over three million followers: Bahá'í Faith, Buddhism, Christianity, Confucianism, Hinduism, Islam, Jainism, Judaism, Shinto, Sikhism, Taoism, Vodou.

There is a wealth of information and data relating to the world's religions, much of which can provide a wonderful starting point or point for discussion in mathematics lessons. Impress your friends and colleagues with some of the following 'Did You Know…?' statements!

- Did you know that religious figures for 2007 show that 33.32% of the world's population consider themselves to be Christians, 21.01% Muslims, 13.26% Hindus, 5.84% Buddhists, 0.35% Sikhs, 0.23% Jews, Bahá'í 0.12%, while other religions and those classifying themselves as 'non-religious' make up the remaining 25.87%? If the world contained just 1 million people – how many would be Hindu? What if there were only 100 people?
- Did you know that Christians are the largest religious group in the world, and have over 2.1 billion followers?

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- Did you know that Judaism is the smallest of the five 'World Religions' with 14 million followers?
- Did you know that Hinduism is the world's oldest religion, originating around 2 900 BC?

The very essence of World Religion Day makes it easier to embrace the idea of cross curricular work with RE, although work carried out in history involving ordering events on a timeline can also be linked to mathematics. Click here for a timeline activity requiring pupils to order the major religions according to when they were founded, and position them on the marked timeline.

Useful websites for World Religion Day

Religion Facts: an objective guide to the world's religions
Teddy's Day Out: an artefact/religion matching activity for EYFS children
Woodlands Junior School, Kent: a child-friendly, easy-to-read site packed with information on the major religions
Ontario Consultants on Religious Tolerance: a useful one-stop shop of religious information and images for the teacher.

Starter of the month

EYFS

- Use familiar objects and common shapes to create and recreate patterns and build models
- Use language such as 'bigger' or 'circle' to describe the shape and size of solids and flat shapes.

Show the children a selection of stars from different religions and talk about their properties, counting sides and angles. Children can make rubbings or arrange/stick stars into repeating patterns. The Religion Facts website has a wide range of images including…

Four-pointed star (Christianity)

Six-pointed star (Judaism)

Nine-pointed star (Bahá'í Faith)

Twelve-pointed star (Christianity)

KS1

- Visualise common 2-D shapes… identify shapes from pictures of them in different positions and orientations; sort, make and describe shapes, referring to their properties (Yr2)
- Identify reflective symmetry in patterns and 2D shapes and draw lines of symmetry in shapes (Y2)

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Allow the children time to look closely at a range of symbols and stars associated with some of the world's main religions. Some of the stars are shown above, and appropriate symbols might include:

Buddhism
(Wheel of Life)

Buddhism
(Lotus Flower)

Judaism
(Menorah)

Islam

Islamic star patterns are a beautiful and highly geometric art form whose original design techniques are lost in history. Many lend themselves well to work on reflective symmetry and looking at properties of shapes. Click here to use an online applet to generate your own fantastic Islamic star patterns in seconds. You too can produce designs such as these...!
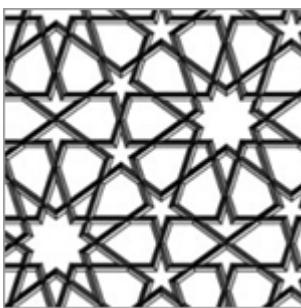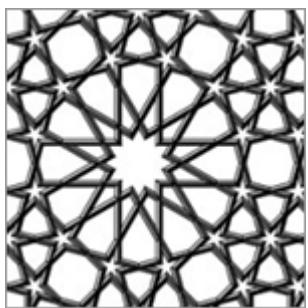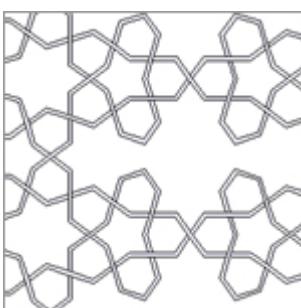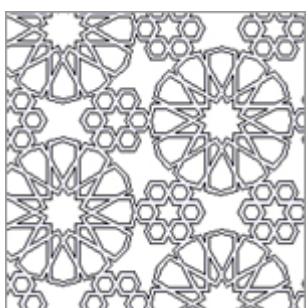
KS2

- Draw polygons and classify them by identifying their properties, including their line symmetry. Visualise 3D objects from 2D drawings; make nets of common solids (Y4)
- Make and draw shapes with increasing accuracy and apply knowledge of their properties. Estimate angles, and use a protractor to measure and draw them, on their own and in shapes (Y6)

Motivate provide enrichment for both teachers and students through mathematical-based live video conferences aimed at all age groups. One such video conference that took place last year was entitled Maths of churches, mosques, synagogues and temples. It focused on the rich source of mathematical activity that different places of worship can provide and looked at symmetry, geometrical construction and patterns.

Although the two-part conference has already finished, the site provides a wealth of materials, including the presenter's opening PowerPoint presentation, and images of religious buildings which could be incredible stimuli for work on 3-D shape.

The activities go on to support the construction of shapes often seen in religious buildings and artefacts including general and Ogee arches, circle patterns, the Trefoil and the Rose window.
We are really keen to hear from anyone who has tried these, or any of the other Primary Magazine ideas…do get in touch through the Primary Forum.

A little bit of history – Mayan numbers

The Mayan civilization began around 2600BC and ended around 900AD. The area they lived in covered what is now Belize, Guatemala, Honduras, El Salvador, and part of Mexico:

The Mayan number system dates back to the fourth century and was approximately 1 000 years more advanced than the Europeans of that time.

They used a base 20 number system. It is believed that this was because the Mayan's lived in a warm climate and rarely needed to wear shoes and therefore 20 was the total number of fingers and toes they could count with. There were two important markers in this system: 20, which relates to all the fingers and toes; and five, which relates to the number of digits on one hand or foot.

Their system was set up so that the first five place values were based on the multiples of 20. They were 1, 20, 400, 8 000, and 160 000 as opposed to our Arabic number system of 1, 10, 100, 1 000, and 10 000.

The Mayan system used a combination of two symbols. A dot would represent the units one to four and a dash would represent five. Using this system they could write the numbers to 19. The numbers would be read from bottom to top so six would be 5 + 1, seven 5 + 2, fourteen 5 + 5 + 4 and so on. It is thought that counters may have been used, such as grain or pebbles, to represent the units and a short stick or bean pod to represent the fives.

Click here to download the Mayan Numbers worksheet as a PDF.

.www.ncetm.org.uk

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

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Here are the numbers 1 to 20:

1	2	3	4	5	6	7	8	9	10
•	••	•••	••••		•	••	•••	••••	

11	12	13	14	15	16	17	18	19	20
•	••	•••	••••		•	••	•••	••••	•

The Maya was one of the few ancient civilisations that understood the concept of zero. This allowed them to write very large numbers. As you can see in the number table above, 20 is represented by a dot to represent one lot of 20 and a symbol which represents zero. This symbol was usually a shell, but sometimes it would be a head or other similarly shaped object.

It is interesting to know that with all of the great mathematicians and scientists that were around at the time in ancient Greece and Rome, it was the Mayan Indians who independently came up with this symbol which usually meant completion as opposed to zero or nothing.

You could develop some interesting investigational problems for the children using the Mayan number system.

Compare our number system with that of the Maya:

1000	1	1	5	6
100	1	0	2	7
10	1	3	0	3
1	1	7	8	0
	1111	1037	5208	6730

Remember ours: 10 x 10 = 100, 10 x 10 = 1 000

Remember the Mayans': 20 x 20 = 400, 20 x 400 = 8 000

8000	1	1	5	6
400	1	0	2	7
20	1	3	0	3
1	1	7	8	0
	8421	8037	40 808	50 860

What are these numbers?

8000	●			●●
400	◍	●●● ▬	●●	●
20	●●●	●	◍	▬▬
1	●● ▬▬	◍	● ▬▬▬	● ▬

This information was found at these websites, which have more details:

ThinkQuest
Wichita State University

Something to share

Planning a maths event - Who? What? Where? Why? When? How?

Having decided that you want to hold some kind of mathematics event, there are several crucial questions to ask. The order in which you ask them does not matter, and indeed it is nigh on impossible to keep them separate. However, as soon as you fix one part, other decisions will probably need to be reconsidered.

While you will need to have given some consideration to these questions before you discuss them with colleagues, the 'who, what, where, when, why and how' format gives a good structure to your staff meeting. Prepare some large sheets of paper with the questions and supply lots of pens. Share out the sheets and pens so that nothing is missed during the initial brainstorming (thought shower, if you prefer). After 10 to 15 minutes, begin to focus on the achievable and support the development from there. Make sure you produce some summary minutes so that everyone is clear about what has been decided. If time permits, hold two meetings: one very early, preferably months ahead, to identify a theme (give time to develop suitable links if they don't exist already and allow time to collect resources); the second meeting should then be around a month beforehand. Again, produce a summary of what was decided so that everyone is clear about what they have agreed to do. A few minutes in the staff meeting the week before would be useful for final details.

So, in no particular order...

Why?
For many of us, the 'why?' might well come first. However, it could also be one of those things that arises from a great idea when you begin to consider the 'what?'. How many times have you heard someone turn a flippant suggestion into a reality when someone else picks it up and runs with it, adding, "What a great way to ...."

There are many reasons for holding a mathematics event. From raising the profile of maths to developing children's financial capability; from problem-solving to cross-curricular maths, and much more. Just make sure the activities are fun, and everyone will have a great time and learn lots too!
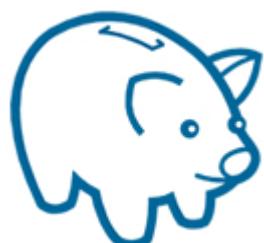
Some parts of the Every Child Matters agenda are easier to develop than others. Are you hitting the financial capability strand? Finance might lead you to think of bargains and deals. How to extend this across the whole primary age range could lead to the simple, overarching title of Money Week.

Are you intending to raise money for a particular cause or purpose? If so, this could give you your theme. Or, if you are interested in covering part of your curriculum in a fun way, is any money raised irrelevant? A World War II street party could involve a whole range of shape, space and measures activities. Invited guests might only be needed to make a small contribution to cover costs. But working out those costs and making sure you don't make a loss involves a range of mathematics. Even if you are happy to make a loss, an estimate of how much that might be, and where you are going to get that sum from, could involve a good deal of mathematics - particularly if you need to prepare a list of costings and put in a proposal. Don't do it all yourself: turn it into a maths lesson or two!

Who?

Who is your event for? The children? Their parents? A mixture of both? The whole school or just part of it? Which part? All of the time or some of the time? Who might you invite? Governors? Members of the local community? It may well be that you decide that there needs to be some class work which culminates in a 'sharing with parents' type of event. Can you involve local businesses? Do you have a link with a particular group or charity?

Once many of the basic overviews are decided, you will soon get down to the 'who does what?' stage, leading you to consider the more specific 'whens?'.

When?

Not just what time of year, but what time of the week and day too. You know your catchment area best of all. If you want to engage parents, when are they most likely to attend? Immediately after the end of the school day? During the evening? On a Saturday or Sunday morning?

What?

Begin at the beginning. Is there something already timetabled in that you could easily link with and expand in a way which suits your purposes? For example, if you have an after-school club which focuses on circus skills, or if a travelling fair regularly visits the area, then think about how you could link with this theme to develop the kind of event you are considering. It helps with publicity, and the success of one naturally feeds in to the other. An annual summer celebration may take a different theme each year, or perhaps it sticks to a very similar but successful formula. Even if there is no particular theme, it makes a great basis and rationale for a money week. Alternatively, there may be some other event usually focused on another curriculum area you can link with.

A different approach could be to identify a particular mathematics topic such as time, money or shape, and think about how it could be taught across the curriculum. This approach could make it easier to identify more focused learning objectives.

Once the basics are decided, you can begin to think about what resources you will need. Where will you get them from? Who will make or provide them? It is useful to have decided some kind of theme well in advance and to publicise it to colleagues. Asking everyone to keep an eye out for resources on 'x' and to save details in one particular file on your server (or you might have to do that yourself) could easily build a large bank of resources. Some will be useless in your context, but to others it will prove to be an absolute goldmine.

Where?

This is likely to be hugely influenced by the 'what?'. Alternatively, the 'where?' could dictate the 'what?'. Will you be using classrooms, the main hall, indoors or outdoors or both? If outdoors, does this mean the school field, playground or car park? And, of course, what about the weather? Would rain ruin everything? Or is enough of it under cover not to matter? Alternatively, is there enough shade if it is blazing hot? If indoors, does furniture need to be moved? Do some areas need to be off-limits for security purposes? If so, how will you manage that? The wider 'where?' might include visits or a maths trail. We often miss what is right under our noses. The local supermarket or bakery could be a useful resource.

How?

How will you structure your event? Will it be based around one big event? Can the preparation and aftermath be usefully included? If it is to take place during the day, do you need a timetable? Will

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everyone be doing something similar or rotating through a variety of activities? Are all activities suitable for everyone?

If you are fundraising, why not set up a school bank some time beforehand to allow the children to save for the event? Parents could also use the bank to save their contribution to a trip. Take advice from your local bank as this could involve a great deal of work. Maybe they will run it for you.

As you can see, once you start thinking - provided you have no particular fixed agenda to start with - it becomes difficult to separate out your 'who?', 'what?', 'where?', 'when?', 'why?' and 'how?'. Nevertheless, those questions form an excellent starting point. Be careful, though: once you fix one part, the snowball rapidly gathers momentum. It is then that you need go around the same questions all over again as a whole new batch of 'who?', 'what?', 'where?', 'when?' and even 'whys?' will crop up as you begin to get down to the nitty-gritty of the planning. And even if part of your agenda is fixed, use the same questions to clarify and inform. You will still need to get down to the practical at some stage.

Don't forget to inform the media. And evaluate afterwards. Far from taking the gloss off, this should identify both successes and pitfalls and be a great help next time!

Some useful resources
Maths All Week a maths week sourcebook - a guide to setting up and running a maths week from BEAM, £28.50 ISBN 1874099979

Money Week - a themed approach to financial capability for 3-11 year olds - from the Personal Finance Education Group, offering a whole bank of resources.

And try googling **Maths Week** for lots of tried and tested ideas. Have fun!