Primary Magazine

Issue 17

National Centre for Excellence in the Teaching of Mathematics

Welcome to the 17th issue of the Primary Magazine. Our famous historian is Blaise Pascal and we explore the art of Andy Goldsworthy. We explore the misconceptions in fractions, decimals and percentages and National Number Day. Up2d8 considers whether a 16-year-old could make a good headteacher!

Contents

From the editor

On 16 October 2009, a report released by the Cambridge Review of Primary Education in England stated that children should not start formal learning until they are six. They say that there is no evidence that an early introduction to formal learning has any benefit. They believe that the kind of play-based learning featured in nurseries and reception classes should go on for another year and that continuing this informal but structured learning (that follows the Early Years Foundation Stage programme) for a year or so would bring children in England in line with many European countries, where school starts at six or even seven, and standards are often higher at these ages. They also recommend that KS2 SATs should be scrapped!

It seems the government disagrees, saying that a starting age of six would be completely counter-productive and that it would be a backward step to scrap English and mathematics tests at eleven.

Here are the current school starting ages in Europe:
Five years old: England, Scotland, Wales, N. Ireland, Malta, the Netherlands
Six years old: Austria, Belgium, Czech Republic, Denmark (6-7), France, Germany, Greece, Hungary, Iceland, Irish Republic, Italy, Norway, Poland, Portugal, Spain, Sweden (6-7)
Seven years old: Estonia, Finland, Latvia, Lithuania

What do you think? Please comment in the Primary Forum.

Have you seen Schools Research News? This is a newsletter produced by the Chief Adviser on School Standards Unit at the Department for Children, Schools and Families, intended to help keep us up to date with recently published research and with opportunities to get involved. If you would like to be added to their circulation list for future research information, email research.summaries@dcsf.gsi.gov.uk.

As mentioned in Issue 15 of the Primary Magazine, Inspiring Mathematics Champions was a project developed by the NCETM, supported by Yorkshire Forward which promotes achievement in primary mathematics. Its main aim was to support trainee teachers in building teaching skills in using and applying mathematics through the development of problem solving and cross-curricular approaches. We are now delighted to be able to share with you the work of two students, Amy and Bethany, who developed a maths trail around the grounds of the stately home Brodsworth House: their account of what they did is available to download.

An example of their teachers' resource booklet for KS1 is available for you to read. Please contact us if you would like to see more. We hope that this will all be available on the portal at some stage in the future.

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Up2d8 maths

Babar Ali is an amazing 16-year-old who is headteacher of a school in India, with over 800 pupils and ten other teaching staff who are also students of around Babar's age. He began his school for fun when he was nine years old, but now it is recognised by the Indian government. Babar has a passion for learning and passing his learning on to help young people get out of the poverty trap by being educated enough to get better jobs than the few on offer in his village and surrounding areas. We consider if it is right that he is a headteacher at such a young age and whether what he is doing is helpful to his country.
This resource provides ideas that you can adapt to fit your classroom and your learners as appropriate.




In addition to the ideas on the spread, here are some more that you could adapt and try:

- when considering favourite subjects, you could use multilink with a colour to represent a subject area – e.g. number, music, reading – and ask the children to choose the colour to represent their favourite: put the like-coloured cubes together in towers, place them side by side, count how many chose each and then find totals and differences. Alternatively, use a picture to represent each subject area and construct a pictogram
- have some catalogues available (e.g. Argos) and ask the children to choose a toy and find out how much it would cost in rupees. Make this accessible to most ages and abilities by rounding prices and exchange rates as appropriate
- compare the average daily wage in West Bengal (70p) to the national minimum hourly wage of someone over 22 in the UK (£5.80). Work out how much that would be for a seven-hour day. Make up a table to show the comparisons for a day, week, month etc
- the children could make a model of a classroom, which could include making relevant 3D shapes
- use the table below to explore equivalent costs of the different items by converting rupees, dollars and euros into sterling. This would be a good opportunity to practise the use of a calculator
- ask them to use the table to make up and cost a menu for a day for a family of, say, four. They could do this for an imaginary Indian family within a budget of 70p, keeping some change to save for other essentials like clothing

drinks - cup of milk coffee	Rs10.00	$0.20	€0.16
drinks - cup of masala tea	Rs10.00	$0.20	€0.16
drinks – glass of sweet lassi	Rs25.00	$0.50	€0.40
drinks – drinking water Besleri (1 litre bottle)	Rs20.00	$0.40	€0.32
drinks – drinking water Bisleri/Kingfisher (19 litres)	Rs70.00	$1.41	€1.11
drinks – soft drink (Pepsi/Coke, 1.5 litre)	Rs30.00	$0.61	€0.48
drinks – milk tetrapak (Nestlé, 1 litre)	Rs37.00	$0.75	€0.59
drinks – juices (orange/apple, 1 litre)	Rs60.00	$1.21	€0.95
food – egg (20 piece)	Rp12.00	$0.24	€0.19
food – bread/roti chapatti per piece (12")	Rp10.00	$0.20	€0.16
food – local dessert (Bebinca)	Rp25.00	$0.50	€0.40
food – local restaurant small meal (vegetable thali)	Rp35.00	$0.71	€0.56
food – local meal, curry with bread	Rp40.00	$0.81	€0.64
food – local meal, aloo gobi (potato with cauliflower)	Rp45.00	$0.91	€0.72

food – local meal, vegetable masala with bread	Rp60.00	$1.21	€0.95
food – chicken/fish masala with bread	Rp85.00	$1.71	€1.35
food – white rice (1kg basmati)	Rp70.00	$1.41	€1.11
food – potatoes (1kg)	Rp50.00	$1.01	€0.80
food – tomatoes (1kg)	Rp50.00	$1.01	€0.80
food – fruits, pineapple/papaya/kiwi (each)	Rp20.00	$0.40	€0.32

- ask your headteacher how much it costs to run your school for the day. Work out how much this works out for each child – use a calculator to help. How many children could go to school with Babar Ali for that amount?
- would you like to be headteacher of your school? Not just for a day, but everyday. Interview your headteacher about how long s/he spends working each day (both at home and at school), whether or not s/he comes into school in the holidays etc. before deciding.



Download this Up2d8 maths resource - in PowerPoint format.

Download this Up2d8 maths resource - in PDF format.

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The Art of Mathematics
Andy Goldsworthy (1956 -)

Andy Goldsworthy was born in Cheshire on 26 July 1956. From around 13 years old he worked as a farm labourer. He was brought up in Yorkshire and studied fine art at both Bradford College and Preston Polytechnic. When he left college, he lived in Cumbria, Lancashire and Yorkshire. Due to a variety of circumstances he gradually drifted northwards to Dumfriesshire. He married in 1982 and has four children. Since separating from his wife, he met Tina Fiske, an art historian who came to work with him. They now live together in Penpont in Dumfriesshire.

Andy Goldsworthy uses the materials at hand in the remote, open air area he chooses to work in – stones, mud, flowers, pinecones, leaves, twigs, reeds, thorns, snow and ice. He has commented:

> "I can't edit the materials I work with. My remit is to work with nature as a whole."
> "Each work grows, stays and decays."

His workplaces have ranged from The North Pole to Japan, the Yorkshire Dales to the Australian outback, via Canada, the Lake District, St Louis and more. He uses only his own hands, teeth and found tools to prepare and arrange the materials in site-specific sculpture and land art. His work is usually short lived but demonstrates an extraordinary sense of place and play, drawing out the character of the local environment. All his work is recorded through photographs. These help him to show each work "at its heights, marking the moment when the work is most alive"; he believes "process and decay are implicit".

Goldsworthy frequently publishes a book showing how the work was produced – each book is a work of art in itself. Some of his more recent sculptures have been made from stone. He has begun to use machine tools and to work with others, including an assistant and five dry-stone wallers, who were used to help make sure some of his structures were at least semi-permanent. Some have been moved to locations far from their origin, others are placed indoors at his studio in Dumfriesshire in an attempt to preserve them.

One of his most recent commissions is a piece called 'Drawn Stone' for the entrance to San Francisco's De Young Museum. Drawn Stone echoes the frequent earthquakes and their effects on the area. The piece includes broken limestone, which can be used for benches, and a giant crack in the pavement that branches into smaller cracks. He created the smaller cracks with a hammer, deliberately adding unpredictability to the work.

The outdoor environment is a powerful learning medium and a rich resource for mathematical exploration. Margaret McMillan, pioneer of nursery schools, said: "The best classrooms are roofed by the sky." Andy Goldsworthy certainly encourages us to use the outdoors for mathematical and artistic exploration, no matter where we are.

All ages

Show the children the selection of Andy Goldsworthy art. These can be viewed as a PDF. Discuss what is the same about each piece? What is different? Look at the variety of materials used. How many of these are available locally? What else could you use to create the same effect?

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

Foundation Stage

- spot shapes in the environment. Take a small group of children for a walk around your setting. Take photographs and put them together into an 'Our Shape Walk' book for the children to enjoy. Repeat with other groups – you will be surprised at what one group will notice and others will miss. Once the book is complete, ask pairs of children where a particular photograph was taken. Can they tell you how to get there? Let them take you there and find where the photograph was taken from
- have a collection of pebbles in a basket in the outdoor area. Encourage children to use them to make their own sculpture. Photograph each sculpture and display alongside a picture of one of the stone sculptures above. When the display is complete, talk about what is the same and different about all the sculptures.

Key Stages 1 and 2

- having looked at Andy Goldsworthy's art above, challenge the children to make an outdoor work of art focusing on a triangle or square. Discuss what they might use and where they might find the materials they need. You could obtain some suitable materials from your local garden centre or have some collecting walks for items such as conkers, twigs, leaves and pine cones beforehand. Photograph the work for display. You could also section off the area and invite parents and other classes to view your outdoor art gallery. If, at some other time in the year, it snows, remind the children of this activity and take them outside to have a go
- challenge the children to make geometric designs and structures using natural materials. Set up an interactive display in the classroom with a range of materials for children to explore. Take photographs before tidying and display near the table to inspire others to have a go
- look at and discuss Andy Goldsworthy's 'Iris Leaves with Rowan Berries'. Show the children a set of pick-up sticks. Demonstrate how, to begin the game, the sticks are all held together and then dropped. What shapes can the children spot in between the sticks? How could they highlight those shapes? Do the children think this is how some of Andy's work was created? Or were his materials deliberately placed? Give each pair of children a set of pick-up sticks or some straws, long leaves or lolly sticks to experiment with. Take photographs or stick down straws or lolly sticks to make a more permanent piece of artwork. Pick out geometric shapes with a contrasting material.

Key Stage 2 (and perhaps older Key Stage 1) children could also explore Andy Goldsworthy's arches and create one of their own. These could be small scale, over a wooden train track or small world play fences, or larger depending on the materials available.

You can find more information on these websites:

- ArtisanCam
- Morning Earth
- Andy Goldsworthy Digital Catalogue
- Cass Sculpture Foundation

For some Andy Goldsworthy-inspired children's artwork:

- Sir Harold Jackson blog

Focus on…Number Day

It's nearly upon us (although you still have time to plan for it!) – the day that could prove to be the most exciting day you and your pupils have had at school this year…Number Day, 4 December 2009!

This year, all funds raised from Number Day activities go towards supporting the work of the National Society for the Prevention of Cruelty to Children (NSPCC). The NSPCC was founded in 1884 and now has 180 community-based projects, as well as running the NSPCC Helpline and ChildLine in the UK and the Channel Islands. Most of its work is with children, young people and their families, but it also works to achieve cultural, social and political change.

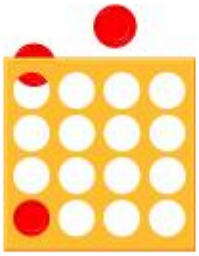
To achieve the aim, that all children are loved, valued and able to fulfil their potential, the NSPCC has four main objectives:

- to mobilise everyone to take action to end child cruelty
- to give children the help, support and environment they need to stay safe from cruelty
- to find ways of working with communities to keep children safe from cruelty
- to be, and be seen as, someone to turn to for children and young people.

So, what is Number Day? Well, it's an excuse to really raise the profile of mathematics in your school and the local community, with everyone spending the whole day immersed in exciting maths activities, while raising money for a good cause.

To get you started with the planning of your number day, the NSPCC has developed a website full of exciting mathematics activity ideas, assembly plans and posters to promote your fundraising events – covering Key Stages 1 to 4. You can register your interest on the Number Day website, and you will receive a web address enabling you to access all of the materials.

Why not use Number Day (or the whole week) to explore some of the 'mathematical stories' focused on in Issue 3 of the Primary Magazine? You will find a comprehensive list of mathematical story books plus activities and lesson ideas to use with all the children to Year 6. Issue 12 of the Magazine has a 'Maths to Share' feature focusing on the use of games in mathematics lessons. There are masses of exciting games available online, many of which reflect popular television shows that the children will love. Number Day on 4 December could be just one big game!



Whether it's finding higher or lower, playing connect four or mathematical hangman, everyone is sure to have fun. Try these or some of the other online games below.

One primary school in Solihull, West Midlands, decided to aim high during the last Number Day, by allowing all of their pupils to release, en masse, hundreds of red helium balloons into the sky. Attached to each was a mathematical puzzle or question written by the pupils, with instructions for those finding the balloon to complete the puzzle and return to school. The landing positions of any balloon tags returned were plotted on a map, and prizes awarded for the longest balloon flight. A wonderful idea, and one that could round off your Number Day celebrations with great excitement.

- Maths is Fun is a wonderful site with links to electronic versions of many games and puzzles that the children will recognise. They include Reversi, Tower of Hanoi, Broken Calculator and Multiplication Games, amongst many others
- HoodaMath has three clear categories of games; geometry, arithmetic and logic. Hundreds of possibilities cover all key stages.

The Comber Primary School's CountIT project has developed a whole range of online games and activities. There are interactive online games for the Early Years Foundation Stage, Key Stage 1 and Key Stage 2.

Starter of the Month

Foundation Stage

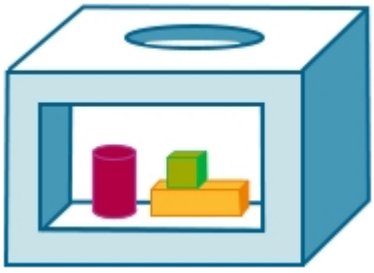
Use a range of number rhymes during the lesson such as *Ten Green Bottles*, *One Man Went to Mow*, *Five Little Speckled Frogs*…the Number Day website has more suggestions. Provide the children with digit cards 1-10 and ask them to hold up the related number card as they join in with the rhyme. Challenge them to hold up the card instead of saying the number… they could even try to get faster and faster!

Ask groups of four or five pupils to choose a rhyme from a given list. They should each have a few minutes to 'rehearse' saying the rhyme very quietly (or silently if possible!) to themselves, but holding up the numbers as they arise in the rhyme. Allow each group to perform to the class, who should try to guess the rhyme from the numbers displayed.

Key Stage 1

The NSPCC Number Day materials include activities based on Guess My Shape. These involve providing the children with clues to help them distinguish the shape being described from a wider set. This could be extended with the pupils making up their own clues, using specific targeted mathematical vocabulary.

A 'feely bag' is a popular resource in the classroom, where a selected pupil puts their hand into an opaque bag containing shapes (2D or 3D). They then describe the properties of one of the shapes to the rest of the class, who try to identify it from a list or from a duplicate set of shapes on show.



A 'feely window box' works in a similar way, but the bag is replaced by a box with a 'window' or 'screen' on one side (like a television). The child selecting the shape cannot see into the box, and yet the rest of the class can. It is a good way of involving everyone in the activity.

Key Stage 2

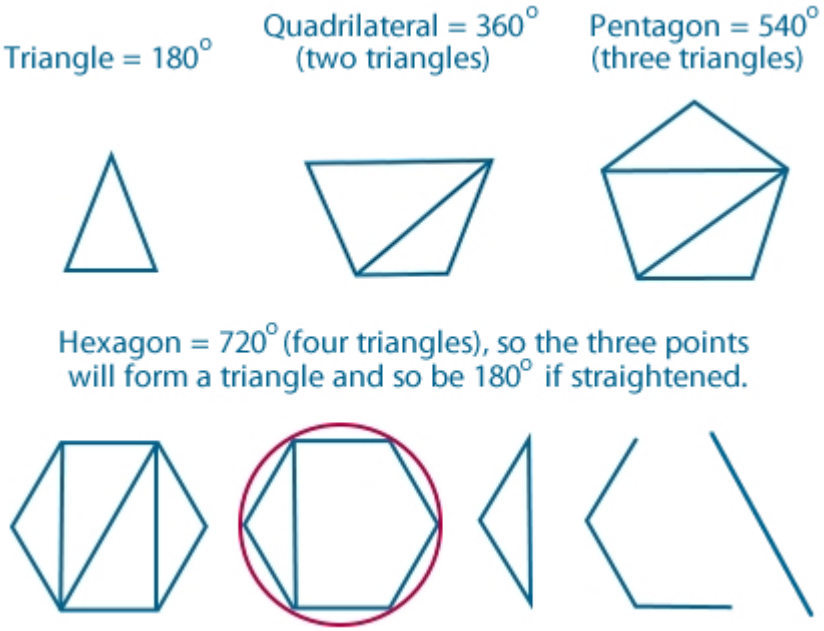
The NSPCC Number Day activity provided for Key Stage 2 is Numbers Up, a version of bingo. They also suggest playing your own classroom version of 'Who Wants to be a Millionaire?' using mathematical questions matched to the children's ability. Why not make this even more realistic by using the 'Who wants to be a mathionaire?' quiz templates provided by Maths is fun. The TES website has a template designed around the same popular television show, fully adaptable for you to enter your own questions. Let the fun begin!

A little bit of history – Blaise Pascal

Pascal is a significant figure in mathematics and science. He was a mathematician, physicist, and religious philosopher. This article gives a small insight into this Frenchman, highlighting some of his achievements and parts of his life.

Pascal was considered to be a child prodigy. His father was a judge, who was also interested in mathematics and science. Pascal's mother died when he was three and shortly after this his father moved the family to Paris where he decided to educate his children at home. All three of his children (he also had two daughters) showed extraordinary intellectual ability, particularly Blaise. He had an amazing aptitude for mathematics and science, so much so that at 11 his father forbade him to do any more until he was 15, so that he could concentrate on his studies of Latin and Greek. However, when he was 12, his father found him writing on a wall with coal, an independent proof that the sum of the angles of a triangle is equal to a straight line! From then on he was allowed to study Euclid and also to sit in on the meetings of some of the greatest mathematicians and scientists of the time. As a result of listening to one of these he produced the proof for what is known as the Mystic Hexagram. It is still known today as Pascal's Theorem, which states that if a hexagon is inscribed in a circle, then the three intersection points of opposite sides lie on a line (called Pascal's Line).

You could try the angles in a triangle investigation with your children. It's good fun and helps to demonstrate this theory (although not strictly in Pascal fashion) in a different, much more basic way. It is also a good example of finding proof at a primary level.



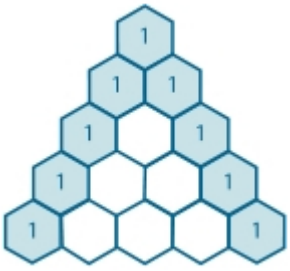
He also helped to create two major areas of research which were new at the time. One, which he did when he was 16, was related to geometry, and the other related to probability and strongly influenced the development of modern economics and social science. This began in about 1654 when he started to investigate the chances of getting different values for rolls of the dice. His discussions with Pierre de Fermat are said to have laid the foundation for the theory of probability. His father, who died in 1651,

seemed to spend most of his later life calculating and recalculating the taxes he owed and it was this that led Pascal to construct the first type of mechanical calculator capable of adding and subtracting –

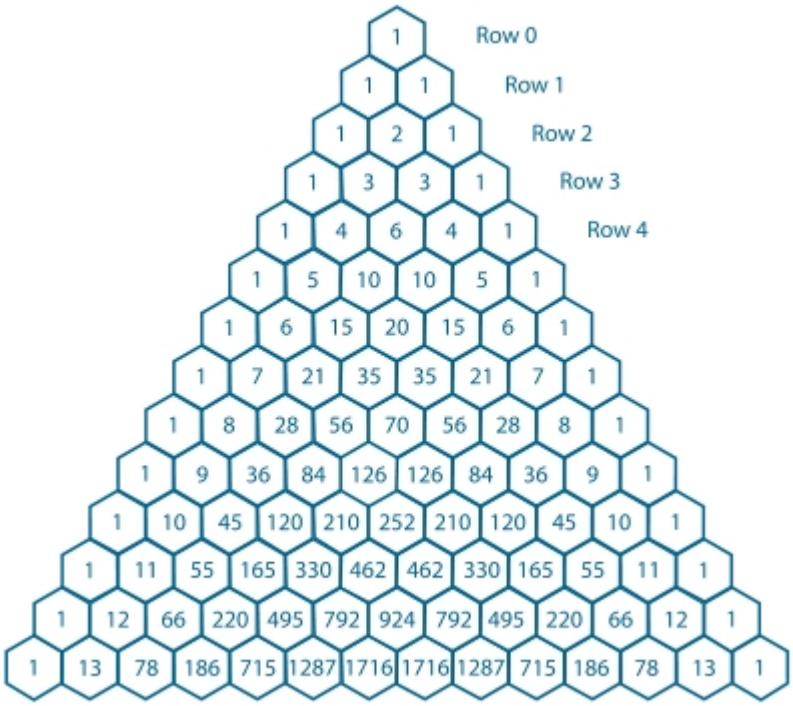
and he wasn't yet 19! Originally he made one to help his father and then some to sell, but they were too expensive for most people to buy and became status symbols for the rich. He improved and refined his first design and over the next 10 years built and sold 50.

Pascal is probably best known in primary school circles for his famous triangle.

Each number is the sum of the numbers directly above it. Have you given this to your class to try? If not, why not give it a go?



Pascal's Triangle is more than just a big triangle of numbers. It is used in algebra and probability.



In 1646, Pascal joined a religious movement within Catholicism, and five years later had a 'second conversion' which caused him to mostly abandon his other work and devote himself to philosophy and theology.

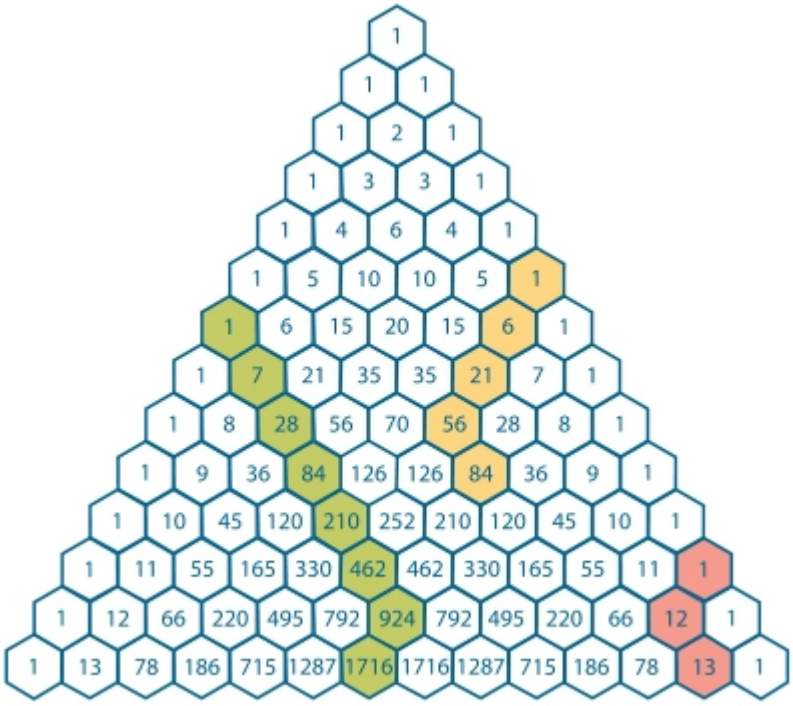
He suffered from a nervous illness throughout his life which gave him constant pain. In 1647 he had a paralytic attack that so disabled him he could not move without crutches. In 1662 Pascal's illness became more violent. His health was fading quickly and he wanted to be moved to the hospital for incurable diseases, but his doctors said that he was too unstable to be carried. In Paris, on 18 August

1662, Pascal went into convulsions. He died the next morning. The last words he said were, 'May God never abandon me.'

Fascinating things to investigate in Pascal's Triangle

Hockey stick pattern
If a diagonal of numbers of any length is selected starting at any of the one's at the sides of the triangle and ending on any number inside the triangle on that diagonal, the sum of the numbers inside the selection is equal to the number below the end of the selection that is not on the same diagonal itself, eg:

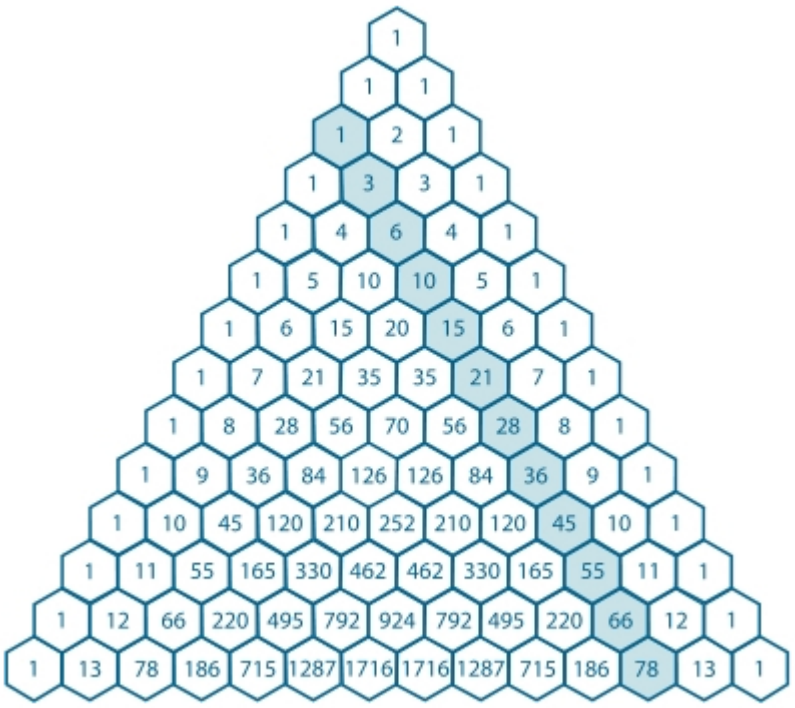
1 + 6 + 21 + 56 = 84
1 + 7 + 28 + 84 + 210 + 462 + 924 = 1716
1 + 12 = 13



Magic 11s
If a row is made into a single number by using each as a digit of the number (adding the tens number of a two-digit numbers to the previous one) it is a multiple of 11. Check it out!

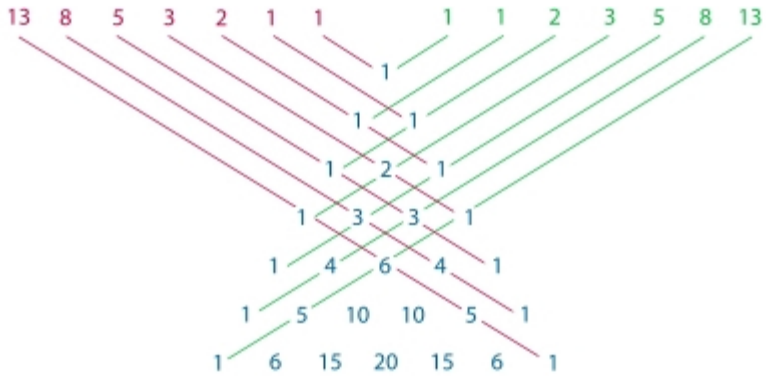
Triangular Numbers

They can be found in the diagonal starting at row 3 as shown in the diagram. The first triangular number is 1, the second is 3, the third is 6, the fourth is 10, and so on.



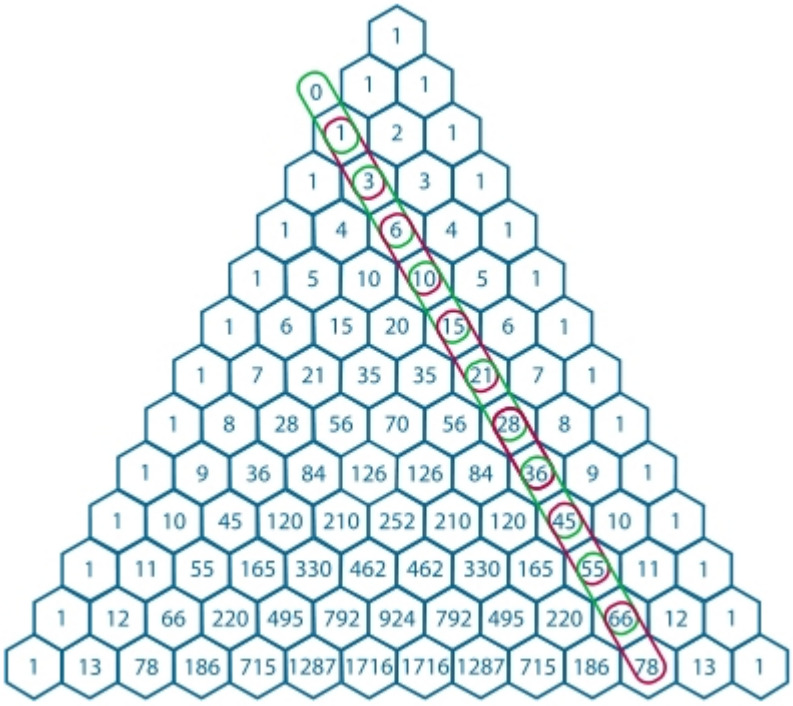
Fibonacci numbers

To find these you need to go up at an angle: you're looking for 1, 1, 1 + 1, 1 + 2, 1 + 3 + 1, 1 + 4 + 3, 1 + 5 + 6 + 1.



Square Numbers

These are found in the same diagonal as the triangular numbers. A Square Number is the sum of the two numbers in any circled area in the diagram. The very first square number is 0^2. The second is 1^2, the third is 2^2 (4), the fourth is 3^2 (9), and so on.



To find out more about these investigations and others visit these websites:

- Pascal's Triangle
- Drexel Math Forum

Wikipedia has more information about Pascal.

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Maths to share – CPD for your school

Mathematics Subject Knowledge – fractions, decimals and percentages

The concepts of fractions, decimals and percentages are traditionally considered hard for children and adults to understand. Analysis of Key Stage 2 tests acknowledges that questions relating to fractions, decimals and percentages pose particular problems for children, especially those working at level 3. It is well known that children and adults often do not appreciate that fractions, decimal and percentages are equivalent ways of writing the same quantity and that they are different ways of expressing related ideas.

Before the meeting
Ask colleagues to read the paper Fractions: difficult but crucial in mathematics learning, Nunes, T., Bryant, P., Hurry, J. and Pretzlik, U. (2006). It may be helpful to download copies to give to them.

At the meeting
Questions from the paper to consider for discussion:

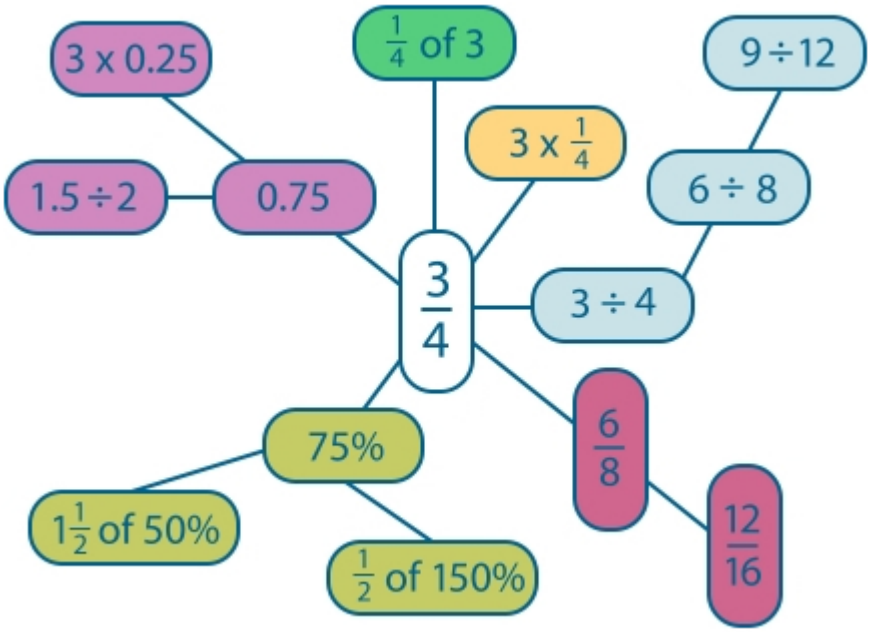
- were the children's misconceptions highlighted in the paper familiar
- what explanations could be offered for the misconceptions?
- were you surprised children were more successful in division problems? Is this the case in your class?
- how do you use children's experiences to teach the different aspects of fraction?
- do you include opportunities, sharing as situations, in which meaning of fraction can be explored by pupils?

Ensure that teachers are aware that this is an opportunity to develop their subject knowledge and address misconceptions – no judgements will be made.

10-minute activity – you may need to provide some mathematical resources, eg. multilink, number lines, etc. to facilitate thinking and discussion.

Connections
Ideally, the teachers should work in groups of three or four. Give each group a large sheet of paper with a different fraction written on it, e.g. 1/3, 4/5, 3/8, 5/6, 1/12, (not ¾). Ask the groups to write or draw as many different aspects of the fraction as they can. Allow 10 minutes to make a spider diagram. Model

this example for 3/4 to get them started:



After ten minutes, ask one person from each group to share some of their different representations. This is a good opportunity to discuss and address any misconceptions. You may also want to discuss whether this would be a good activity to use in class.

Here is an opportunity to explain and illustrate the different meanings of fraction notation as both names of numbers and as operators:

- part of a whole unit
- comparisons between part of a set and the whole set
- a point between two whole numbers
- result of a division operation
- comparing the sizes of two
    - sets of objects
    - measurements

This is a good opportunity to encourage colleagues to self-evaluate their subject knowledge further in this area using the NCETM Self-evaluation Tool.

Misconceptions in fractions, decimals, and percentages

This area of mathematics is fraught with misconceptions. The next activity (approximately 20 minutes) will provide colleagues with a chance to identify and rectify common misconceptions in fractions, decimals and percentages.

Pre-prepare the questions from Checking your Subject Knowledge: Fractions Decimals and Percentages by cutting them up individually and placing them in an envelope.

Ask colleagues to work in pairs. One person should take one misconception from the envelope. They must then identify what the misconception is and then teach it correctly to their partner. They should identify any vocabulary and consider what visual images would best support the explanation.

Here are some of the misconceptions and areas that have been addressed:

Fractions

- fractions are always parts of one, never bigger than one
- inaccurate recognition of the 'whole'
- fractions are parts of shapes and not numbers in their own right
- a fraction such as ¾ is always seen as 3 lots of ¼ without recognition that it can also be a ¼ of 3
- I want the biggest half! Inaccurate division into equal parts
- ½ is smaller than 1/3
- common misconceptions when performing fractional operations, eg. 2/4 +1/4 =3/8.

Decimals

- decimals with more digits are larger - ordering 0.25 is bigger than 0.3 (remember significant digits!)
- 0 as a place holder 3/100 is 0.03 not 0.3
- reading 0.11 as nought point eleven
- misaligning digits when calculating using vertical columns
- moving the decimal point when multiplying by 10.

Percentages

- percentages can never be bigger than 100%
- not understanding that percent means out of 100.

Other examples can be found in two excellent texts:

- *Children's Errors in Mathematics*. Alice Hansen (Ed). Learning Matters (2008)
- *Children's Mathematics 4-15*. Julie Ryan and Julian Williams. McGraw Hill (2007)

Moving towards greater understanding of fractions, decimals and percentages

Remind your colleagues that children need physical objects and pictures and social activity to 'hook into' on their journey towards a better understanding of mathematical concepts and ideas. A range of models, forms and representations are paramount to good teaching of any subject, not least to support different learning styles. The movement between concrete, visual and symbolic representations of a problem is often quite complex, and the connections between the different forms and the implications of using different representations need to be explored. You might find it helpful to share the excellent work on models and representations from the NCETM primary CPD module with the teachers. There is also a comprehensive list of mental images for fractions, decimals, percentages, ratio and proportion (FDPRP) on the ATM website.

Remind colleagues that the National Strategy Primary Framework for Mathematics has a rich source of interactive programmes which provide models and images to support learning in this area too. Below is a small sample:

- ITP Fractions
- ITP Decimal Number Lines
- Spreadsheets Decimal Target Board
- Spreadsheets Fraction, decimals and percentages converter
- Spreadsheet Fractions of amounts

There is also support for assessing pupils' progress on the National Strategy Primary Framework for Mathematics in the form of assessment focuses in the planning blocks.

This final section provides a link to further CPD that will enable your colleagues to reflect on their understanding of models and representations and the use of them within their teaching.

Final Task
In small groups, solve this problem adapted from a problem in Cohen, S. (2004), Teachers' professional development and the elementary mathematics classroom: Bringing understandings to light, Mahwah, New Jersey, Lawrence Erlbaum Associates.
Sheila works in a café where baked potatoes are a speciality, the most popular filling for which is cottage cheese. Each potato uses three fifths of a tub of cottage cheese. Sheila has four tubs of cottage cheese in the fridge. How many portions can she serve?

Allow colleagues time to solve the problem.

Follow-up task
Ask colleagues to look at Session 2 of the Primary Module 'Models and Representations' on the NCETM portal.

Ask them to consider how their models compared with those on the video clips. Ask them to bring with them their thoughts about use of models and images for a five-minute feedback session at the next meeting.

Further reading
Effective mathematics teaching
What makes some teachers of mathematics more effective than others?