Primary & Early Years Magazine 57

National Centre for Excellence in the Teaching of Mathematics

Welcome to Issue 57 of the Primary Magazine. In this issue, The Art of Mathematics features the artist Paul Cézanne. A Little Bit of History continues its series on inventions: in this issue we look at the rubber. Focus On... features an article on money matters from pfeg (Personal Finance Education Group), and Maths to Share looks at an account of a meeting between the Mathematical Association and a key official from the Department for Education.

Contents

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Editor's extras

The National Curriculum

Last term, we published a new 'Essentials' page for implementing the National Curriculum, the final version of which has now been published. Implementing the new curriculum is a 'one-stop shop' with links to resources on the NCETM website that will be helpful to subject leaders who are beginning to consider how to support teachers in readiness for the new programme of study.

As part of this support we have produced a suite of 16 videos focusing on calculation and the associated skills and understanding (for example, the concepts of place value and exchange). The videos seek to demonstrate how fluency and conceptual understanding can be developed in tandem. One of the aims of the new National Curriculum, that children should 'reason mathematically', is demonstrated throughout. Each set of videos has an accompanying presentation to stimulate thought and discussion about teaching and learning. We hope you enjoy the videos and find them helpful in supporting teacher professional development. We'd be delighted to receive your feedback, and to learn how you use them (either by commenting below or emailing us at info@ncetm.org.uk). In the near future this suite will include videos focusing on fractions, algebra and division. So keep a look out for these!

National Curriculum Training Programmes

A two-day programme to help primary school maths coordinators and specialist (MaST) teachers prepare for the introduction of the new National Curriculum is being offered, starting this autumn, in a collaboration between England's five major maths CPD providers, including the National Centre for Excellence in the Teaching of Mathematics (NCETM).

The course, run jointly by the NCETM, NRICH, the Mathematical Association, the Association of Teachers of Mathematics, and the National Association of Mathematics Advisors, will be run twice, at two different locations:

- **London:** The Institute of Education, Tuesday 26 November 2013, and Thursday 27 March 2014
- **Cambridge:** NRICH Headquarters, Thursday 12 December 2013, and Friday 4 April 2014

The programme will cover key mathematical themes of the new curriculum, and introduce participants to some new materials to support teaching.

The cost of the course is £180 for two, linked days. Participants can choose either venue.

More details about the course and booking information can be found on the NRICH website.

The NCETM Professional Development Lead Support Programme (PDLSP)

We're pleased to confirm more new dates for our programme of national free face-to-face events for Primary CPD leads, the NCETM Professional Development Lead Support Programme (PDLSP).

Those who complete the programme are accredited by the NCETM to provide professional development in the priority areas of arithmetic proficiency in primary schools; to date over 140 participants in the programme have been accredited, with more to come.

The dates and locations for the new Primary cohorts are:

Places	Date	Location	Region
20	14 & 15 Nov	Novotel, Leeds city centre	Y&H
	23 & 24 Jan 2014		
20	13 Dec 2013	Rochester, Kent	SE
	7 Feb 2014		
20	17 Jan 2014	Cheshire	NW
	21 Mar 2014		
20	5 & 6 Mar 2014	London, venue tbc	London
	28 & 29 Apr 2014		

Note: Rochester and Cheshire are being run as two one-day events, times to be confirmed; the London Primary Cohort (5/6 March and 28/29 April) is particularly aimed at Primary SLEs.

The PDLSP microsite has full details of the programme - including support materials, and information about how to book your free place.

Colleagues who have completed the first cohorts have said about the programme:

> *'I really valued the input from experienced colleagues and the diversity of viewpoints was very refreshing.'*
>
> *'One of the main criteria for successful PD is that it stimulates new thinking – it certainly did that for me.'*
>
> *'The course is definitely impacting on my daily work.'*

New online material for subject leaders to support high attainers in mathematics in primary schools

Have you seen the section of our website which aims to support schools in evaluating and supporting their provision for high attaining pupils in mathematics in primary school? High Attaining Pupils in Primary Schools will help subject leaders, senior leaders and teachers to identify and support pupils who are attaining higher than expected standards in mathematics, not just in Year 6 but from the time they begin school.

pfeg workshops

The Personal Finance Education Group (pfeg) is planning an afternoon of workshops for any primary HEI PGCE or BEd tutors who would like to come along and find out more about how to support their primary PGCE trainees to teach young people about money and start to build their financial capability. We are also extending the invitation to staff at teaching schools who may feel this is of interest to them. What Money Means for Initial Teacher Training: Teaching Financial Education in the Primary Classroom will take place at the London Road campus of the University of Reading from 1:00 to 3:00 on 10 December, with registration and lunch from 12:30. The workshops largely focus on helping any staff supporting PGCE or BEd students or trainees on School Direct and work-based routes into primary teaching navigate the wealth of resources available to use with trainees. These resources were developed jointly with University of Reading tutors, within the What Money Means project, managed over the past five years by pfeg. If you are interested in attending these workshops please see their flyer for further details.

And finally…

We didn't find this in time for last issue's A little bit of history featuring pencils. You and your children might be interested in watching how pencils are sharpened after they have been made in this gif. A great opportunity for some counting and time work – we'll leave you to think of how!

The Art of Mathematics
Paul Cézanne

Paul Cézanne was a French artist whose work was said to have laid the foundations for the transition from late 19th-Century Impressionism to early 20th-Century Cubism. Two of the well-known artists that followed him years later, Matisse and Picasso, are said to have remarked that Paul 'is the father of us all.'

Paul Cézanne was born on 19 January 1839 in the southern French town of Aix-en-Provence. He was baptised in the parish church, with his grandmother and Uncle Louis as godparents. His father, Louis-Auguste Cézanne, was a wealthy banker who co-founded a banking firm that prospered throughout Paul's life. This gave him financial security and enabled him to follow his dream to become an artist. Most artists of the time were not so fortunate and had to sell their paintings in order to survive.

His mother, Anne Elisabeth Honorine Aubert, was said to be vivacious and romantic, but also 'quick to take offence'. It was from her, apparently, that Paul got his vision of life. He had two younger sisters, Marie and Rose.

Paul developed his artistic interests at an early age much to the dismay of his father, who would have liked him to follow in the family business. In 1862, after a number of bitter arguments, his father gave him a small allowance and sent him to study art in Paris. Over time, his father began to support his choice of career and, when Paul was 47, he gave him a substantial inheritance, equivalent to £218 363, which meant that he had no financial worries.

The Bay of Marseilles, view from L'Estaque

From the start of his life in Paris, he was drawn to the more radical group of people in the Parisian art world. He admired artists such as the romantic painter Eugène Delacroix and the notorious Edouard Manet. These were artists who exhibited realist paintings that were, to many, shocking in both style and subject matter. Paul immersed himself within this group but over time was rejected. It was his father's inheritance that enabled him to become financially independent and to leave them. This meant that he became and remained quite isolated.

Paul's work can often be recognised by its repetitive brushstrokes. His early works suggested romantic expressionism. These gradually developed into representations of contemporary life at the time. He was interested in simplifying nature, turning naturally occurring forms as cylinders, spheres and cones, for example he would treat a tree as a cylinder and an apple as a sphere.

Paul never felt that he had achieved the goals he had set for himself and, because of this, he left most of his works unfinished and destroyed many others. For many years he was only known to his old impressionist friends and a few newer post-impressionist painters such as Vincent van Gogh, but in 1895, an ambitious Paris art dealer arranged a show of his work and began promoting him whenever and wherever he could. In 1904 he set up a major exhibition in which Paul's art work was featured. By the time of his death Paul was well known and had attained the status of a 'legendary figure'.

In 1906 Paul was caught in a storm while out sketching. He decided to go home, but on his way he collapsed. He regained consciousness but the following day fainted and was put to bed. He never left his

bed again. He died a few days later, on 22 October, of pneumonia. He was buried at the old cemetery in his hometown of Aix-en-Provence.

Information sourced from:

- Paul Cézanne - The Complete Works
- Wikipedia.

Now for some mathematics!

Show Still life with basket of apples


The Basket of Apples

This painting gives an opportunity for counting. Can the children estimate how many apples they think are in the painting? Can they find an efficient way of counting them? You could print out copies and ask the children to loop ten apples at a time and count in groups of ten then add on any remaining.

In the main part of the article it mentioned that Paul Cézanne focussed on the shapes of the natural things that he painted, for example he would see apples as spheres. Can the children visualise these fruits as 3D shapes? What about the other things in the painting? You could ask the children to set up a still life display on their tables, maybe using pencils, scissors and other pieces of classroom equipment. They should try to visualise the 3D or 2D shapes that these pieces of equipment represent. They could then make a painting of their items using the 3D or 2D representations.

Show The Banks of the Marne

Ask the children to describe what they can see in the painting. Can they estimate the number of trees and tell you why it is difficult to count accurately? What 2D shapes can they see in the house? You could include 3D shapes here as well as 2D, for example can they see the cone that makes up the roof of the tower or the triangular prism that makes up part of the 2nd storey of the house?

They could construct houses out of boxes, or make them using nets of cuboids and triangular prisms (that they make themselves). They could include a tower like the house in the picture using cylinder and cone shapes. You could make a class village or housing estate with their models, adding roads that make right or left turns and other things such as roundabouts. This could lead into some work on direction and turns or rotations.

What colours can they see in the trees and water? This would be a great opportunity to do some paint mixing and explore ratio. Can they mix similar colours, using blues and yellows to get a result like Paul has achieved? What ratios of blues and yellows have they made? They could express these as ratios, proportions or percentages.

This would also be a good opportunity to rehearse reflection and symmetry. Ask the children to paint a picture that has reflections of trees in the water as in Paul's painting.

Show The Bibemus Quarry 3

Another good painting for paint mixing! Can the children make the purples, greens and oranges? What ratios, proportions and percentages have they made?

What shapes can the children identify in the painting? Can they identify any angles? You could ask them to paint a picture of a shape building with the colours they mixed above. Of course, you will need to name and discuss the properties of the appropriate 2D shapes expected for your year group.

Show The card players

The children could explore the angles made by the men, as in the article on Henri de Toulouse-Lautrec.

Ask them to identify the names of the different angles they can see, for example the angles made by the men's elbows and wrists. Can they estimate these? Ask them to point out any acute, obtuse and right angles?

You could ask them to estimate these angles and then demonstrate how to find the actual size. If you can, print out copies of this picture and give them to the children. They could use protractors to measure the angles to the nearest five degrees.

They could then draw stickmen, in similar positions to the men in the painting, which show a variety of angles. They could measure these and then order the sizes of the angles from smallest to largest.

You could ask the children to put their arms and wrists in different positions and talk about the movement they made to arrive at each position. What were the directions of their movements? Did they make any turns or rotations? Were these clockwise or anti-clockwise?

You could explore body ratios. You can find information on some of these in the *Up2d8 maths* feature, The world's tallest and shortest men, from Issue 12. The children could use these to draw scaled-down lifelike people.

You could lead a discussion of the mathematics involved in playing a game of cards and try a few different games out!

The ideas here are just to give you a taster of the mathematical activities that could be involved when looking at artists such as Paul Cézanne. 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!

Explore further!
If you've enjoyed this article, don't forget you can find all the other *Art of Mathematics* features in the archive, sorted into categories: *Artists*, *Artistic styles*, and *Artistic techniques*.

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Primary
& Early Years
Magazine 57

National Centre
for Excellence in the
Teaching of Mathematics

Focus on…
Using financial education to enrich mathematics teaching

Background

In 2010, the NCETM Early Years Magazine carried a report from Jan Campbell OBE (founder and trustee of the PSHE Association) about an ambitious five-year programme in primary schools.

The 'What Money Means' (WMM) project was set up to increase the quality and quantity of financial education in primary schools, run by pfeg (Personal Finance Education Group), an organisation helping schools to plan and teach financial education.

From 2012, pfeg extended the reach of WMM into Higher Education Institutions, deploying consultants to work with university tutors to develop materials for use with trainee teachers on PGCE, school-based routes and BA Education courses.

In September 2013, the important relationship between mathematics and financial education was recognised in the new national curriculum in England:

> *'Mathematics is …essential for everyday life…and necessary for financial literacy and most forms of employment.'*

pfeg's consultant, Alison Terry has been working in partnership with Catherine Foley and Nasreen Majid - mathematics education tutors at the University of Reading. Their aim - to explore exactly how learning about money and learning about maths - could be mutually helpful.

In this short report, Alison and Catherine talk about what worked with trainees and suggest some interesting resources for use in the classroom.

View from the pfeg consultant

Alison explains how maths and money work so well together and gives her ideas for some other resources you might like to explore below.

Money is such a unifying context for mathematics – ask the question, can you see any connection with money in this topic and the answer is invariably 'yes'. Many of the trainee teachers that we worked with also reported that using money as a focus helped to make the teaching of maths less daunting and more 'real'.

The experience of the teachers involved in the WMM project was that this was never truer than when planning activities involving money. Setting purposeful tasks involving money can lay the foundations for more complex concepts later on. For example, with decimals, teachers have said that 'when it's money – they get it'. Also, money-based tasks often lead naturally to opportunities to practise a range of mathematical concepts. Some examples include:

- KS1: Sorting and classifying coins by shape, colour or value – laying the foundation for classifying geometric shapes in later years

- KS1: Budgeting for looking after a pet – labelling items with different prices in the role play area and practising giving change and writing receipts

- KS2: Asking the question, 'what is the average price of a packet of chocolate biscuits', leads to a discussion on means. The activity can also lead to a survey in response to the question, 'which packet is the best value for money?' Linking the activity to sugar and fat content can bring in work on ratio and proportion

- KS2: Asking the question, 'how could you buy a new tablet computer?' leads to work on savings and loan products and percentage interest (AER/APR) as well as giving the opportunity to explore the 'buy now, pay later' culture

- KS2: For the higher attainers – comparing prices by introducing unitary concepts - ie, cost per item/litre/kg - will lead later on to more complex compound units such as density.

The NCETM Primary Magazine has also reported previously on some ideas linked to money: Issue 20 looks at pocket money, and Issue 40 has a focus on banks and banking.

There are plenty more ideas for both key stages within the pfeg Primary Toolkit – a box of resources available to order for free. You can also browse through the searchable database on the pfeg website.

There are over a hundred resources with mathematical content - around seventy with a primary focus.

Here is just a small selection of some of the resources that have been very popular with teachers - all of these are free:

- Learning About Money in the Primary Classroom – a free hard copy resource that gives teaching and assessment ideas for all primary contexts, including a pull-out curriculum planning framework document

- Nationwide Counting on Money (KS1) and The Cost of Money (KS2) – online resources including a suite of interactive games with a money focus

- My Money Mathematics Resources – although targeted at KS3-4, many of the materials are suitable for KS2. All are written with mathematical learning objectives in mind and referenced to NC levels.

Putting it into practice

Work with trainees at Reading focused on practical ways to incorporate financial education in the primary maths classroom. Catherine Foley gives a few practical ideas below for developing children's understanding of money and mathematics as mutually reinforcing concepts:

Coffee shop – an activity for upper Key Stage 2
Children are given a range of information about the clientele of a coffee shop on a particular morning, covering the gender, age, occupation, arrival time and amount spent by each person. Rather than being set a narrow task, they begin by exploring the data and finding out what stories it tells. They might plot the distribution of purchases in the shop over time, present information about the gender and age

groups and relationships between these and average amounts spent, and explore what recommendations they could make to the coffee shop owner in terms of staffing and marketing.

Working on this kind of problem empowers children to develop the kind of creative skills they will need to successfully tackle non-routine problems, at the heart of the new National Curriculum for mathematics. They can then apply these skills to a context meaningful for them – how can they plan the refreshments at the forthcoming Christmas fayre?

Developing coin recognition

One of the hardest tasks for any Key Stage One teacher is helping children to understand and recognise the values of different coins, and the idea that the same amount can be made by different combinations of coins. This may be particularly difficult for newly-arrived children familiar with different coin systems, or children living in households where many transactions take place online or using credit cards. In addition to the usual grouping and sorting activities with real coins, creating coin rubbings, try playing 'Guess my coin' or using coin feely bags, where children have to describe details of the coins and really notice their similarities and differences. The Barclays Money Skills resource pack for ages 4-7, produced as part of the set of materials for My Money Week 2013, provides a set of bingo cards and suggested activities to develop children's coin recognition.

Draw and write

Asking children to draw and write about how we pay for things provides fascinating insights into their understanding of money. By leaving the questions as open as possible – How do adults pay for things?… How can we take care of our money?… children reveal not only their understanding of the mechanics of money, but also their experiences and conceptions of the role of money and saving. Their answers may surprise you – responses such as 'money comes from the supermarket' and 'to get money I will set up my own charity' are not unheard of! There are support materials in the Learning About Money in the Primary Classroom area of the pfeg website.

Using children's literature

From Lauren Child's 'Charlie and Lola – Please May I have Some More of Yours?' and Mick Inkpen's 'The Great Pet Sale' to 'One Hen: How One Small Loan Made a Big Difference' by Kate Smith Milway, and 'Millions' by Frank Cottrell Boyce, both fiction and non-fiction books provide rich opportunities for exploring money and mathematics. Will Lola save enough for her toy seal? How can Damian and Anthony (from 'Millions') dispose of their unexpected windfall?

For more ideas on using children's literature and traditional tales to develop finance education, download Learning About Money in the Primary Classroom or have a look at this year's literacy-focused My Money Week national competition support materials.

The power of role play

Early Years practitioners have always known that role play is one of the most powerful vehicles for helping children develop their mathematical understanding, and money provides a perfect context, be it a café, clothes shop, garden centre or bank. But role play shouldn't stop in the Foundation Stage: the Teachers TV video Making Maths Real has an example of Year 3 and 4 children exploring how to pay the bill in a pizza restaurant.

Taste test
After taking into account steps to ensure the safety of any children with food allergies, set up a tasting basket with three different brands of common items e.g. cereals, biscuits, fruit snacks – ensure the basket includes the most expensive brand, the supermarket's own, and a value variety. Carry out blind tasting, and ask children to compare their preferences with the prices of the different products. They may be surprised! This kind of activity links perfectly with exploring 'buy one, get one free' offers and percentage decreases. Children can work out how much they could save over one year by choosing a cheaper brand, and what that money could be used for.

View from the University

At the University of Reading our trainees have been enthused by our work on personal finance. Not only has it opened their eyes to some of the less tangible roles and responsibilities of being a teacher, but it has given them endless starting points for making mathematics meaningful in their school experience placements and on into their teaching careers.

Round up

For more information about the work that was carried out at The University of Reading, please do take a look at the video. It gives a flavour of the enthusiasm of the students who took part and may encourage you to have a go yourself!

pfeg has also produced a toolkit to help HEIs implement a programme of financial education.

The University is hosting a session for other interested HEI tutors, colleagues from SCITTs and Teaching Schools on 10 December 2013 – spreading the word about how motivating and rewarding the context of money can be in the primary maths classroom.

Interested parties can contact Susan Woodason at the University of Reading via education-events@reading.ac.uk.

For more information see the pfeg website, call 020 7330 9470, or email support@pfeg.org.

Thanks to Alison Terry of pfeg and Catherine Foley of the University of Reading.

Explore further!
If you've enjoyed this article, don't forget you can find all previous *Focus on...* features in our archive.

A little bit of history – rubbers

As we all know, a rubber is something that we use to erase pencil and sometimes pen marks. Have you ever wondered how they were invented? Apparently, when the first pencils were made no one had anything to rub out mistakes so they used breadcrumbs! Can you imagine the mess that would leave in the classroom? Thank goodness for those who invented the rubbers we use today!

Breadcrumbs continued to be used as rubbers in some places until the late 19th/early 20th Century and they had additional benefits that the rubber didn't… a student from Tokyo said, 'Bread erasers were used in place of rubber erasers, and so they would give them to us with no restriction on amount. So we thought nothing of taking these and eating a firm part to at least slightly satisfy our hunger.'

A potted history of the rubber…

Rubber tree (closeup)

Rubbers, other than breadcrumbs, were made from tablets of rubber or wax. They were used to rub out lead or charcoal marks from paper. Bits of rough stone were also used to rub out small mistakes on parchment or papyrus written in ink.

In 1770 'real' rubbers began to appear. The first was thanks to Joseph Priestly who discovered a vegetable gum that could rub out pencil marks. He called this substance 'rubber'. In the same year Edward Nairne, an English engineer, was credited with developing the first widely marketed rubber made out of…rubber. Apparently he accidently picked up a piece of rubber instead of a breadcrumb and discovered its erasing properties. He made his first rubber for an inventions competition. He then began selling them for three shillings per half inch cube (a lot of money in those days!).

Rubber in its raw state like this was, like breadcrumbs, perishable and so didn't last very long. In 1839 the inventor Charles Goodyear (the Goodyear tyre was named after him) discovered the process of vulcanisation, a method that cured rubber and made it durable. From this time rubber rubbers became common.

Have you ever wondered how rubbers work? Wonder no more:

Quite simply, the molecules in the material making up a rubber are stickier than those that make up paper. This means that when a rubber is rubbed onto a pencil mark, the graphite sticks to the rubber's surface instead of the paper's.

There are several types of rubber. The main four are:

1. the art gum eraser rubber which is made from soft rubber. It is used for rubbing out large areas of pencil marks without damaging the paper. This rubber tends to crumble with use leaving a residue which needs to be blown or brushed away. It is often used by artists

2. the pink rubber which is often used by writers. It used to always be pink but these days it comes in different colours. It is probably the most common rubber and is made from synthetic rubber and volcanic ash (pulverised pumice)! It is often found on the tops of wooden pencils. Unfortunately it

tends to smear and leave a residue. Because of the pumice it can often damage the surface of paper if used repeatedly. Due to its abrasiveness, it is often used to clean computer circuit boards!

3. the kneaded rubber is usually white or grey in colour and has a putty feel. It is pliable and can be shaped into points. It is another rubber often used by artists because it can be used to absorb and lift light graphite and charcoal marks from paper or canvas. It doesn't wear away like other rubbers but does lose its absorbency and begins to make marks instead of removing them

4. the vinyl, or plastic, rubber is made of a soft plastic or PVC. Like the kneaded rubber it is pliable and non-abrasive and can rub out light pencil marks without smearing or damaging the paper.

These days rubbers can be made up of many different materials such as vinyl, gum, rubber and plastic. They come in different colours, shapes and sizes too. They can be rectangular blocks or conical caps that can be placed onto the end of a pencil. They can be barrel shaped or made to novelty designs. One thing is for sure – rubbers are now an essential piece of home, office and school equipment – especially for all the Sudoku puzzle fans out there!

Information from:

- Human Touch of Chemistry
- Jetpens
- Wikipedia.

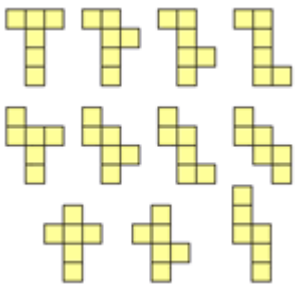
Now for some mathematical fun with rubbers!

In the article it mentions that Edward Naime sold his rubbers for three shillings per half an inch cube. Ask the children to convert three shillings to our current money. In those days there were 20 shillings in a pound. You might like to share the history of our monetary system with the children. You will find some useful facts in A little bit of history from Issue 9.

The children could also find out how much half an inch is in centimetres. They could draw the face of one side of a cube to that dimension. They could then draw five more faces and see if they can make a net of a cube. They could carefully cut it out, fold it and make a cube the size of the rubbers that Edward sold.

They could scale the measurement up and make a cube that is 2, 3 or 4 times the size. This would be a good opportunity to explore the properties of a cube and to work out a suitable net. Can they find all 11 possible nets?

Here they are:



Make a collection of the rubbers that the children have. They could then try to identify the type of rubber that they are. Are most of them the common 'pink rubber'. They could then sort these according to a criterion of their own, for example, colour, shape, those on the end of a pencil. They could use a Carroll or Venn diagram for this.

They could draw around their own rubber and then rotate it for 45° or 90° to make a pattern that shows rotational symmetry. What shape is their drawing? What shape can they see in the rotation? Can they tessellate their rubber? If so, as in the article on pencil sharpeners, they can make an Escher-style design.

'Gomme'

You could ask the children to research on the internet the different rubbers available. Can they find the four different types mentioned in the article? How are they the same, how are they different? How many different types of novelty rubbers can they find? How many have they seen in use at school or at home? Do they have one that is similar to any that they can see? What 3D and 2D shapes can they see in the different rubbers? This would be another good opportunity to rehearse properties of shape. From a selection of rubbers (real or from the pictures), you could ask questions that involve ratio and proportion, such as, what is the ratio of pink rubbers to green, what proportion are neither?

Give the children copies of the pictures of the rubbers they found on the internet. They could, for example, cut them out and make repeating patterns, sort them into Carroll or Venn diagrams, make 2D drawings of them identifying the shapes that they have made, stick them on a number line according to their prices.

They could find the price range of a selection of the rubbers they found and plot these on a number line. They could then work out totals and differences using the most efficient strategy.

The children could estimate and then measure the length of their own rubber. They could then compare this with their friend's. Which is the longest? By how much? They could place several rubbers in a line and then estimate and measure their total length.

You could give the children some small pieces of bread and ask them to compare their rubbing out qualities with their own rubbers!

We hope that this article has inspired you to make a more mathematical use of your classroom rubbers! If there is any area of history that you would like us to make mathematical links to, please let us know.

Explore further!

If you've enjoyed this article, don't forget you can find all previous *A little bit of history* features in our archive, sorted into categories: *Ancient Number Systems*, *History of our measurements*, *Famous mathematicians*, and *Topical history*.

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Gomme by Francesco Gasparetti, some rights reserved

Maths to share – CPD for your school

Making sense of the current changes in the Mathematics Curriculum in England is an account of a meeting between the Teaching Committee of the Mathematical Association and Steffano Pozzi, a civil servant at the Department for Education (DfE), who has played an important role in overseeing the changes to the Mathematics National Curriculum.

If you are interested in using this article for a staff meeting, send the report to colleagues, asking them to read the introduction and the section about primary mathematics. It would also be useful if colleagues could see copies of the National Curriculum, so ask them to bring theirs along to the meeting or provide some for them to use.

Begin your meeting by highlighting the section in 'Curriculum Design' which says that one key aim is to give greater freedom to schools to determine their own curriculums and decide what is covered in Years 3, 4, 5 and 6. The only condition is that it must all be covered by the end of Year 6.

- Do colleagues think this freedom will allow them to adjust elements of the curriculum to make them more achievable for their children?

You could spend some time looking at the objectives for a particular area of mathematics, for example, time. Ask colleagues to look at those for Year 3.

- tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks
- estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight
- know the number of seconds in a minute and the number of days in each month, year and leap year
- compare durations of events (for example to calculate the time taken by particular events or tasks).

Spend some time discussing how these objectives could possibly be spread across Years 3 and 4, for example, so that the children are able to achieve them and go on to tackle more complex time problems with confidence in Years 5 and 6. It might be worth considering some of these ideas:

The main focus of time could be analogue and digital time in Year 3 to five minutes and move telling the time to the nearest minute to Year 4.

Teach 24-hour clock time in Year 4 and focus on 12-hour clock time in Year 3.

Move clocks with Roman numerals to Year 4 when they are taught to read Roman numerals to 100.

Year 2 children could be introduced to simple digital time in Year 2, as is often current practice.

You could discuss teaching the time in a way that is simpler for some children to understand. Have colleagues ever considered focussing on minutes past? The children could count around the clock from,

for example, 3 o'clock to 40 minutes past 3 o'clock in intervals of five minutes and link to the digital time of 3:40. They could then investigate how many minutes it is until the next hour and so be able to tell the 'to' time of 20 minutes to 4.

An implication for the teaching of time is that it is included in measures, which has a great deal of content. It might be worth discussing other areas of mathematics in which it can be consolidated and reinforced, for example during addition and subtraction by solving real life problems that involve finding time durations and differences or in other subjects such as science or P.E..

Are there other areas of the mathematics curriculum that can be adjusted in a similar way to benefit the children? Spend a few minutes looking through the NC document and together make a list of any that stand out.

- With this freedom is there danger that some areas in mathematics might be left to Year 6?

Stress the importance of a whole school mathematics policy with clear guidance on what should be taught and when. You could arrange another meeting to begin to put one of these together as a staff.

Under the heading 'Primary Mathematics' it states:

> *The government wishes to continue to emphasise fluency, but this should not be understood to mean 'rote learning without understanding'. The government therefore want to communicate that conceptual understanding is clearly important and that any emphasis on practice needs to be a part of achieving that understanding.*

- How do colleagues feel about this?
- Does this statement alleviate fears that we are going back to the 'old days' of mathematics teaching that many of us experienced… learning rules?

Lead a discussion on conceptual understanding.

- What do colleagues think is meant by this term?
- How could this be achieved in the four operations?

You could highlight the importance of all children using manipulatives in order to help them develop their understanding. In the next issue of the Primary Magazine we will be looking at addition and subtraction and the use of manipulatives and visual representations to enable conceptual understanding. It might be worth booking a meeting for a future date to explore the suggestions given with colleagues.

Another recommendation is that children need frequent practice of varied problems. What do colleagues think this means? It might be helpful to develop a bank of problems for each operation that also involve mixed operations and some other element of mathematics, for example fractions, time and other measurements. Encourage colleagues to consider those that could be solved using the 'bar model'

which was a focus of the previous Issue's Maths to Share. If you have time, ask colleagues to make up a few problems for their year group. You could then share these and work out how they can be adapted to other year groups.

In the synopsis there is mention of the fact that there has been a rebalancing of the curriculum away from data handling. Discuss when data handling could be included in other subject areas such as science and geography.

It also mentions 'measures and its context in geometry'. In KS1 and KS2 there are separate sections for each of these areas. In KS3 they are grouped together with an emphasis on their connections. Ask colleagues when they currently make links between the two. You could ask them to look at the measures programme of study and find when links are specifically made between measure and geometry.

This synopsis is from the Mathematical Association. All the mathematics associations have been very proactive in contributing to the National Curriculum consultation. Have you ever considered joining one? Involvement in a professional community such as these with like-minded people doing similar roles provides you with essential support.

Membership of a subject association offers a wide variety of opportunities, including:

- resources and publications
- sharing ideas through local meetings and networks
- professional development events and annual conferences
- involvement with others in curriculum and resource development

Mathematics subject associations are directly related to the teaching and learning of mathematics in schools and colleges. There is at least one association to meet your needs at each stage of your career and to support any role you are likely to undertake in mathematics education. Many people belong to more than one association. Why not find out more about each one?

If you decide to use it for staff professional development, please let us know (either by posting a comment below or emailing us at info@ncetm.org.uk) - we'd love to hear what you did.

With thanks to the Mathematical Association for permission to use their article

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