Primary
& Early Years
Magazine 50

National Centre for Excellence in the Teaching of Mathematics

Welcome to Issue 50 of the Primary Magazine. In this issue we feature the Italian artist Michelangelo. A little bit of history continues its series on inventions with the mobile telephone. Focus on... looks at the number 50, and Maths to share explores the changes to mathematics in the Primary National Curriculum.

Contents

Editor’s extras

In *Editor’s extras* we have details of the new draft National Curriculum for mathematics, and a new suite of videos we've produced to support its implementation.

The Art of Mathematics

This issue explores possibly the best known artist in history, the Italian, Michelangelo. He is particularly famous for his painting of the ceiling of the Sistine Chapel in the Vatican. If you have an artist that you would like us to feature, please let us know.

Focus on…

As this is the 50th edition of the Primary Magazine we are focussing on the number 50.

A little bit of history

This is the second in a new series about inventions. We are looking at another treasured item in many people’s possessions, the mobile telephone. If you have any history topics that you would like us to make mathematical links to, please let us know.

Maths to share – CPD for your school

We begin a three-part series in which we explore the changes to mathematics in the latest draft of the National Curriculum. These highlight implications for our teaching throughout the school. In this issue we look at the changes in KS1. If you have any other areas of mathematics that you would like to see featured please let us know.

Image credit
Page header: The Hand of God by Yarra64,

Editor's extras

National Curriculum consultation

The latest draft of the National Curriculum was released on 8 February. Have you read the expectations for mathematics? If not, it is important that you do and make your views heard. A consultation is currently being held, and ministers at the Department for Education (DfE) are willing to listen to any comments you would like to make: your views are very important. You haven't got much time left to respond, as the consultation period ends on 16 April. There is also an opportunity to discuss this in the Primary Forum.

Videos to support the implementation of the new Curriculum

The draft new Curriculum has three overall aims: that pupils should develop fluency, reason mathematically, and be able to solve problems. Research by the Department for Education demonstrates that a key feature of high performing jurisdictions is that the development of quick recall, accuracy and fluency in parallel with the development of understanding and reasoning are all required to promote sound mathematical development (DfE 2012 p70). Procedural fluency and conceptual understanding are not mutually exclusive. The Ofsted Survey of Good Practice in Primary Mathematics (Ofsted 2011) found that many of the successful schools sampled teach fluency in mental and written methods of calculation, alongside understanding of the underlying mathematical concepts.

We've now produced a suite of videos which focus on calculation and the associated skills and understandings - for example, the concepts of place value and exchange - and they seek to demonstrate how fluency and conceptual understanding can be developed in tandem. The National Curriculum aim that children should reason mathematically is demonstrated throughout and one teacher is heard to say "reasoning is drip fed into everything that we do". Each suite of videos has a PowerPoint presentation to stimulate thought and discussion. The videos can be accessed at https://www.ncetm.org.uk/NCVideo. We hope you enjoy the videos and find them helpful in supporting teacher professional development. We'd be delighted to hear your feedback and any comments you have.

The NCETM Professional Lead Development Support Programme

We have added some new dates in the summer term for the PD Lead Support Programme, a series of national free face-to-face events for CPD leads in teaching schools and improvement agents. These events are for:

- Specialist Leaders in Education (SLEs) and other colleagues from Teaching School Alliances charged with organising and running mathematics PD opportunities;
- teachers based in schools with a remit for supporting colleagues in their own and other schools such as Mathematics Specialist Teachers (MaST) and ASTs
- other teachers who are charged with organising and running mathematics PD opportunities;
- mathematics and/or numeracy advisers and consultants from Local Authority teams;
- independent mathematics consultants and organisations offering mathematics PD;

- colleagues from HE institutions offering PD.

This programme consists of four elements:

- an initial 24-hour residential development day, beginning at 17:30 on the first evening and ending at 15:30 on the second day;
- planning, execution and evaluation of an interim task based on input offered in the first residential;
- a second 24-hour residential (with timings the same as the first);
- a commitment to plan and offer future PD opportunities drawing on the input, discussions and experiences gained during the programme and to offer regular (termly) feedback regarding reach and impact for at least a year following accreditation (a re-accreditation process is offered after one year).

Colleagues completing this programme will be accredited by the NCETM to provide professional development in the priority areas of arithmetic proficiency in primary schools and algebraic proficiency in secondary schools and colleges.

Accredited PD Leads will:

- receive a certificate indicating their status as an 'NCETM Professional Development Accredited Lead';
- be entered into a directory of Accredited PD Leads which will be held on the NCETM portal;
- receive an 'NCETM Professional Development Accredited Lead' logo which can be used on any relevant documentation to signal your accreditation.

There is no cost attached to attendance at the two residentials: accommodation and meals are included, but please note that travel and supply costs if appropriate, should be met by those attending.

If you are interested in taking part, you can find out more - including details of how to book your place – here.

And finally…

If you have a class of JLS fans (or even if you don't) you might like to show them this YouTube clip from Chris Moyles' Quiz Night. In the clip JLS give the children a mathematics quiz – can they work out the answer? There are other mathematical quizzes by various artists listed on this site that you might like to explore.

The Art of Mathematics
Michelangelo Buonarroti

Michelangelo Buonarroti was born Michelangelo di Lodovico Buonarroti Simoni on 6 March 1475 in Caprese in the Republic of Florence, now known as Tuscany, in Italy. His father was a banker, a job, which in those days, made a family middle class in the social hierarchy. Michelangelo started studying grammar, but disliked it so much that he stopped and became an apprentice to the painter Domenico Ghirlandaio. He did so well as an apprentice that by the next year, he was earning the same pay as Ghirlandaio.

In 1489, his teacher Ghirlandaio sent him to the Humanist Academy at the request of Lorenzo Medici, who had founded the academy. Medici and his family were important people in Italy at the time: they were bankers who had taken over the cities' politics, and while in power spent a lot of money funding the arts. Medici died in April 1492, which forced Michelangelo to lose his status at the Academy and move back home to live with his father.

Two years later, Medici's successor rehired Michelangelo. Unfortunately, the city's politics had changed, and the Medicis were thrown out of Florence. The new family in power was the Savonarola. Michelangelo was forced to move from Venice to Bologna in search of work. He returned to Florence towards the end of 1494, when the Medicis had regained control.

Pietà

He was commissioned to sculpt John the Baptist, which was sold as an ancient art piece to a cardinal in Rome. The cardinal found out it was a fake but was so impressed with Michelangelo's workmanship that he asked him to come to Rome, and in 1497, he was paid to sculpt Pietà.

It was put on display, but people thought another artist had done this work. Michelangelo was really insulted and he signed it so that everyone would know he was the artist. It is the only piece Michelangelo signed or ever needed to sign.

Around 1499, Michelangelo was asked to complete David, a piece portraying David after killing Goliath, which had been unfinished for more than 40 years. Completed in 1504, it was meant to be raised off the ground on a column. But when people saw it, they thought it was so beautiful, so it was placed at ground level in the piazza to be seen and enjoyed by everyone.

The next year, Michelangelo was asked by Pope Julius II to build his tomb, but due to his other projects, it was never completed. He worked on it for over 40 years, but it was missing several key statues that were needed to finish it.

From 1508 - 1512, he worked on what is possibly his best known work – the ceiling of the Sistine Chapel in Vatican City, as a commission from Pope Julius II. He hated this job because he found the work painful to execute, and he felt that his painting was below acceptable standards. He also thought that one of his rivals had convinced the Pope to make him paint so they could watch him writhe in agony for four years. The finished product has 300 figures, and nine episodes from the Book of Genesis. During the entire four years of painting, he hardly ate, slept, or went out. His main goal was just to be over and done with the dreadful project!

After painting of the ceiling of the Sistine Chapel he returned to Florence and worked for the Medici family again.

From 1534-1541, he was back in the Sistine Chapel painting The Last Judgement on its wall, commissioned by Pope Clement VII. Several prominent people are painted into this scene, which came as a surprise. Some of the town's folk are represented in hell, particularly a certain politician, known for his underhand dealings. Michelangelo has a self-portrait in there as well; the skin Bartholomew is tearing off himself is Michelangelo but unlike the politician, he is in heaven!!


The Last Judgement

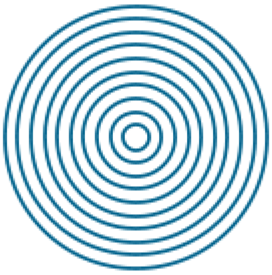
Michelangelo was the only artist at the time to have his biography published while still alive. Besides being an artist, Michelangelo wrote poetry. He is believed to have been gay and never married. He died in Rome on 18 February 1564. He was the longest living of the Renaissance artists, and perhaps the most well-known artist of all time.

Let's explore some mathematical ideas from the paintings of Michelangelo

You can find examples of his artwork at the Web Gallery of Art.

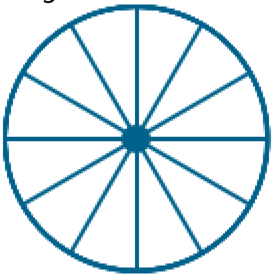
Show the children The Doni Tondo

Ask the children to identify the shapes that they can see in the painting. Focus on the two circles. You could explore the idea of concentric circles. Concentric circles share the same centre, like in this example:



The children could make colourful paintings of concentric circles that demonstrate their understanding of these. You could explore the NRICH activity LOGO Challenge 12 - Concentric Circles, which asks whether the children can reproduce a design comprising a series of concentric circles. They could test their understanding of the relationship between the circumference and diameter of a circle.

You could ask the children to draw two circles, one smaller than the other by drawing radii of equal lengths from a central point:



Alternatively, they could draw their circles by tying a piece of string round a pencil and pinning the other end of the string to paper (for the centre) and then take the pencil for 'a walk'. Or they could use a pair of compasses.

Whichever method they use they could then make a bold outline around each circle (or use two different coloured pieces of paper) and stick the smaller one inside the larger. This could form a boarder as in Michelangelo's painting. They could draw or paint a picture in the middle and decorate their boarder with different polygons and non-polygons.

If they know the length of the radius of their circle, what could they do to this to find the diameter? They could work out the circumference of their circles using string and find its relationship to the diameter.

Show the children [View of the Chapel]

Can they see the symmetry in this painting? Ask them to tell you where the imaginary mirror line would go to show the symmetry of the building which includes the pillars, pews, rectangular wall panels, floor tiles. Ask them to look for these different things and to tell you what else they can see that is symmetrical.

You could give them counters, cubes and a piece of string. They make the string the line of symmetry and use the cubes and counters to make a symmetrical pattern on either side of it. You could ask them to do something similar but instead of cubes and counters they use objects from around the classroom. You could give them a second piece of string and ask them to make their patterns symmetrical in four quadrants.

On paper they could make their own symmetrical picture of the inside of a church similar to Michelangelo's. They could also construct a symmetrical model using boxes and tubes or they could make their own cubes, cuboids and cylinders using nets which they visualise for themselves.

Show the children [The Conversion of Saul]

Ask the children to estimate the number of people in this painting. Then together think of an efficient way to count them. You could give the children copies of this painting and ask them to group the people in twos, fives and tens in order to count them. Which do they think is the most efficient way?

You could ask problems such as, if there are 24 people how many legs/arms/eyes are there? They would need to double the number of people and add on the appropriate numbers for the horse.

You could ask them to choose one of the people to copy. Ask them to draw their figure in proportion, e.g. seven head lengths, seven foot lengths are the same as a person's height. They could explore other body proportions using strips of paper, e.g. arms and legs and use what they find to improve their drawings.

Show the children the painting of the ceiling of the Sistine Chapel

It took Michelangelo about four years to complete this work. You could explore this length of time. How many months, weeks, days, hours, minutes and seconds make up four years?


The Creation of Adam

Study each section of the painting: what story might each part be telling?

You could explore the 2D shapes that make up the different sections, including squares, rectangles and triangles. What do the triangular shapes look like? They should be able to liken them to isosceles and equilateral triangles. You could spend some time exploring the properties of these. You could also give different lengths for the three shapes and ask them to work out perimeters and areas.

They could make their own painting or drawing that tells a story, sectioning into different shapes in the way that Michelangelo has.

Show the children Lunette and Popes

Again, you could use this painting to explore shape and symmetry as suggested above. Ask the children to make their own version of this painting, measuring and drawing accurately the different rectangular sections. They could carefully draw the semicircle by drawing half a circle using radii as suggested in the first painting.

You could ask them to explore the angles of the arms and legs of the popes. They could make the arms and legs of their figures in their painting or drawing of the same angles. These could be an estimate using the appropriate terms of acute, right angle and obtuse or could be measured using a protractor.

The ideas here are just to give you a taster of the mathematical activities that could be involved when looking at artists such as Michelangelo. We know you can think of plenty of others! If you try out any of these ideas or those of your own, please share them with us!

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Focus on…
The number 50

As this is the 50th issue of the magazine we thought we would focus on the number 50!

Here are some mathematical facts that you might like to explore with your class:

- the number 50 is a number between 49 and 51
- the number 50 is an even number, as it can be divided equally between two
- the factor pairs of 50 are:
  - 1 × 50
  - 2 × 25
  - 5 × 10
- there are six divisors of 50 which give whole number answers, these are the same as its factors 1, 2, 5, 10, 25 and 50
- the number 50 has two prime factors which are 2 and 5
- the product of prime factors for the number 50 is 2 × 5 × 5
- the first ten multiples of 50 are 50, 100, 150, 200, 250, 300, 350, 400, 450, 500; all multiples of 50 are even numbers
- if you double 50 you get 100 and half of 50 is 25
- 50 squared is 2 500
- the cube of 50 is 125 000 (since 50 times 50 times 50 is 125 000)
- the square root of 50 is 7.07 rounded to the nearest hundredth
- 50% as a decimal is 0.5 and ½ as a fraction
- the phrase 'fifty-fifty' expresses something divided equally in two, it is also used in probability to describe an equal chance of something happening
- if you travelled a distance of 50 miles then this would be the same as travelling approximately 80 kilometres (50 x 1.6)
- if you used 50 gallons of fuel then this would be equivalent to approximately 225 litres (50 x 4.5)
- 50 pounds (weight) is about the same weight as 22.7 kilograms (50 ÷ 2.2)
- in 50 days there are 4 320 000 seconds (50 × 24 × 60 × 60)
- a 2D shape made up of 50 sides is called a pentacontagon
- the number 50 is the smallest number that can be written in two different ways as the sum of two square numbers:
  - 50 = 72 + 12 and 50 = 52 + 52
- the number 50 can also be written down as the sum of three square numbers:
  - 32 + 42 + 52 = 9 + 16 + 25 = 50
- in the binary number system 50 can be written as 110010
- in the hexadecimal number system 50 can be written as 32
- in Roman numerals the number 50 is denoted by the letter L.

You could ask the children to find as many ways as they can of making 50 in two minutes. Ensure they use all four operations separately and mixed, e.g. 26 + 24, 75 – 25, 10 x 5, 150 ÷ 3, (2 x 30) - 10, fractions, e.g. ¼ of 200, decimals, e.g. 39.7 + 10.3, percentages, e.g. 10% of 500, as appropriate.

Now for some non-mathematical facts:

- in chemistry, 50 is the atomic number of tin
- it is the fifth magic number in nuclear physics

- in bingo, ball number 50 is called blind 50 or half of a century
- in the United Kingdom, the M50 is the motorway which links Tewkesbury and Ross-on-Wye
- if you have been married 50 years then you will be celebrating your golden wedding anniversary
- 50 is the score on the centre of a dartboard (the bullseye)
- there are 50 states in the United States of America (as of 2010)
- the TV show Hawaii Five-O got its name because Hawaii is the last (50th) of the states officially to become a state
- 50 is an important number in the bible - for example, Pentecost occurred 50 days after Christ's resurrection; the word Pentecost is derived from the Ancient Greek for the fiftieth (day)
- 5-O (Five-Oh) is slang for police officers and/or a warning that police are approaching. Derived from the television show Hawaii Five-O
- 50 Cent is the nickname of a rapper
- a blue whale weighs about 50 tons at birth
- a Canadian brand of beer called 50 Ale was created in 1950 by Labatt breweries to commemorate 50 years of partnership
- the speed limit, in kilometres per hour, of Australian roads unless a different limit is specified.

Do you have any facts about 50? If so please let us know.

Information from:

- Bukisa
- Hub Pages
- Wikipedia.

A little bit of history – the mobile telephone

In today's world, most people communicate through the use of mobile phones. It's hard to believe that fifteen years ago they were a rarity. In this article we look at a brief history of the mobile phone which includes a few, but not all, of the significant dates.

The history of mobile phones goes back many years beginning with the development of devices that connected wirelessly to public telephone networks. In 1843 a chemist by the name of Michael Faraday researched whether space could conduct electricity. His discoveries had an enormous effect on the technology related to the development of the mobile phone.

It is believed that in 1865 Dr. Mahlon Loomis, an American dentist, was the first person to communicate through wireless via the atmosphere. Between 1866 and 1873 he transmitted telegraphic messages at a distance of 18 miles between the tops of Cohocton and Beorse Deer Mountains, Virginia. He developed a method of transmitting and receiving messages by using the Earth's atmosphere as a conductor and launching kites enclosed with a copper screens that were linked to the ground with copper wires.

First car-mounted radio telephone (1924)

The first, more commonly, used ‘mobile phones’ were the shore-to-ship radio and during the Second World War, the military wireless radio telephones. Mobile telephones for cars became available from some telephone companies in the 1940s. All these early devices were very bulky and consumed a lot of power and the network at the time could only support a few simultaneous conversations.

Dr Martin Cooper, who is considered to be the inventor of the first portable handset, was the general manager for the systems division at Motorola, and in 1973 he made the first call on a portable cellular phone. He set up a base station in New York with the first working prototype of a cellular telephone, the Motorola Dyna-Tac.

Cellphone

John F. Mitchell, Motorola's chief of portable communication products and Martin Cooper's boss in 1973, played a key role in advancing the development of handheld mobile telephone equipment, successfully pushing Motorola to develop wireless communication products that would be small enough to use anywhere and he participated in the design of the cellular phone.

In 1977 cell phones went public in the US and public cell phone testing began. The first trials were in the city of Chicago with 2000 customers, and eventually other cell phone trials appeared in Washington D.C. and Baltimore. Japan began testing cellular phone services in 1979.

In the 1990s, the 'second generation' mobile phone systems emerged. This differed from the previous generation by using digital instead of analogue transmission, and also fast out-of-band phone-to-network signalling (2G). As a result of this, the rise in mobile phone usage was explosive and during this time pre-paid mobile phones were introduced.

In 1993, IBM Simon was introduced. This was possibly the world's first smartphone. It was a mobile phone, pager, fax machine, and PDA all rolled into one. It included a calendar, address book, clock, calculator, notepad, email and a touchscreen with a keyboard. The IBM Simon had a stylus you used to tap the touch screen with. It featured predictive typing that would guess the next characters as you tapped.

Along with the introduction of 2G systems there was a trend away from the larger 'brick' phones toward small 100g–200g hand-held devices. This was possible through technological improvements such as more advanced batteries and more energy-efficient electronics, and also the higher density of cell sites for increased usage.

In 2001 3G was trialled in Japan and subsequently launched there the year after. European launches of 3G were in Italy and the UK. This technology increased connection speeds and enabled another transformation of the industry in the form of a full range of multimedia services including the internet, radio and television.

At the end of 2007, there were 295 million subscribers on 3G networks worldwide, which reflected 9% of the total worldwide subscriber base.

By 2009, 4G was being developed because it had become clear that, at some point, 3G networks would be overwhelmed by the growth of a huge variety of applications.

What will be next?

Now for some mathematics!

You could show the slides from Slideshare which give a potted history of the mobile. The children could make one of their own to share with the class.

Mobile phones

Ask the children to make a timeline of the significant facts in the history of the mobile phone. They can also place their birth year onto it and find out how far the mobile phone had developed by the year they were born.

The children could explore the timeline of the different phone brands at Timetoast. They could make up their own timeline using a selection of these facts.

Find out how many children in your class have mobile phones of their own. Use this as an opportunity for them to represent this information in a way they think is appropriate. You could also do this for the make of phone they have.

Find out what they use their mobiles for, e.g. text messaging, using the internet, reading emails, listening to music. Again, ask them to represent this information using their preferred method. Discuss why information like this could be relevant and for whom.

Collect some mobile phone leaflets or information printed off the internet and use these to explore tariffs. They could find out which is the best value.

They could further develop the idea above by considering mobile phone pay-as-you-go tariffs and work out the of calls and texts. How does this compare with taking out a contract? Would they get a cheaper phone or other free gifts?

Ask the children to give you one of their mobile phone numbers. Write this on the board. Can they read it as a whole number? You could ask them to explore single or pairs of digits, e.g. are any of them:

- square numbers
- prime numbers
- square roots
- multiples of 5
- what do you get if you add the digits together?
- what is the digit total?


Mobile phone mast

Ask the children to investigate the manufacturers of mobile phones and make up a price list for those that they can buy without a contract. They could rehearse calculation skills as they compare prices.

If, at the end of 2007, there were 295 million subscribers on 3G networks worldwide, which is 9% of the total users of mobile phones, can the children work out (using a calculator) how many people had mobiles altogether?

The TES has a great activity, Mobile Phone Deal Investigation, for Years 5 & 6:

> *'You start with Jo's situation (you are given the amount she is paying for her current phone and her mobile phone usage over an average month). Then get the children to work in groups and put the statement cards in order from most to least important. Finally, get the groups to look through the posters of the 4 mobile phone companies and decide on the best deal for Jo in the long and short term.'*

You could work through the NRICH activity Mobile Numbers, which is all about inventing mobile phone numbers that are easy to remember.

We hope this has given you a few ideas of how you can link mathematics to mobile phones. We know you can think of plenty of others! If you have ideas of your own, please share them with us!

Information from:

- Federal Communications Commission
- Wikipedia.

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Primary
& Early Years
Magazine 50

National Centre
for Excellence in the
Teaching of Mathematics

Maths to share – CPD for your school

The Primary National Curriculum for Mathematics

In *Maths to share* we are beginning a series on the changes to mathematics in the proposed draft of the National Curriculum. In this issue we look at the changes for KS1. In Issue 51 we will explore the changes for lower KS2, and then in Issue 52, upper KS2. We are comparing the proposed National Curriculum with the expectations from the Primary Strategy framework as many schools are familiar with this and some still use this for guidance on what mathematics to teach. It would be a good idea to copy the mathematics-related objectives for Years 1 and 2 for colleagues to examine in detail. You could use the information below about the changes to stimulate discussion and work out the implications in the teaching of mathematics at your school. It would be a good idea to involve all staff in any discussions as teachers in KS2 need to be aware of what the children are learning in KS1 to inform their practice as the children move through the school.

The National Curriculum for mathematics aims to ensure all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Share these aims with colleagues. What do they think of them? Hopefully they will think these are really sound and form a good basis for what we would wish for the children we teach. How does the teaching and learning in your school currently measure up to these aims?

Share this quote from p53 of the National Curriculum:

> *'Calculators should not be used as a substitute for good written and mental arithmetic. They should therefore only be introduced near the end of Key Stage 2 to support pupils' conceptual understanding and exploration of more complex number problems, if written and mental arithmetic are secure.'*

When are calculators used in your school and for what purpose? Discuss the idea that they can be used effectively as a resource to rehearse, for example, number recognition, place value and repeating patterns in KS1.

Changes in Year 1

- children should count to 100 instead of 20
- multiplication and division problems including arrays are now included, previously these were expectations for Years 2 and 3

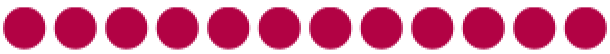
- there is a greater demand on using halves and quarters as operators
- volume should be taught, it wasn't anywhere in the primary section of the previous National Curriculum.

Discuss these changes. Do colleagues think they are reasonable?

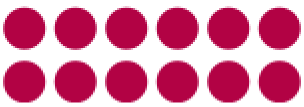
How will your children in Year 1 cope with counting to 100 instead of to 20? Do colleagues believe that some of their children are already able to do this? Do they consider that raises expectations and provides a greater scope within which to work?

How many of your colleagues use arrays in Year 1 for simple multiplication and division? It might be worth spending some time during the meeting exploring arrays. For example you could give colleagues 12 counters and ask them to set these out in as many different arrays as they can. Then ask them to make up multiplication sentences and word problems to go with them. It is worth sharing that the multiple is the first number in a multiplication statement and the number of that multiple required is the second, so for example, six lots of two would be written 2 x 6. Ask colleagues to consider the divisions that can be done with the arrays, maybe focussing on sharing - for example, twelve shared between two. You could explore the calculation section of the NCETM Self-evaluation Tool for KS1.

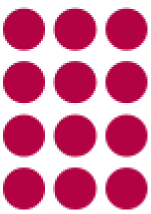
Can colleagues visualise the multiplication and division statements that can be generated from these arrays?



12 x 1 = 12 or 1 x 12 = 12, 12 ÷ 1 = 12 or 12 ÷ 12 = 1



6 x 2 = 12 or 2 x 6 = 12, 12 ÷ 2 = 6 or 12 ÷ 6 = 2



3 x 4 = 12 or 4 x 3 = 12, 12 ÷ 4 = 3 or 12 ÷ 3 = 4

Arrays are an important visual representation and manipulative throughout KS1 and KS2. They help to develop the conceptual understanding of multiplication and division which leads to the development of formal written methods in upper KS2.

You could explore multiplication further in Maths to Share from Issue 25, and division from Issue 27.

Focus on the changes in fractions. How are these taught in Year 1 at the moment? Do colleagues link fractions with sharing, e.g. if they share eight objects between four children do colleagues refer to each child as having one group out of the four or ¼ and explore how much ¾ would be? It might be worth suggesting that they start using the language of fractions when they teach sharing.

Do colleagues ever ask the children to count in halves? It might be worth suggesting that they try this.

A deep understanding of what a fraction actually is, is very important in KS1 for children to be ready to achieve the expectations in KS2. You could explore the teaching of fractions in the EY and KS1 in Maths to Share from Issue 36.

What do colleagues think of the inclusion of volume in measures? Do they think this could be helpful? Some teachers confuse capacity and volume, for example, they refer to the amount of liquid in a container as capacity when it is actually volume. Capacity is the amount of liquid a container can hold (measured in ml, l etc). Volume is the amount of space a 3D object occupies (measured in mm^3, cm^3, m^3). However they are related because 1ml = 1 cm^3. Including both might help to make the definitions of both clearer. What do colleagues think?

Changes in Year 2

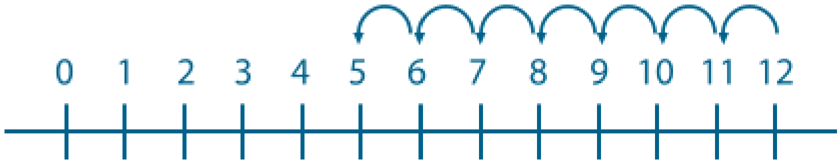
- more emphasis on the mental mathematics expectations
- introduction of the commutative rule which was not made explicit before
- inverse operations for checking are now explicit in Year 2
- greater range of fractions are explored including equivalents of quarters
- in measures children are expected to be able to read a thermometer.

A symbol that needs to be explicitly explained is the equals sign (=). Many children get the impression that the number after the equals sign is the answer to a calculation. This symbol is supposed to show equality and from the outset children need to appreciate this. What is on one side of the equals sign must be the same as that on the other, e.g. 23 + 7 = 15 + 15. It might be helpful to remind colleagues of this.

What do colleagues think of the emphasis on mental mathematics? You could remind colleagues of the mental calculation strategies that children need to be aware of in KS1, such as doubling and near doubling, adding multiples of 10 and adjusting. It might be helpful to look at Maths to Share from Issue 14, which focuses on mental calculation.

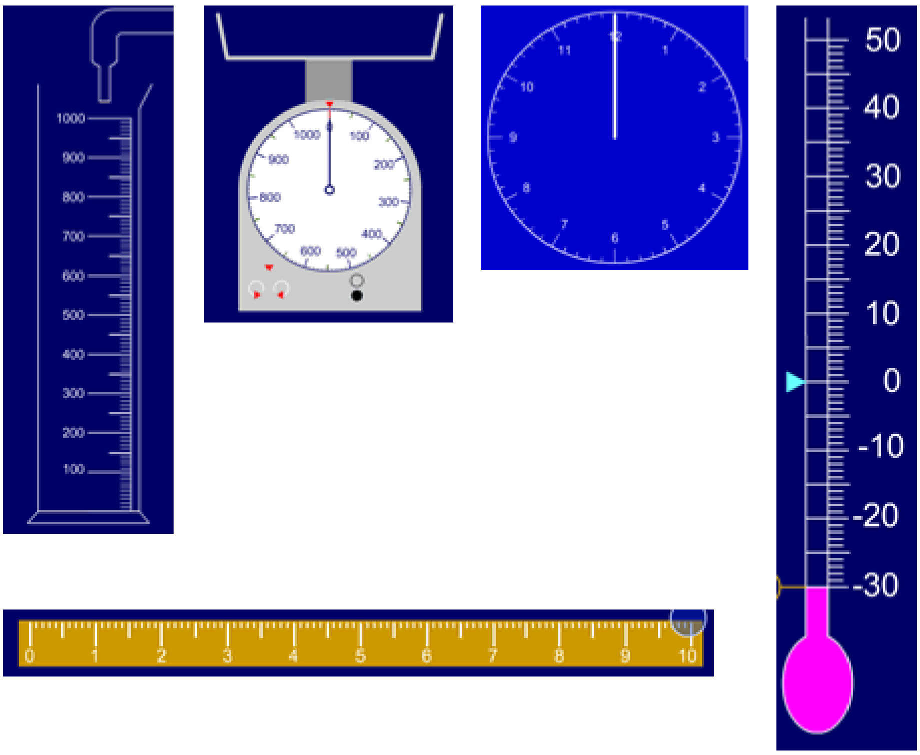
There is a greater emphasis on the commutative rule for addition and multiplication. It is worth emphasising that the children need to be aware that it doesn't matter which way round they add or multiply, the answer will be the same. They also need to be aware that subtraction and division can be done either way round but the answers will be different. Often children believe that you cannot subtract a larger number from a smaller one and that you cannot divide a smaller number by a larger one. This can often lead to misconceptions later. You could encourage colleagues to demonstrate this for subtraction using number lines with their children, for example:

12 – 7



7 – 12

It is often helpful to show this so that children are aware that the number system doesn't begin at zero, but that negative numbers mirror the positive ones. It might be helpful to encourage colleagues to display number lines from -20 (with negative numbers) to 100 in their classrooms.



How would colleagues support pupils to read a thermometer? Ask them to consider what real life experiences children will have of different types of thermometers (those with scales and digital). Can teachers identify the skills of reading a thermometer to other areas of mathematics that they teach? How can teachers help pupils to make these connections themselves?

We hope that this has been helpful in possibly allaying some of the fears that might be present in implementing the new National Curriculum in KS1!