Primary Magazine

Issue 36

National Centre for Excellence in the Teaching of Mathematics

Welcome to the 36th issue of the Primary Magazine. Our article *A little bit of history* focuses on the Ancient Greeks, we look at the art of African masks and focus on trees. Our CPD opportunity considers the development of fractions in the EYFS and KS1 and our ICT feature explores the use of spreadsheets in KS1 in mathematics. *It's in the News!* features the second part of our Olympics mini-series.

Contents

Editor's extras

On 27 June, the NCETM held an event, *Developing Future Leaders in Mathematics*. The aim of this event was to discuss what information and resources should be available to help support the future mathematics specialist teachers as they complete their courses. The NCETM is committed to the development of a microsite to provide what these teachers would consider helpful. It was a really good event. We invited teachers from the MaST (Mathematics Specialist Teacher) pathfinder programme and also Cohort One from around England. Sir Peter Williams opened the conference with a speech about the importance of mathematics specialist teachers. Brenda Spencer spoke about how MaST can support teachers in the EYFS, Jane Salisbury told us about the work she had done as part of the NCETM national priority project we told you about in Issue 35, and the teachers from the Wandsworth group of pathfinders shared the work they have been doing to help promote mathematics in their local authority. Mary MacAteer from Edgehill University talked about the MaST programme from a university perspective. The microsite will be ready for people to explore later this year and we will let you know when it is. A report of this event will be available shortly.

Did you see the report written by Professor Robin Alexander in *The Guardian* in March of this year? If not, it is well worth reading. He pleads for schools to teach a richly rounded curriculum. He also talks about the primary reviews undertaken by Cambridge and Rose, how they've been dismissed by successive governments and how another is underway. Professor Alexander is the director of the Cambridge Primary Review which is now in its dissemination and networking phase.

Did you know that you can take your class to the Bank of England, on Threadneedle Street in the City of London? The Bank delivers a presentation suitable for particular age groups on the importance of money – what it is, why we have it, saving, spending and much more. It is absolutely free and well worth a visit. There is a museum to look around and a bar of gold, worth over £300 000 and weighing over two stone, that the children can try to lift up. Their website gives details of how to book or, if you can't make the journey, they provide teachers' packs with a copy of the video they show at their presentation. The pack has resources for use in school. It is a great resource for financial capability with an obvious link to mathematics. If you are working on these matters and haven't yet discovered the resources provided by the Personal Finance Education Group (PFEG) you might find their website useful.

If you are able to visit the Bank of England you might also be interested in walking to St Paul's Cathedral. There are various school trails that you can do here including a mathematics one: let us know if you have been to either of these, we'd love to know what you thought of them.

When did you last read any mathematics education research? Responses to this question usually cover a range from *'When I did my training'* to *'It informs my everyday teaching'*, but it would seem that there are many people who say things like, *'I'd like to read some research but I have no idea where to start'*.

For these people in particular, there is a new microsite on the NCETM portal, Accessing Research, where there are ten study modules.

Each study module consists of:

- the module itself (in PowerPoint form) offering you activities, discussion points, etc. related to the research article
- the full research article
- some brief contextualising notes including things to do before you start, how long it might take and what others who have used this module think of it.

Reading what other people have written about an area of mathematics education that you are interested in can give you a fresh insight into that topic and also provide a different perspective from which to reflect upon your own practice.

Why not put aside some time during the summer term to have a look at one of these modules – perhaps as a pair or small group – as part of your continuing professional development. Perhaps the article 'Pre-service primary teachers' concepts of creativity in mathematics' by David Bolden, Tony Harries and Douglas Newton may be a good place to start to give you an opportunity to think about creativity in the classroom. But wherever you start, these study modules have the potential to provide you with an interesting way to engage with research.

Comments from people who have worked on this module included:

- *I really enjoyed it.*
- *The way that the slides guided me through what sections to read, and then to stop and reflect, made it very easy to follow and make use of the text.*
- *I will make sure I leave room not only for me to be creative with resources but also allow my pupils to be creative with their mathematics.*
- *It has started the ball rolling on thinking of ways in which I can teach creatively, and teach creativity. I am now going to think about how this is achievable within a maths classroom, and furthermore the importance of it.*

Do tell us about your experiences working on one of these modules.

And finally, another fun website to explore: Number Picture. This is a web application that enables you to come up with, easily create, and share fresh and interesting tools for visualising data.

Magazine authors: *Caroline Clissold, Emma Low, Cherri Moseley, Donna Wright*

It's in the News!

In this second part of the two-part series on the Olympics 2012, we look at the timetables of events, the events themselves and their venues across the UK. We don't cover the ongoing saga of the purchasing and receiving tickets, but that is something you might like to add. In this issue's article A little bit of history there is some information about the first Olympic Games in Ancient Greece. This mini-series might provide useful suggestions if you are currently talking about this topic. If not, it might prove helpful for when you do. In these slides there are links to geography, history and PE. They give opportunities for work on a variety of mathematical concepts such as number, data handling and measurement including time.

The mathematics opportunities are endless, so here we give just a few more!

Before you use the slides you might find it helpful to look at the following websites for further information:

- The official website of the London 2012 Olympic and Paralympic Games
- CBBC news
- Daily Telegraph (torch route).

Please note – some of the news items may be out of date at the time of publication, but they will still provide great mathematical activities!

This resource provides ideas that you can adapt to fit your classroom and your learners as appropriate. As always, we would be extremely grateful if you could give us some feedback on how you have used it, if it has worked well and how it can be improved.

Download this *It's in the News!* resource - in PowerPoint format.

Download this *It's in the News!* resource - in PDF format.

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The Art of Mathematics
African Tribal Masks

African tribal masks are highly sought after, both by art collectors and as souvenirs. Museums and art galleries across the world house collections of both original and replica works. African art was originally viewed as 'naïve' until its spiritual and social functions were appreciated.

African tribal masks can be made of various materials, including leather, metal, fabric and various types of wood and are worn in a variety of ways. Made to be used, rather than a work of art as such, masks were worn to cover the face or the whole head while others sit on top of the head. Horizontal plank masks were worn on top of the head and often resemble a bird in flight. The underneath is carved to fit the top of the head. Helmet masks cover the whole head and are usually made from a hollowed-out tree trunk.

During celebrations such as initiations, weddings, funerals, harvests, war preparation, peace and all manner of troubled times, masks are worn by a chosen dancer or dancers. The mask is a disguise, usually representing a spirit or an ancestor and is therefore in the shape of a human face, or an animal beak or muzzle. Members of the tribe believe that the spirit of the ancestor or animal possesses the wearer. The dancer goes into a trance where he can communicate with the spirit. Sometimes a translator accompanies the dancer to interpret the sounds he makes. When a mask is believed to be the dwelling place of the spirit, the mask itself will be given gifts and become the focus of ceremonies. Rituals and ceremonies are always accompanied with prayer, song, dance and music played with traditional African musical instruments. These rituals and ceremonies were a rich part of African life for many centuries, and, to a lesser extent, still are today. However, the vast majority of people have lost some of their tribal identity and culture, making masking ceremonies no longer commonplace in Africa.

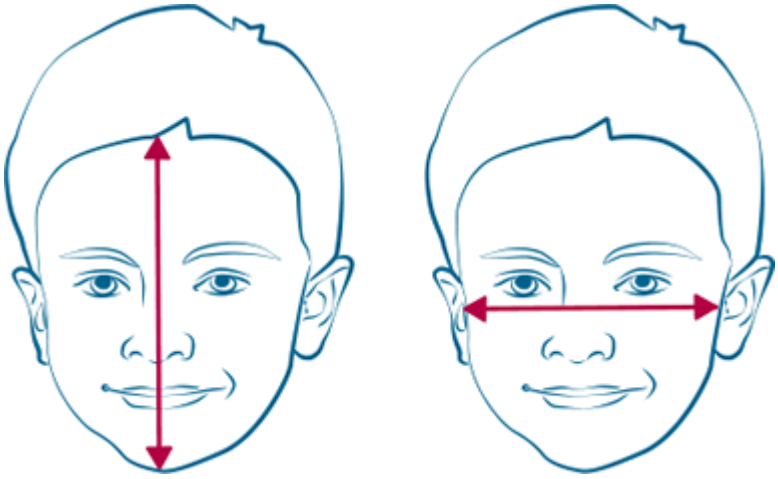
A Department for Education initiative to enhance professional development across mathematics teaching

The tribal masks have clearly influenced other traditions such as the masked carnival parades of South and Central America., as well as Western art movements such as cubism, fauvism and expressionism.

Masks are almost always symmetrical with stylised or exaggerated features to help show emotions. They were originally made by tribal artists whose training would last many years. The artist needed a strong knowledge of traditional carving techniques and an understanding of how these applied to the social and religious objects he created. His work was valued for its spiritual rather than aesthetic qualities. The artist was either the son of a master carver whose skills have been passed down through many generations of the family or an apprentice in the workshop of a master carver. Today, most traditional African artworks are produced for the tourist trade.

Activities

Use the study of African tribal masks to explore the human face. Using string, measure from the hairline to the tip of the chin, then from where the earlobe joins the face to the second earlobe. By folding the string, explore whether there is a relationship between these two measurements. You may find there are groups of measurements where the relationship is almost exact, more than and less than a particular relationship. Gather the relevant children together to see if a description can be used to name each group type.



Explore the golden ratio through the face. For information on the golden ration, go to The Art of Mathematics in Issue 33 - Looking at paintings with a mathematical eye, and A little bit of history in Issue 20, Famous Mathematicians - Fibonacci; both articles offer suggestions for activities.

Ask children to use the measurements of the face to draw and cut out the shape of their face from thin card. Carefully measure where the eyes, nose and mouth are to cut appropriate holes in the mask, then decorate. Make sure that the mask is symmetrical, though with only one central, vertical line of symmetry. For a more detailed design session, go to artyfactory, where you will also find more information and examples of masks.

For more information on African tribal masks:

- Rebirth.co.za
- Wikipedia.

Image Credits

Paul Klee photograph by Alexander Eliasberg courtesy of Wikipedia in the public domain

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Focus on…Trees

Trees are one of the Earth's greatest resources. They keep our air clean, provide food, reduce noise pollution and make our environment look beautiful. Trees are also a great resource to explore in the classroom providing many mathematical opportunities for investigation.

Here are just a few thought-provoking facts:

- there are about 20 000 tree species in the world. The United States has one of the largest tree treasuries, second only to India
- the world's tallest tree is a coast redwood in California, measuring more than 360 ft or 110 m
- the world's oldest trees are 4 600 year old Bristlecone pines in the USA
- the amount of oxygen produced by an acre of trees per year equals the amount consumed by 18 people annually. One tree produces nearly 260 pounds of oxygen each year
- the death of one 70-year-old tree would return over 2 700 kg of carbon to the atmosphere
- trees can induce rainfall by cooling the land and transpiring water into the sky from their leaves. An acre of maple trees can put as much as 76 000 litres of water into the air each day
- the smallest tree is thought to be the Pygmy Pine, growing as little as eight centimetres in height with branches up to five millimetres in diameter and up to one metre long
- some 3 500 English oaks were used in the construction of HMS Victory, now moored at Portsmouth
- a fully-grown oak in the UK grows - and sheds - 250 000 leaves every year and produces around 50 000 acorns in a good year
- it takes approximately two tonnes of timber to make one tonne of paper.

Whether exploring size, magnitude, quantity or type, trees provide a wealth of learning experiences, so where do we start?

Most young children enjoy practising counting on and back through the fun of rhymes and song. Ten Tall Oak Trees provides a fun starting point for children to look at the concept of one less, and counting back in ones, in a thought-provoking context.

Whilst some schools will have a selection of trees on site to look at, others may take the opportunity to visit neighbouring environments to investigate the properties of a variety of trees. During this walk, children could gather a selection of leaves to sort and explore either on site or back in the classroom. Children could decide on their own criteria for sorting, or they could be guided to sort the leaves by colour, whether they are large or small; broad or narrow; smooth edged or jagged edged. They could then discuss how their sets should be presented to clearly show the reasons for their sort. Older children could consider the use of Venn, Carroll and tree diagrams using two criteria.

Leaves images from left to right by Daniel R Blume, pareeerica and anemoneprojectors

These leaves will provide further opportunities for practising measuring skills. Ask children to measure the length and width of the leaves. How can they calculate the area of their leaves? Older children could use these measurements to determine the mean length, width and area of leaves from a specific tree.

After a wood walk, why not work on strategies for estimation. Young children could be asked to estimate how many conkers have been collected by different groups or by the whole class. What strategies do they have for estimating how many conkers each group has collected? Encourage pupils to adjust their estimates once they learn how many conkers have been collected by the first group by comparing the quantities and deciding, visually, if there are more or less in their own collection.

How could pupils estimate the number of leaves on a tree? What would be the best 'bench mark' to use? How many leaves are on a small branch? How many small branches on a bough? How many boughs on the tree? Encourage the children to think about which calculations they can do mentally; which require jottings or more formal methods; which require a calculator.

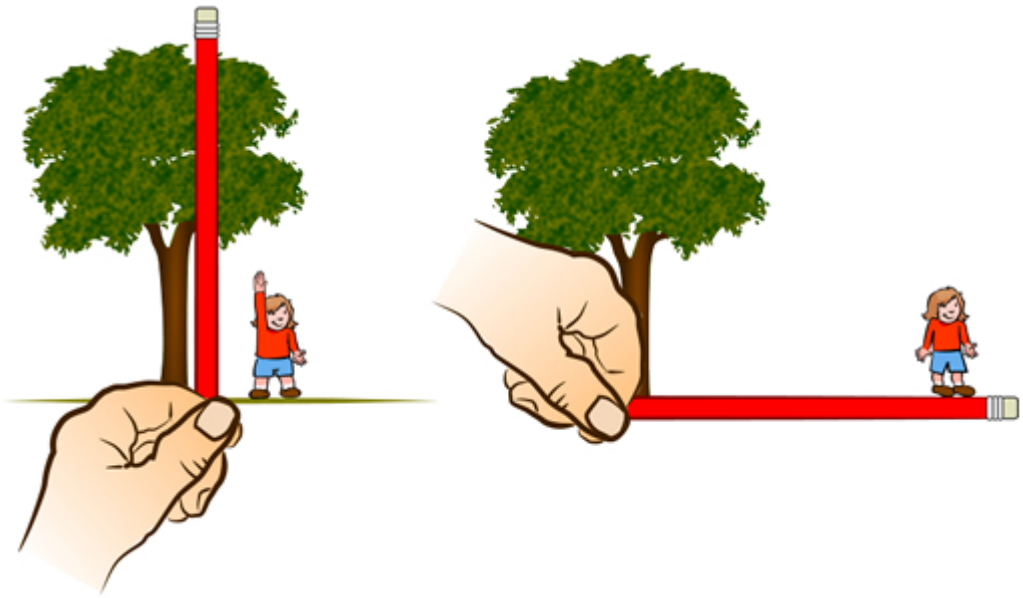
Having explored the quantities of leaves on a tree and their dimensions, we can use this information further to explore 'What if…' type questions.

- what if we laid these leaves tip to base, how far would they stretch?
- what if we lay them next to each other to make a carpet – what would be the total area of the leaf carpet?

Discuss with the children the mathematics required to answer these questions and encourage them to think of 'What if…' type questions of their own.

There are many strategies suggested in WikiHow – Measure the Height of a Tree for calculating the height of a tree. For older children, one of the more successful methods for calculating the height of a tree is the 'pencil method'. To calculate the height of a tree using this method:

- start at the base of the tree, step backwards until you are father away from the tree than the tree's base from the top
- ask a friend to stand next to the tree's base
- hold a pencil straight up by its point. Close one eye and hold the pencil so that it lines up with the tree
- move backwards until the pencil looks as tall as the tree
- carefully turn the pencil sideways, keeping your thumb lined up with the tree trunk. Your pencil should look as if it is lying on the ground.
- ask your friend to walk away from the tree in the direction of the pencil. Tell your partner to stop when it looks as if he or she is lined up with the end of the pencil
- measure the distance between your partner and the tree's base. This will be the approximate height of the tree.



The world's oldest tree is about 4 600 years old. Can the children calculate how old the trees are in their school grounds or nearby woodland? One theory is to count the annual growth rings of a felled tree.

Tree rings photograph by Sheila Miguez

Pupils would need to find a tree stump, preferably a large stump where the rings are clearly visible. The most recent rings are nearest the bark, the older rings are nearer the centre of the tree and may be dark in colour. The children can then count the rings on the tree to estimate how old it was when it was felled. Ask pupils to work out how much older or younger they are than the trees they are looking at.

Alternatively, pupils could measure the girth of the tree (about one metre from the ground) using a piece of a string or tape measure. On average, each year, the girth of the tree will grow by 2.5 cm. So a tree with a girth of 100 cm will be about 40 years old (100 divided by 2.5).

It is important to know that for some trees, just because they are tall, they are not always older than a shorter tree. Ask pupils to investigate a general statement such as, "Is it true that the tallest tree is always the oldest tree?". Ask them to order the trees by age and by height, is there always a correlation?

One last thing….
Did you know that pine cones show the Fibonacci spirals clearly? Take a look at highlighted spirals on the cones on Fibonacci Numbers and Nature and then gather your own pine cones and count their spirals. Does the number of spirals always demonstrate the Fibonacci sequence?

Other Links and Information

- Heritage Woods online: The Wonder of Wood
- The Guardian: Maths all around us
- Learning Maths Outside the Classroom – The School Grounds: One, Two, Tree – Maths Naturally tells of how a school rich in trees, shrubs and hedges used their environment to look at a range of mathematics for all their pupils.
- Learning Maths Outside the Classroom – The Natural Environment: The Royal Statistical Society in Treswell Wood.

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A little bit of history
The Ancient Greeks

In this article, we are being really cross-curricular and looking at some of the ways that you can link mathematics into a topic of the Ancient Greeks. If you are looking at this period of history, try some of the ideas. This will mean you can double up on the maths that you do during the day!

However, due to the large amount of ideas and resources, this feature can only be read directly on the portal, otherwise the interactive nature of the way they are presented will be lost.

Image Credits
Page header - Parthenon photograph by Roger Wollstadt some rights reserved

Maths to share – CPD for your school

Fractions

Do you ever hear your staff complain that the children can't understand fractions or can't complete the required National Strategy objectives for Years 3, 4, 5 or 6? In this issue of Maths to Share we consider how fractions could be taught in EYFS and KS1 to enable the children to be ready to learn what they need to in KS2.

You may find it helpful to refer to Maths to Share in Issue 17 of the Primary Magazine, which featured fractions, decimals and percentages for extra information. There is a PowerPoint presentation, which you might find helpful if you lead a staff meeting on this issue.

Before the meeting ask colleagues to read Fractions: difficult but crucial in mathematics learning. It will form the basis of a discussion during the reflection part of the session.

There is no direct reference to 'fractions', as in finding them, until Year 2 in the Primary Strategy Framework: finding quarters, halves, three quarters of shapes and sets of objects. In Year 1, there is reference to finding halves and quarters in context. These come up for a few days once a term in Block E. If this is all they do, it probably isn't surprising that the children are not likely to be ready to do what is expected of them in KS2.

In Reception and Year 1 there is plenty of reference in the framework to half, but not specifically within the concept of fractions: half an hour, half a turn, half empty, give me half the cubes. In Year 1, in the calculation section, they begin to double and halve.

Their early understanding of fractions comes when they are:

- in the hall making half a turn
- in the water tray/sand pit filling half a container
- sharing chocolates/counters/anything so have half each
- moving minute hand of a clock half way round the clock face.

They cover sharing in Years R, 1 and 2, but many teachers don't mention that when they share equally each group or person has half, a quarter, third etc. For example, if there are 21 sweets and we share these equally between three children each child will have seven, which is one of three groups or one third; two children will have 14 altogether which is two thirds and the whole amount is three thirds. If we spoke the language of fractions like this when covering sharing, it would really help the children make the links that will help them when they work on fractions. You could discuss the idea with colleagues that sharing is very strongly linked to fractions and encourage them to talk fractions when they work on this with their classes.

Fractions are actually operators, for example halving is dividing by or sharing into two, finding a third is dividing by or sharing into three. The article Fractions: difficult but crucial in mathematics learning has some research which indicates that this is a good way into working with fractions with children.

Share with staff these key aspects of fractions that children need to know:

1. fractions are equal parts of a whole, equal amounts or areas, not identical shapes
2. there are different ways to find half, quarter etc.
3. they 'look' different depending on the context
4. the 'whole' can be:

- a number
- more or less than one
- an interval on a number line.

You could talk through these aspects using some of the following activities:

Prove it!
Give pairs of staff three pieces of A4 paper in two colours (two pieces of one colour and one of another). Ask them to fold the piece of one colour in half and tear it. They each then stick one half onto a second piece of paper. Discuss what fraction is outside the square: obviously half because they have covered half of it with the piece they stuck on. Ask them to cut it out and hold it up by one end. Does it look like half? Clearly it doesn't if looking at the shape, so next, ask them to prove that it is.

Were any of them surprised? Discuss how an activity such as this can help the children to realise that a fraction is an area or amount of space, rather than a shape.
Sometimes it is the way we present fractions to children that leads them to the misconception that fractions of shapes must look the same.
If asked to find half of a square, they will invariably suggest these ways:

Halving
Give small groups of teachers a pile of 4cm x 4cm pieces of plain paper and ask them to explore as many different ways as they can to find half. You could ask them to blu-tack their suggestions onto the board. Compare their results and notice just how many ways there are! Again, discuss the value of giving the children an investigation like this.

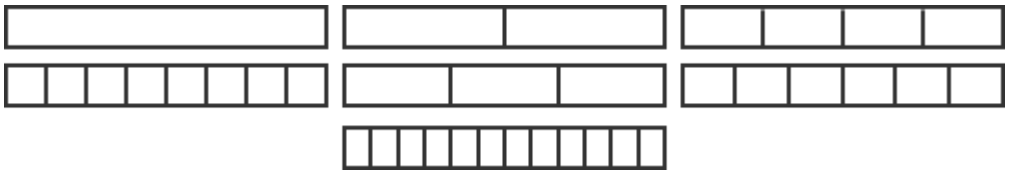
As well as the above, here are some of the results from a Year 2 class when they were set this problem: I want to share this sandwich with a friend, how can I do this so we each get half.

Quarters
Give staff several pieces of rectangular-shaped paper and ask them to find quarters by dividing their rectangles using straight lines. These are common responses:

Does anyone give this example?

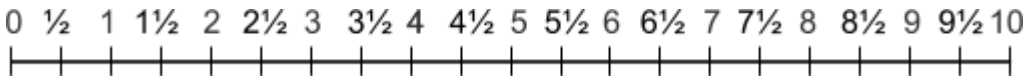
If not, draw it on the boards. Does everyone agree that these are quarters? They don't appear to be the same size – because they are not the same shape. Ask someone to prove they are.
If you divide each quarter in half, making eighths, each piece will look to be exactly the same area so proving these are quarters.

Fraction strips
Give pairs of teachers some strips of A4 paper of equal length and ask them to keep one whole and to fold the others into halves, quarters, eighths, thirds, sixths and twelfths:



Discuss this as a model, which the children can make for themselves to help them understand that the denominator is the number of parts and that the more parts, the smaller the fractions. So proving that the larger the denominator, the smaller the fraction.
Would staff consider doing this for halves, quarters and eighths in Year 1 or 2? What would be the benefits?

Number lines
When considering fractions on a number line, it is worth suggesting to teachers in KS1 that they might practise counting in steps of half or quarter when using their counting sticks or pendulums, so that the children become confident in using this vocabulary. Also, if they are drawing number lines and asking children to plot numbers onto them, they could ask them to mark on whole and half numbers:



Maximising opportunities for fractions
Teachers need to maximise the opportunities to use fractions and the language of fractions regularly so that the children begin to see these as numbers and not something different. In the framework, it talks about solving problems involving, for example in Year 1, counting, adding, subtracting, doubling or halving in the context of numbers, measures or money, for example to 'pay' and 'give change' , so fractions can be included in these objectives because a fraction is a number. Discuss how, as a school, you could include fractions in the blocks below:

Year 1 Blocks A, B, D, E	Solve problems involving counting, adding, subtracting, doubling, or halving in the context of numbers, measures or money, for example to 'pay' and 'give change'
Year 2 Blocks B, D, E	Solve problems involving addition, subtraction, multiplication or division in contexts of numbers, measures or pounds and pence
Year 3 Blocks A, B, D, E	Solve one-step and two-step problems involving numbers, money or measures, including time, choosing and carrying out appropriate calculations
Year 4 Blocks A, B, E	Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate
Year 5 Blocks A, D, E	Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use
Year 6 Blocks A, D, E	Solve multi-step problems, and problems involving fractions, decimals and percentages; choose and use appropriate calculation strategies at each stage, including calculator use

The key experiences for younger children will centre on everyday contexts, practical activities and language. They need lots of opportunities for this to build on from Year 2.

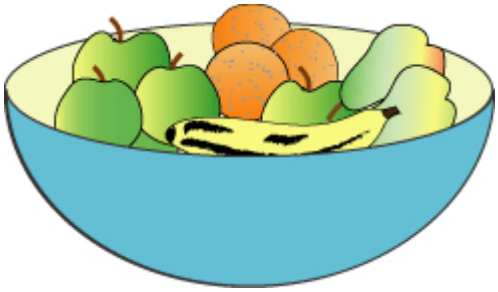
There is a tendency to look at fractions through pizzas and cakes. It is best to avoid using these alone; rectangular items such as chocolate bars are often simpler. The What makes a good resource microsite has an idea centred around fractions and chocolate bars. It would be helpful to share this with colleagues.
Problem solving is key, rather than just colouring or finding halves/quarters of shapes and numbers. Work through these problems together and discuss how they could be adapted for use in EYFS and KS1.

Fair Feast
Here is a picnic that Chris and Michael are going to share equally:

Can you tell us what each of them will have?

A Bowl of Fruit

Here is a bowl of fruit:



Half of the pieces of fruit in the bowl are apples. There are also three oranges, two pears and a banana. How many apples are there in the bowl?
If, instead, one quarter were apples and one quarter were oranges and there were four bananas, three pears and three plums, how many would be apples?

Fair Feast and *A Bowl of Fruit* are reproduced here from NRICH, with permission

Key message

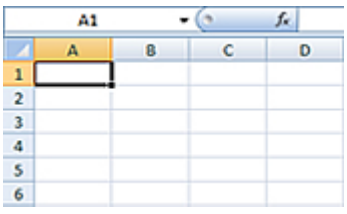
Help the children really understand halves and quarters in KS1 so that they can develop their understanding in KS2. Once they really understand these, they will be able to use this knowledge to develop their understanding of all the others.

Reflection

Give your staff a few minutes to reflect on what they have been doing and to make some decisions on how they will alter their current practice to maximise the opportunities to include fractions in their mathematics lessons.

Suggest that the staff explore the fractions section of the Self-evaluation Tools to assess their confidence in teaching these.

Discuss the article *Fractions: difficult but crucial in mathematics learning*. Find out how they feel about introducing fractions through sharing.
It may also be worth having a look at your mathematics policy and adjusting it so that fractions have a higher profile in EYFS and KS1 and that maybe there is an emphasis on linking fractions to sharing.



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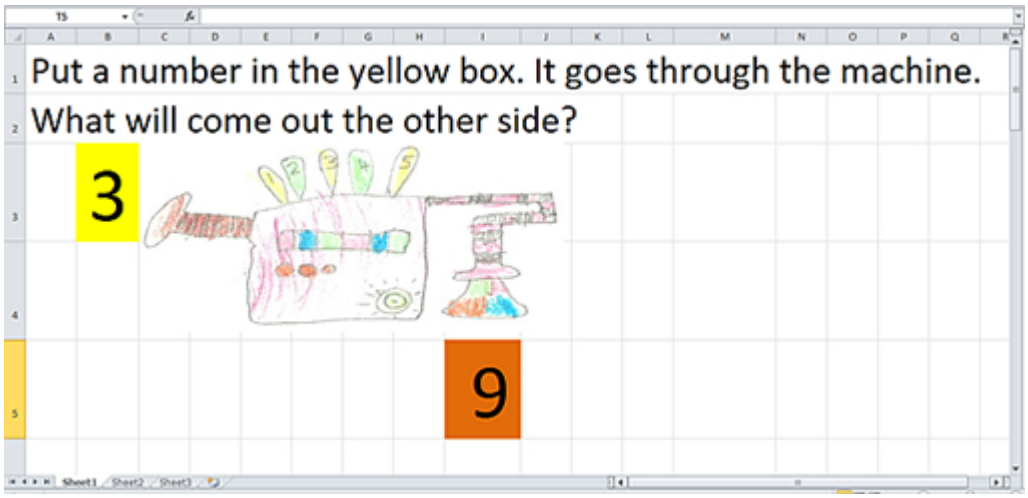
ICT in the Classroom – Spreadsheets for Number and Algebra

"Children display a tremendous intellectual curiosity about number patterns. Computer spreadsheets provide a vehicle for students to express that curiosity, allowing them to explore number patterns algebraically while the computer performs the tedious calculations."
Spreadsheets, Patterns, and Algebraic Thinking by Ploger, Klingler & Rooney (1997)

Spreadsheets can quickly and easily be made and used again and again in class. Here we look at some of these spreadsheets and the learning and thinking they encourage.

Function machines
The simplest applications of spreadsheets are function machines, empty box problems, or problems where we need to work out the operation. In the example below, a child has designed their own machine which has been scanned into the computer. This also gave her a sense of ownership of the mathematics. The orange box contains **=B3+6**, although it could have been **=B3*3**. Children can try different numbers in the yellow box until they can put forward an idea for what the machine might do. The machine gives them a structure for making a generalisation, e.g. "The orange box number is six more than the yellow box number." They can quickly predict and test their ideas.

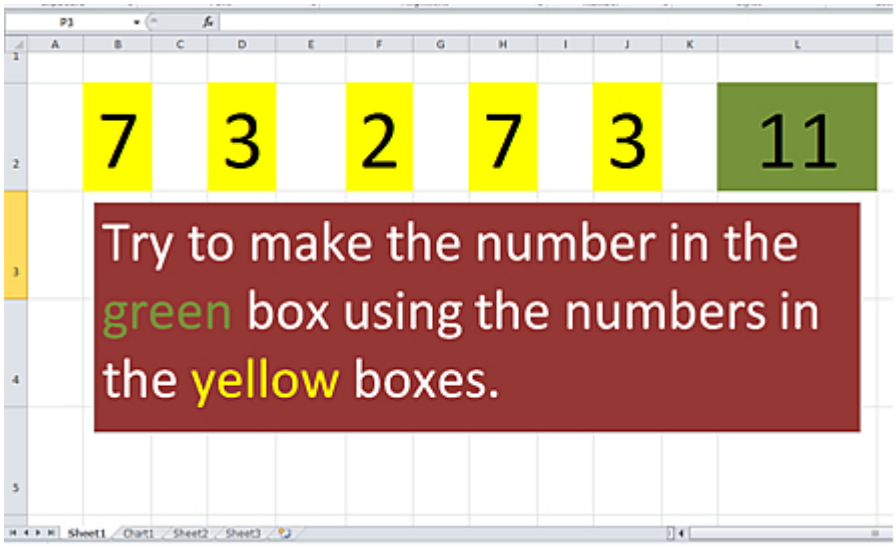


Allow children to play with the spreadsheet and explore "What if…" questions such as:

- what if I put my name in the yellow box, would I get three names in the orange box?
- what if I put a really big number in the yellow box?
- what if I put nothing in the yellow box? Is that the same as '0'?
- what if I put a negative or decimal number in the yellow box?
- what if I change the number in the orange box instead?

The likelihood of children changing the number in the orange box means that it is always wise to have an extra copy of the spreadsheet stored on the computer to open when formulas are accidentally removed.

Practising addition and subtraction facts
This spreadsheet provides five random numbers between 1 and 8, and a target number between 11 and 20. The yellow boxes contain **=INT((RAND()*8)+1)** and the green box contains **=INT((RAND()*10)+11)**. New numbers appear each time **shift + f9** are pressed.

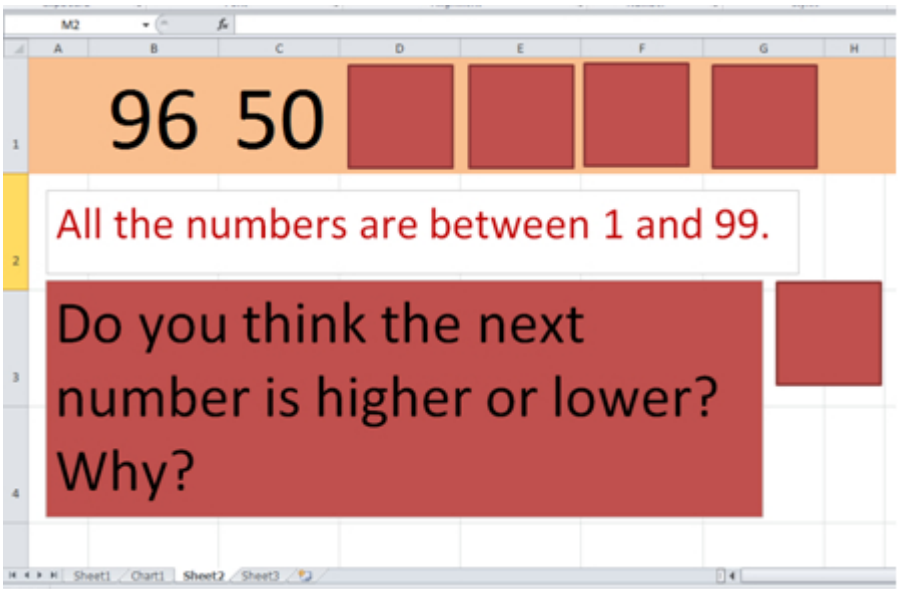


As well as giving children an opportunity to practise addition and subtraction facts through this activity, use questions and group talk to encourage problem solving, reasoning and communication. Try:

- what other numbers would you like to have? Why?
- are there any other ways to make the target with these numbers?
- how are you sure that it isn't possible to make the target with these numbers?
- is it easier to make lower or higher numbers?
- is it easier to make odd or even numbers?
- is it always / sometimes / never possible to use all the numbers?

Comparing and ordering numbers

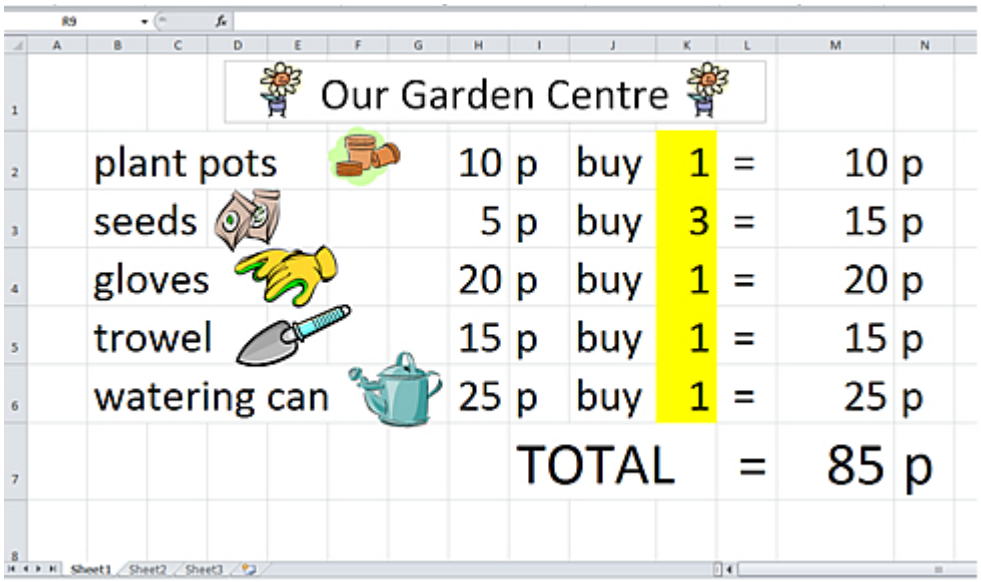
This spreadsheet is created by entering **=INT(RANDBETWEEN(1,99))** into six cells. This generates whole numbers between 1 and 99. Each number, except for the first, is hidden behind a shape. The children can discuss and vote for whether they think the next number will be higher or lower. Model reasoning with statements such as "There are ** numbers higher, but only ** numbers lower, so I think it is more likely to be higher." Reveal the numbers under the shapes one at a time and provide an opportunity for children to discuss that the most likely outcome is not always the one that comes up.



Problem solving with money

To complement a garden centre role play area, or similar class theme, ask children to explore the cost of buying combinations of different items on a spreadsheet. The cells in column M all follow the format **=H2*K2** to enable both the price and the number of items to be changed. Ask:

- how much would it cost to buy a pair of gloves and a watering can?
- how much money would I need to buy three packets of seeds and a trowel?
- which two items can you buy for less than 30p? Are there any others?
- can you make the total exactly 50p? Are there any other ways?
- how much money do you think we would need to spend to start a new garden? Why?
- what if the price of seeds went up to 7p per packet?



Print some completed spreadsheets to decorate the role play area, or for children to use as receipts.

To allow exploration of economic issues more realistically, children will ideally use more accurate prices as soon as they are able to interpret the values involved. Shopping websites are available for children to investigate the real prices of items, from which they can create their own spreadsheets. The ability to experiment with different combinations of purchases makes the spreadsheet a problem solving tool for real situations, such as planning a planting scheme for a school allotment, or the entertainments and refreshments for an end of Year 6 party.

We would love to hear from you if you have worked on spreadsheets in similar ways to these. Please let us know if you have and tell us about what you have done – you could give some examples for us to share in a future issue of the Primary Magazine.