



Welcome to the fifth issue of the Primary Magazine. In this issue, we explore the mathematical possibilities that surround us over the Christmas period, looking at a wealth of opportunities to devise mathematical activities based around the celebrations.

## Contents

### From the editor

In this issue we consider different approaches to improvement and attainment in mathematics.

### Up2d8 Maths NEW!

This issue of Up2d8 is based around imperial and metric measures. This area of mathematics is introduced through two recent news stories, the first about distance signposts put up in Sandbach, a town in Cheshire, using kilometres instead of miles and the second about a trader in east London who faces prosecution for using imperial weighing scales. They provide great opportunities for some exciting measures work.

### The interview

Our interview is with Professor Celia Hoyles OBE, the Director of the NCETM who, among her many achievements, became the Chief Adviser for Mathematics in the Department for Education and Skills in 2004. As you will read in her interview, she has a passion for mathematics which she has passed on to countless children, students and adults over her many years in the field of education.

### Focus on...Christmas

This focus provides a wealth of opportunities to devise mathematical activities based around Christmas, 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.

### Starter of the Month

Our starter suggestions are based around the Christmas theme too. There is an idea for The Twelve Days of Christmas for EYFS. KS1 look at mental calculation strategies to find the value of things in Santa's magic sack. KS2 are offered a word challenge.

### A little bit of history

In this issue, we go back in time to the Ancient Babylonian number system. This is one of the oldest and most sophisticated of the ancient number systems. It has a base 60 system rather than the 10 we use today. It was developed from the way they divided up their day e.g. 24 hours in a day, 60 minutes in an hour. You could make up some challenging maths activities for your children from the information given in this article.

### Something to share: *So we're speaking... but are they really listening?*

The focus in this issue is speaking and listening. The four leaflets included within the Primary Strategy resource box 'Speaking, Listening, Learning: working with children in Key Stages 1 and 2', entitled 'Speaking', 'Listening', 'Group Discussion' and 'Drama' provide a good starting point for teachers looking to plan speaking and listening skills and objectives into their teaching, and include key skills, teaching points and useful classroom techniques. In this issue we provide guidance for using this as a CPD opportunity to use during a staff meeting in mathematics.



## From the editor

We would be really interested in hearing your feedback on the Primary Magazine. We would like to know your views on what you have liked and what you found less useful. We would like to know if you have used any of the ideas from the 'focus' and 'maths to share' articles. We would like to hear your feedback on the Up2d8 maths based around the credit crunch – were you able to use it with your class? How did it go?

We are always looking for ways to improve the magazine and really need your input to be able to do this! Please add your comments to the [Primary Forum](#).

Compared to 1997, 93 000 more 11-year-olds are now achieving the target level for their age in mathematics. However, the shadow schools minister, Nick Gibb, asserted that, "Since Labour came to power, a total of over three million pupils have not obtained the basics in the three Rs, and ministers have still failed to hit targets that they promised to meet two years ago. We must ensure that every pupil leaves primary school able to master the basics."

To this end, one of the latest initiatives being piloted in 21 local authorities this term is Every Child Counts. The government is hoping that this early intervention programme will stop children falling behind. For more details [click here](#) to read an article published in [The Guardian](#).

If you are involved in the pilot, it would be really interesting to hear your experiences of this so far ....is it working, is it sustainable? Please add your comments to the [Primary Forum](#).

You might be interested in reading about an alternative improvement agenda in mathematics teaching set up by The Wroxham School in Potters Bar, Hertfordshire. [Click here](#) for an article about their strategies which include a belief in not labelling children according to attainment. It's well worth reading.



## Up2d8 maths

Recently Sandbach, a town in Cheshire, put up distance signs in metric measures instead of imperial. The town's people had mixed feelings about this. Some were outraged and others were accepting. The children are asked to consider whether we should use imperial measures, metric or both. There is also a focus for discussion on the recent story of a lady who faces prosecution in January 2009 for trading in east London using imperial scales. This presentation opens up many opportunities for exploring imperial and metric 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 Celia Hoyles OBE

Professor Celia Hoyles OBE is the director of the NCETM and a mathematics educator of long standing. She has been Professor of Mathematics Education at the Institute of Education, University of London since 1984, and was head of the Mathematical Sciences Group from September 1995 to August 1998. She was awarded a first class honours mathematics degree in 1967 at Manchester University, and her PhD in Mathematics Education in 1980. She has been the director of over a dozen research projects concerned with primary and secondary mathematics, particularly in relation to the use of computers, students' conceptions of proving and proof, and mathematics used in the workplace. In 2004, the then Secretary of State for Education and Skills, Charles Clarke, welcomed her appointment as Chief Adviser for Mathematics.

For more details about Celia's achievements [click here](#) and follow the profile link.

When asked which weblink she would like included in this interview this was her response: the only link I would like is to the [NCETM portal](#). It has *such* a wealth of ideas now and ways teachers can engage with each other around mathematics. I just hope they will have the opportunity to benefit from it. There is a growing primary community and resources to work with – just browse by phase and pop things you like in your favourites and do let us know how you use our provision.

### What were your memories of mathematics when you were at school?

In primary school, I was taught in a very traditional way but always with humour – even when we did endless sums about 'one man digging a hole at  $x$  rate, how long would  $n$  men take etc'! So odd! In secondary school, I remember my applied mathematics teacher – dashing, glamorous and trained as an engineer (very unusual then). I also had a wonderful pure mathematics teacher, very painstaking in ensuring we *all* appreciated the 'why' of the mathematics she taught and not only the 'how'. In addition to these two, I had a superb tutor at Manchester University who was a real inspiration. I have always found the subject *challenging but enjoyable and rewarding* as well. It was not easy and I was never bored! I always worked hard; I *really* wanted to *really* understand and would persevere until I did, usually working with others if I could. To be honest, I was rewarded and did well.

### Have you always been a mathematician, or is it an interest that developed during your working life?

After earning my degree, I taught mathematics. I found it challenging but discovered a new passion aligned to my old one but just as hard – that is, to try to appreciate 'the pupil's view of mathematics' (the title of my PhD) which involved analysing pupils' conceptions and attitudes. This included misconceptions but also much more, for example, how so often the particular way we teach one topic can have consequences later (just think of adding 0 as a way to multiply by 10, and then students working with decimals!). Since then I have tried to make mathematics more accessible to more students in whatever way I can.

I work a lot now with ICT as a way to take forward this lifetime agenda – to challenge our students mathematically, but with a range of scaffolds in place so students are able to rise to this challenge and obtain timely feedback on their efforts.

We had a wonderful project in primary schools that involved setting up and interrogating a database around how to find the best home for a family, each with a range of distinctive characteristics, and including an alien who had even stranger needs! We worked with a range of teachers and the project became a whole-school project in some places – it was hard fun. I also became very involved with Logo

– who remembers the turtle? The idea of a programming language for learning mathematics has spread to many software innovations. The key to the success of any scenario of ICT use in classrooms is, in any instance, of course the teacher.

My latest passion is the NCETM and to work with our team to put in place an infrastructure so all teachers can have the advantages and the stimulation that I was fortunate enough to have enjoyed.

**How has mathematics impacted on your life?**

Well mathematics has defined my life in so many ways... as a teacher but so much more. I am married to a mathematician (Richard Noss) who also loves technology. We do research together on the use of ICT and mathematics. We also talk about mathematics and the perspective it gives us – and we talk to our non-mathematical friends about it. I want everybody to be a mathematics champion!

**How did you get to where you are today?**

Very traditional route I'm afraid – A Level Pure and Applied as it then was, then Mathematics degree, became a teacher and started to study mathematics education in PGCE, MEd and then PhD. I have kept on learning as much as possible since then.

**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?**

I would like to phone my dear dad – who has sadly died. He always supported me in my mathematics (he was an accountant) and I would like him to know how much I learned from him in so many ways.

**What do you think could be done to help inspire more young people to enjoy mathematics today?**

We just need to support teachers to be able to transmit the joy of it all and to help their students to be successful by building on what the student can do – this sounds easy but in fact it is quite challenging. You need to be a bit of a detective – what is the student thinking and why?

**When was the last time someone surprised you – mathematically speaking?**

I was at a meeting with scientists about STEM (Science, Technology, Engineering, and Mathematics) and a physicist expressed surprise that mathematics teachers were trying to make mathematics teaching more exploratory and interactive. He was convinced that our teaching had not changed at all and we simply transmitted facts and arguments from the board that had to be duplicated and learned by the students.

**If you weren't working in a career that involved mathematics what would you be doing?**

I think I would always be involved in some way in mathematics – but I would be spending more time playing tennis and enjoying all the galleries, museums, plays and music in London!

**And finally, if you lived in a world of cubes and spheres, which would you rather be? Why?**

A sphere: I don't like straight edges.



## Focus on Christmas

### Did you know?

#### Christmas facts

- In 1647, the English parliament passed a law that made Christmas illegal. The ban was lifted only when the Puritans lost power in 1660
- In Victorian England, turkeys were popular for Christmas dinners. Some of the birds were raised in Norfolk and taken to market in London on foot. To get them to London, the turkeys were supplied with boots made of sacking or leather to protect their feet from the frozen mud of the road
- Queen Elizabeth's Christmas message to the nation was televised for the first time on December 25, 1957
- On average, each person in the UK will spend £330 on Christmas gifts
- Each year around 125 000 tonnes of plastic packaging is thrown away over Christmas
- Each year 34-36 million Christmas trees are produced.

Why not use some of these facts to create interesting problem-solving questions for your class?

For more Christmas facts like these [click here](#) to access the Bradford Schools e-portal. Better still, ask the children in your class to find out facts from this site.

Christmas-based activities can provide fabulous opportunities to develop children's problem-solving skills using a meaningful context. Why not try these activities...

#### Christmas holiday activities

You could pose these questions for children to investigate:

- How many [Christmas lights](#) are decorating your house? How many [extra watts of power are they using?](#)
- Have your tape measure handy to [measure the dimensions of the package. How much wrapping paper will you need?](#) Why not [make your own wrapping paper](#), using [tessellations!](#)
- Determine the [probability](#) that Dad gets a tie/pair of socks/etc
- [Estimate](#) and [time](#) how long it takes to unwrap all the presents. Compare and contrast this with [how long it took to wrap them.](#)

#### EYFS

##### Small world play

Tell the children they are going to help Santa to sort his parcels in preparation for Christmas. Collect an assortment of parcels of the same and different sizes, shapes, masses and wrapped in different colours. In a small group, ask the children to sort parcels in whatever way they want. Discuss their methods.

Explain that everyone in the group will have an equal share of the presents and that you need to decide how many of each present will need to be put in each stocking. Give pairs of children responsibility for working out how they can share equally one of the kinds of present. Count together out loud each type of present as you place it in a paper bag. Write the number on each bag.

Encourage their different strategies and mark-making, and support them in finding a solution. They may need to alter their strategy. Help them talk and think through their problem and possible solutions. Ask them for suggestions if they have some presents left over. They may show this in their mark-making.

## KS1

Try this activity based on 'The Twelve Days of Christmas' which has been adapted from an article published by Jenny Houssart in the TES (date unknown).

Sing the song, supported by [PowerPoint resource](#), and then ask these questions:

- How many swans and doves altogether? Find two other sets of presents which add up to this total.
- How many more maids than rings? Ask children to find different questions with the same answers.
- On the twelfth day, how many birds? How many people? How many wings? How many legs?
- If one of the groups of birds flies away, leaving a total of 16 birds, which group is it that flies away?
- The drummers are offered punch and mince pies. Half the drummers like punch.
  - How many drummers like punch?
  - How many don't like punch?
  - $\frac{1}{3}$  like mince pies. How many like mince pies?
  - How many don't like mince pies?

Make up different fractions questions

### Twelve drummers dressing

The drummers are cold. Some wear vests to keep warm, the rest wear coats.

Ask the children to suggest the number wearing coats. How many are wearing vests? Can the children find all the possibilities for finding the number of drummers wearing coats and vests? Can you have 0 vests?

### Twelve drummers drilling

Twelve drummers are arranged in rows with the same number in rows. Find ways of doing this.

How many ways of doing this? Find as many answers as you can. Could lead to a discussion: is  $3 \times 4$  is the same as  $4 \times 3$ ?

## KS2

### Christmas Presents

Mum, Dad, Grandma, Robert and Jenny each gave one present to someone else in the family. No one received more than one present. Use the clues to find out who gave what to whom:

- Mum receives a CD
- Dad receives a book
- Grandma gave a football
- Dad gave a scarf, but not to Grandma
- Robert gave a jigsaw puzzle and did not receive the scarf.

### Solution

Present donated by	Present given	Present received by
Mum	Book	Dad
Dad	Scarf	Jenny
Grandma	Football	Robert
Robert	Jigsaw	Grandma
Jenny	CD	Mum

Why not adapt the context of the activities from the Primary National Strategy [Challenges for Able Pupils](#) book to fit in with Christmas?

These are easy ones to adapt: Gob-stopper (2), Ride at the fair (8), Christmas Tree (22), At the Toy Shop (23), Treasure Hunt (36), Stamps (37), Maisie the Mouse (38), King Arnold (48), Presents (57), Slick Jim (76). If you find more please post your suggestions in the [Primary Forum](#).

If you are following the PNS blocks and units, these suggested activities would fit in well with block E. It would provide a real-life context to the children's work and give purpose and meaning to their tasks. You could adapt and build on the ideas and links on this page. If you do, it would be great to hear your ideas - why not share them in the [Primary Forum](#)?

Why not try these Christmas mathematics activities from the World Wide Web:

North American Aerospace Defense Command (NORAD) [Tracking Santa's Big Trip](#) is a great exercise in geography, distance, speed, temperature and time zones. Highlights of the 2007 trip include Santa leaving the North Pole; hovering over Mt Fuji, Japan, then departing at a speed estimated to be one hundred times that of the Bullet Train which passes nearby; visiting Baghdad, Iraq, and the Army base camps; slowing a bit over Reindeer Lake, Saskatchewan, Canada, where Donner and Blitzen have relatives.

[NRICH](#) have some great Christmas activity ideas: [click here](#) to see them.

### CPD opportunities

- Share ideas your ideas with colleagues. Together consider how ideas can be adapted to suit different cohorts/year groups.
- Plan a whole school assessment for learning activity - eg 'The Super Smart Snowman Dress' the snowman has 3 different hats/noses/accessories. How many different snowmen can you make?

[Click here](#) to download the activity sheet.

Use the activity as part of an APP task to moderate levelling and illustrate progression.





## Starter of the month

### EYFS

Sing 'The Twelve Days of Christmas'. As you sing, ask the children to match each line with the appropriate number of fingers and a suitable action. As you sing point to the number on a number line. As the children's awareness of numbers develops you could ask a child to come and point to the numbers.

### KS1

#### Santa's magic sack

Use 2 different coloured multi-link cubes and fill a bag with them.  
Decide on a value for each colour. For example, blue = 10, yellow = 1.  
Shake the bag and ask children to pull out 4 cubes.  
Can they make and say the number represented by the cubes?  
eg 2 blues, 1 yellow = 21.

### KS2

#### Christmas Word Challenge

If  $a = 1$ ,  $b = 2$   $c = 3$  etc, find Christmas words which are worth a multiple of 10,

For example, **Bells** has a value of  $2+5+12+12+19$  which is 50.

Here is a list of words to get you started, but ask the children to come up with their own. They can get 5 points for every word that has a sum of a multiple of 10 and 20 points if they can find a word that has a total of 100. It is up to you to decide whether calculators would be appropriate:

Present  
Santa  
Wrapping paper  
Snowman  
Tinseltime



## A little bit of history - Babylonian numerals

The Babylonians lived in Mesopotamia, which is between the Tigris and Euphrates rivers.



*Click the thumbnail to download a larger map.*

They began one of the oldest number systems in the world about 5 000 years ago. We know about it from clay tablets which have been found in the area. There are many thousands of these tablets still around today, some of which are in the British Museum in London.

Their system began with tally marks just as most of the ancient number systems did. The Babylonians developed theirs based on wedge-shaped symbols which they imprinted, using a stylus, onto wet clay tablets and then baked them in the hot sun.

They had a very advanced number system even for today's standards. It was a base 60 system rather than a base ten, the one we use today.

The Babylonians divided the day into twenty-four hours, each hour into sixty minutes, and each minute into sixty seconds. This form of counting has survived for four thousand years and is the basis of our time system.

Here are the numbers to 70, made of just two symbols ([click here](#) to download a larger scale copy of these number charts).

1	2	3	4	5	6	7	8	9	10
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In the Babylonian system, numbers to 59 stay in one column like our ones/units to 9, when the extra number is added the 60s column begins as does our 10s. At 60, lots of 60, as with 10 lots of 10, the next column begins in this case for 3 600 instead of our 100s.

3600s	60s	1s	Value
		∩∩	$1 + 1 = 2$
		<∩	$10 + 1 = 11$
		<<	$10 + 10 = 20$
	∩	∩∩∩∩	$60 + 1 + 1 + 1 + 1 = 64$
	∩∩∩	∩∩	$60 + 60 + 60 + 1 + 1 = 182$
∩	∩	<∩	$3600 + 60 + 10 + 1 = 3671$
∩∩	∩		$3600 + 3600 + 60 = 7260$

[Click here](#) to download a copy of these number charts for use with the children. Can they work out how to write different Babylonian numbers using the information? Information in this article was sourced from the following websites:

[Association of Teachers of Mathematics](#)  
[Babylonian Numbers](#)  
[Wichita State University](#)



## Something to share

### So we're speaking---but are they really listening?

Ensure copies of the four posters from the resource box **Speaking, Listening, Learning: working with children in Key Stages 1 and 2** (DfES 0623-2003) are available for all staff. [Click here](#) to download this resource.

Ask colleagues to work in groups to decide whether the statements in the table below are always, sometimes or never true.

Encourage them to explain how they can be sure.

3D shapes roll in a straight line.	When you cut a piece off a shape, you reduce the area and the perimeter.
A pentagon has fewer right angles than a rectangle.	Quadrilaterals tessellate.
If you divide a number by 2, the answer will be less than the number.	The square of a number is greater than the number.
Multiplying makes numbers bigger.	Shapes with larger areas have larger perimeters.
In a lottery, the six numbers 3, 12, 26, 37, 44, 45 are more likely to come up than the six numbers 1, 2, 3, 4, 5, 6.	Numbers with more digits are greater in value.

Ask them to consider the following questions as they try the activity:

- Who talked the most? Who spoke the least?
- Did they have a role in the group? What was it?
- Did anyone feel uncomfortable? If so, how could this have been avoided?
- Did people tend to support their own views, or did anyone take up and improve someone else's suggestion?
- Has anyone learnt anything? If so, how did this happen?

Adapted from **Improving Learning in Mathematics**, DCSF, 2005

[Click here](#) for full details of the resource, and download/order options.

Have any of them used an activity such as this before? (A similar activity is referenced in Issue 2 of the magazine, within 'Group Work').

'Speaking and Listening' has been the *buzz* phrase in primary education for a while now, but have teachers really changed their practice to support pupils in the development of effective speaking and listening skills in mathematics? Rosemary Sage (**Lend us your ears**, 2003) claims that 60% of our time in everyday life is spent listening, 20% speaking, 12% reading and only 8% writing. If this is indeed true, then it is vital that we establish rules and guidelines in the classroom, and instead of

assuming children will 'collect' the skills they need as they grow, actually TEACH children the speaking and listening skills they require.

Picture the scene... Year 2 children are gathered around their teacher's feet on the carpet at the start of a mathematics lesson. The teacher is asking a variety of questions requiring recall of number facts, as well as the occasional explanation of method. Another question is posed, and after a few seconds' thinking time, several hands shoot in the air. When directed by the teacher, two children take turns to give their different responses. A third child, when asked, gives the same response as the first.

How do we as teachers often respond? Many of us have been guilty of a response such as, "Weren't you listening?... Brian just said that!" In actual fact, the child may have been listening very carefully, internalising the meaning of the question, carefully working out their response, before raising their hand to share this with the group. The fact that the answer is the same as another child is simply coincidental.

In 2003, every primary school received a box of materials entitled **Speaking, Listening, Learning: working with children in Key Stages 1 and 2** (DfES 0623-2003 G). Among the materials for supporting teachers in this area, it maps out a progression of objectives for the direct teaching of speaking and listening in ALL areas of the curriculum. With reference to the Year 2 child above, the materials suggest that it is not until a child reaches approximately Year 4, that they are able to adapt their intended response in light of someone else's contribution.

The materials contain a wealth of support for schools, including:

- handbook with advice and assessment
- poster focusing on progression across Year 1 to 6
- progressive speaking and listening objectives for Years 1 to 6
- examples of teaching sequences for teaching these objectives
- video footage linked to some of the objectives
- leaflets on the four aspects of speaking and listening (Speaking, Listening, Group Discussion and Drama).

A key strength of the materials is that they support the integration of speaking and listening into all areas of the curriculum, including mathematics. Many references, though not mathematics specific, clearly show the links between the skills required:

*"...children use speaking and listening to solve problems, speculate, share ideas, make decisions and reflect on what is important."*

(**Speaking, Listening, Learning; working with children in Key Stages 1 and 2**, Handbook.)

Ask colleagues to refer to the four leaflets from the resource box **Speaking, Listening, Learning: working with children in Key Stages 1 and 2**. Ask them to choose either 'Speaking' or 'Listening' and scan the contents. Pose the following questions:

- To what extent are these skills already taught explicitly across the school? In your class?
- How can you adapt your planning of mathematics to include opportunities for the teaching as well as practice and consolidation of these skills?

It might now be appropriate to split the group to cover all four of the leaflet foci. Ask them to consider the 'Useful classroom techniques' on their leaflet and try to think of appropriate activities in a mathematical context. Share ideas between the group.

Some examples of this are available, many of which have been written by local authority mathematics curriculum support teams. It would be useful for colleagues to have copies, though credit must be made to the relevant authors.

- [Cumbria LA](#)
- [Kent LA](#)
- [Leicestershire LA](#)

### Next steps

There is now a far greater emphasis on 'divergent assessment', where teachers spend time observing pupils at work, listening to their mathematical discussions and assessing their understanding. [Assessing Pupils' Progress](#) is currently high on the agenda of many primary schools. It provides a structured approach to assessing mathematics (as well as reading and writing), enabling teachers to track pupils' progress and improve the quality and reliability of their teacher assessment.

It is vital then that as teachers, we work towards ensuring that all pupils are equipped for, and are given the opportunity to, communicate their mathematical understanding to us and their peers. The skills of speaking and listening are paramount to effective mathematics teaching and learning.

*"...to confine children to mathematical tasks where the language skills of writing and reading predominate over those of talking and listening is unlikely to maximise mathematical growth."*

(from Bullock Report, 1975, cited in **Maths Talk**, Mathematical Association, 1987)

- Ensure all teachers have access to copies of the Primary Strategy resource box **Speaking, Listening, Learning: working with children in Key Stages 1 and 2** (DfES 0623-2003 G)
- Try, where possible, to include the relevant speaking, listening and learning objectives into mathematics planning. Four objectives are identified for each term (for years 1 to 6), one for each of the four foci identified in the leaflets.
- Take time to share ideas and good practice with others – we all have something to learn!