Primary Magazine

Issue 38

National Centre for Excellence in the Teaching of Mathematics

Welcome to the 38th issue of the Primary Magazine. Our history article focuses on the Aztecs, we look at the art of Pieter Bruegel the Elder and focus on chocolate. Our CPD opportunity considers enriching 2D and 3D shape and our ICT article explores databases. *It's in the News!* features spiders.

Contents

Editor's extras

On 27 June, *The Guardian* highlighted some activities that they placed on their Guardian Teacher Network on the subject of How to teach...debt. Did you know that 45 years ago, on 28 June, the credit card was launched? Personal debt is rising, we are in a financial crisis, as are several European countries and the USA. It might be a good idea to plan a few activities to enable the children to become aware of debt and engage in money management. The article in The Guardian has links to some useful resources developed by the Personal Finance Education Group (PFEG), which you might find useful.

St Edmund's Catholic Primary School in Richmond undertook an NCETM Regional Project, Mathematics through purposeful contexts, which involved money management. The objectives of the project were to:

- create cross-curricular projects where mathematics is learnt through purposeful contexts
- consolidate key numeracy skills; handling data, budgeting, percentages
- address ECM: economic well being; enjoy and achieve; positive contribution
- teach real-life money management
- provide a context for writing for a purpose: advertising, speeches, persuasive writing
- broaden opportunities for speaking and listening to an audience
- raise the profile of citizenship: job roles, leadership, running a small business
- improve the confidence of staff: enable them to plan and deliver creative schemes of work
- increase children's enjoyment in the subject and to help them understand and embed new mathematical skills more effectively and so improve children's confidence and achievement.

Their project is ongoing but you might find it interesting to read about what they have done so far.

Have you ever held a 'Money Week'? If so, we'd love to hear about it and maybe share your work in a future edition of the Primary Magazine. If not, but you are thinking about it, the resources suggested here might be of help to you in your planning.

As promised in Issue 36, the Mathematics Specialist Teacher (MaST) microsite is now live. It is in two sections, the first is called 'getting started' and provides useful information for teachers interested in becoming a mathematics specialist teacher. The information about the programme comes under these five headings:

- Background
- School leadership teams
- Teachers and subject leaders
- Funding for MaST
- Further support information.

The second section is a new addition and is called 'the MaST programme and beyond'. It is aimed at giving support to those teachers who have completed the programme in their work in schools. It helps to answer these questions:

- Developing and supporting the MaST role: how can you ensure maximum impact in your school?
- Models for working with colleagues: which is most appropriate in your school… coaching, mentoring, the lesson study approach?

- Working with Early Years Foundation Stage practitioners: are you confident in supporting staff in Nursery and Reception classes?
- Supporting others in the school community: how can you work most effectively with support staff, parents and governors?
- Research and resources: what resources are already available to support you in being as effective in your role as possible? What has already been tried and tested?

There is also a MaST online forum for you to get involved with so that you can support each other.

The Research and Resources section is particularly useful to all teachers, especially subject leaders, as it brings together all the 'Maths to Share' articles and the articles involving linking mathematics with history and art from all the Primary Magazines. The section about supporting in Nursery and Reception classes has a series of videos of young children working. A favourite is Judging the Show Jumping, which shows just how much young children are capable of in mathematics! This is well worth sharing with your colleagues.

With the National Strategies gone, where are you going for your advice and support? If you are looking in-house, then where are subject leaders getting their ideas and support? The mathematics subject associations can provide you with tools and inspirations to lead mathematics in your school. Have you ever thought of becoming a member of one? If not, why not have a browse at those available to see what they offer?

You might find it helpful to keep teachfind in mind if you are looking for the archived National Strategy materials. Even when the official National Archive says that something you might want is not available, you can get it on this site. It has proved very useful to everyone who knows about it.

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It's in the News!

In this issue of *It's in the News!* we are looking at spiders and other minibeasts. This autumn there are reportedly more spiders invading our homes and gardens than ever before. Apparently, this is because the summer was warm and damp, producing ideal conditions for spiders to breed.

In these slides there are links to geography and science. They give opportunities for work on a variety of mathematical concepts such as number, data handling and measurement.

Before you use the slides you might like to gen up on our eight-legged little friends! The following websites give further information:

- guardian.co.uk (honey bees decline)
- guardian.co.uk (spider season)
- Minibeasts at pppst.com
- Nick's Spiders of Britain and Europe
- uksafari.com
- Wikipedia.

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

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

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

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The Art of Mathematics
Pieter Bruegel the Elder

Pieter Bruegel the Elder
Image courtesy of Wikimedia Commons

Bruegel was one of a rare breed of artists famous in their own lifetime. He was born near Breda, sometime between 1525 and 1530. There is some confusion about whether Breda was the Dutch town of Breda or the Belgian town of Bree, which is Breda in Latin. At around 30 years of age, he changed his name from Brueghel to Bruegel, removing the 'h' from his name. No one knows why. His sons continued to use the original form of their surname.

Bruegel was probably the most significant painter in Northern Europe during the middle part of the 16th century. Known as Pieter Bruegel the Elder, as one of his sons was also called Pieter, he was nicknamed 'Peasant Bruegel' because he chose to paint peasant life, including New Testament topics set among scenes of ordinary life in contemporary Flanders.

It is believed that Bruegel was apprentice to Pieter Coecke van Aelst (1502–1550), a leading Antwerp artist, sculptor, architect, and designer of tapestry and stained glass, when he was a young man. Bruegel married Coecke van Aelst's daughter Mayken in 1563. They settled in Brussels.

After becoming a Master of the Antwerp Guild, Bruegel travelled around Europe for two or three years, meeting many artists. One of those was miniaturist, Giulio Clovio, who created a small-scale picture of the Tower of Babel on ivory. Unfortunately, the picture did not survive to the present day. Bruegel's own, much larger, version of the Tower of Babel was to become one of his most famous paintings. On his return from Europe, Bruegel started working for Hieronymus Cock (1510-1570), the Antwerp engraver and publisher of prints. Whilst in Switzerland, Bruegel had made many drawings of the Alps. These sketches formed the basis of a number of detailed landscape designs which were then engraved by other artists. Cock was clearly pleased with Bruegel's work and he began to work on figure compositions too. Bruegel continued to be active as both a painter and designer of prints for the rest of his life.

Bruegel's first son, Pieter, was born in 1564. Pieter Bruegel the Younger also became a painter. Around the time his first son was born, Bruegel acquired a patron and friend, Nicolaes Jonghelinck, a wealthy Antwerp merchant, who would eventually make a collection of 16 of Bruegel's works. Jonghelinck commissioned a series of paintings known as the 'Months'. Only five of the 12 paintings survived: The Hunters in the Snow (January), The Gloomy Day (February), Haymaking (July), The Corn Harvest (August), and The Return of the Herd (November).

In 1568 Bruegel's second son, Jan was born. He was also to be a painter – Jan Brueghel the Elder. Towards the end of his life, Bruegel was strongly influenced by Italian Renaissance art. His figures became larger in scale and closer to the spectator. He also became less concerned with the setting for his paintings. However, he refused to adopt the idealised figure style evolved by Italian Renaissance artists and his popularity diminished. Despite the developments in his work, Bruegel continued to paint very much in his old style, with tiny figures in a panoramic space. In September 1569 Bruegel died, and was buried in Notre Dame de la Chapelle, Brussels. Nine years later, his wife Mayken Bruegel died. The two boys were brought up by their grandmother, Mayken Verhulst Bessemers, who was also a painter. She worked on miniatures. After Bruegel died she gave both his sons their first lessons in painting. Fewer than 50 of Bruegel's works survive.

Children's Games

Pieter Bruegel the Elder Children's Games
Image courtesy of Wikimedia Commons

One of his most famous paintings is Children's Games, painted in 1560 and now in the Kunsthistorisches Museum, Vienna, Austria. More than 200 children are engaged in more than 80 play activities, though not all can really be called games. All the children can be seen clearly, as if you are looking down from above. Although the children look, at first glance, to be scattered randomly, there is a pattern. Rough lines of children fan out from the bottom left corner in the foreground. There are small groups of children behind them in a backwards and forwards wavy line. No two children are alike. The way they are painted suggests movement. Many of the games are still played today. This painting could become the focus of several mathematics activities:

- are there really more than 200 children? Discuss how you could find out. Children could print out a copy of the picture and mark off each child counted. Younger children could put a cube on each child in the printed out picture, then collect all the cubes and make them into ten sticks to help them find the total. Another method could, essentially, be to carry out the same activity on a computer, putting a bright cross or dot on each child, then counting them. Pool the results. If there are different totals, discuss whether the most frequent answer (mode) is assumed to be correct or if the mean should be calculated. If the mean is not a whole number, what might that mean? Should the result be rounded up or down, or does it depend on what is the nearest whole number?
- the Elliott Avedon Virtual Museum Of Games at the University of Waterloo in Kitchener, Ontario, Canada, illustrates and discusses 32 of the games on their About The Games page. Agree a size to enlarge the picture to on the screen. It cannot be copied or you will lose the interactivity. Draw a 1 cm grid on clear plastic, such as an OHP slide or similar. Label each row and column, either one with letters and the other with numbers, or both with numbers if the children understand co-ordinates. Ask the children to identify where, on the grid, each of the named activities are. They should make a list of the games and their co-ordinates to share and check.
- as mentioned above, 32 of the 84 games have been identified and listed, so that means there are at least 48 other games which could be identified. Using the same grid, pairs of children can work

- together to identify a game and say where it is. List the location of each game on the whiteboard with a running total. Can the class find all 84 identified games?
- as well as the full picture, the Kunsthistorisches Museum website offers 20 different close-ups of the painting. Allocate a picture to each pair of children. The children should briefly describe the game in their picture and invent a scoring system so that a winner could be identified if the game were being played. These games do not have to be one of the 84 identified – ask the children to use their imagination!

For more information on Pieter Bruegel the Elder try any of these websites:

- Arcadian Galleries
- Web Gallery of Art
- WikiPaintings
- Wikipedia.

Focus on…Chocolate

September is the birthday month of George Cadbury (19 September 1839 - 24 October 1922) the third son of John Cadbury, a Quaker, founder of Cadbury's cocoa and chocolate company. So what better reason do we need to focus on mathematics and chocolate!

Chocolate lovers may be interested to know that:

- the UK has the seventh highest consumption of chocolate in the world. Switzerland takes the top spot
- 40% of the chocolate eaten in the world is consumed in Europe
- 66% of chocolate is consumed between meals, with 22% of all chocolate consumed between 8pm and midnight
- Britain really is a nation of chocolate lovers. We eat an estimated 660 900 tonnes of chocolate a year, an average of 11 kg per person per year. This equates to about three bars a week
- the UK chocolate industry is worth £3.6 billion and sales of chocolate just keep growing and growing, with an estimated 17% increase in sales over the next five years
- about 8 000 new chocolate products were introduced worldwide last year – meaning that a new chocolate treat was launched almost every hour of every day
- chocolate makers use 40% of the world's almonds and 20% of the world's peanuts
- the annual consumption of cocoa beans averages around 600 000 tonnes per year
- consumers spend more than £12 billion annually on chocolate.

(sources: Divine Chocolate, TipTopTens.com)

Some of these facts make interesting starting points for data handling investigations. As a class or as a school, why not explore these questions:

- how much chocolate do we eat in a day? A week? A year?
- at what time of day do we eat most chocolate?
- how much money do we spend on chocolate each week/each year?
- which is the most popular brand of chocolate or what is our favourite chocolate bar?

Discuss other influencing factors on the data, such as Easter and the purchase and consumption of Easter eggs. Once the answers to these questions are discovered, discuss with the children how the information could be used further. How would this information be useful to chocolate retailers? Alternatively, link findings with ideas of healthy eating or look at other items that could be bought with the annual expenditure on chocolate.

Coloured chocolates such as Smarties or M&Ms can be used to practise counting or to learn about fractions, percentages, averages and probability. Using chocolates as practical resources can provide very motivating opportunities although many children may be disappointed to find that they are unable to eat their resources at the end of the activity!

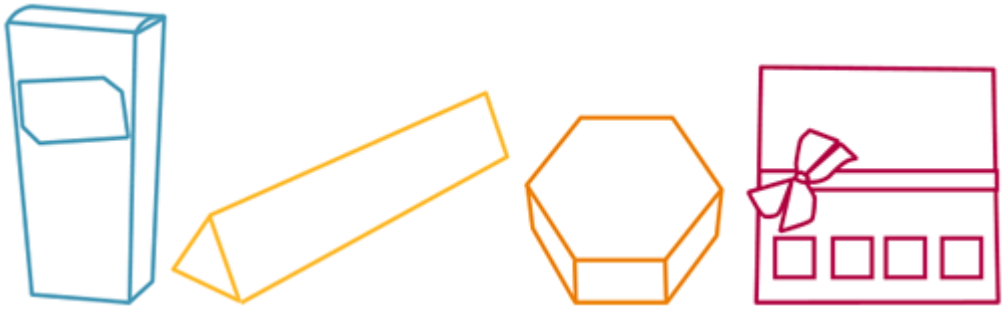
Coloured chocolate sweets, photograph by anemoneprojectors

Very young children could be allocated a colour of sweet and then given all the chocolates of that colour from a tube of Smarties or a packet of M&M's. In their group, ask the children to discuss the fairness of allocation. Can they find their number on a numberline and use this to work out *Who has the most chocolates? Who has the least?* Other than eating the sweets, can the problem be solved so that allocation is fair? Older children can go on to calculate the fraction or

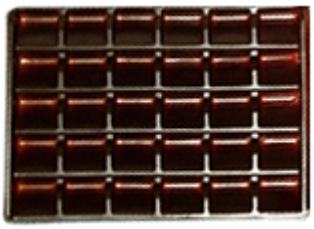
percentage of each colour of chocolate in a given group or explore *What's your favourite colour?* and *Do you get equal amounts of each colour?*

In this scenario, ask the children to discuss their hypothesis and how they could check it. With a number of packs of the same sweets, children can explore the mean, mode, median and range of each colour and then discuss the suitability of each average. They could then look at *What's the chance that the first sweet you pull out will be your favourite colour?* Ask the children to find the probability as a fraction, decimal or percentage of each colour being pulled from the bag first and then discuss why answers are different for each packet and how responses could be made more accurate. Results could be presented as a pie chart showing each colour and its percentage and then compared with retailers' published percentages of distribution of colours. The Smarties Project shares the percentage distribution of Smarties by colour in 2009 and for those teachers using M&Ms, this forum shares findings of the distribution of M&Ms colours.

Packaging can provide some interesting starting points too.



Very young children can describe and sort chocolate boxes of different shapes and sizes. They can also explore the shapes of the faces of the containers and use them to print 2D shapes. The internal trays of chocolate boxes can provide opportunities for counting - can children count how many holes there are and find the correct amount of 'sweets' or other objects to fill the tray? If the internal trays are arranged in uniform rows and columns, these can also provide contextualised opportunities for exploring arrays and the relationship between multiplication and division. Older children can unfold boxes and look at the nets they make. Having explored a range of nets and the shapes of the faces on the boxes, ask the children to design their own chocolate box and create the net to make it. Much older primary children can explore surface area by recording the dimensions of, in the first instance, a cuboid-shaped chocolate box. Ask children to calculate the area of each face and then find the total surface area. If you are able to access YouTube, this video clip looks at the downsizing of packaging and may provide a useful starting point for discussion and for investigating what any packaging may look like if it were downsized by 10% or 25%. The NRICH Christmas Chocolates activity is also a great puzzle to help develop skills of generalisation by investigating the amount of chocolates in a hexagonal-shaped box. It challenges children to consider multiple ways of looking at the structure of the problem and helps them to derive general formulae.



Chocolate box inner tray

Bars of chocolate also provide great motivation for understanding and ordering fractions as in NRICH's challenge, Chocolate. Three tables are set up with one bar of chocolate on the first, two bars of chocolate on the second and three bars of chocolate on the third table. Children are told that at any given point, the activity may end and they need to be seated at the table where they would receive the largest proportion of chocolate if it were shared equally amongst all the children at the table. As they are

chosen, children have to say where they would sit and why. This PowerPoint also provides visual images to develop an understanding of fractions through using bars of chocolate.

Chocolate bar wrappers contain useful information and data for children to use in real-life problem solving situations. Ask older children to record and compare the data highlighted on each wrapper, such as the cocoa, fat, sugar and calories/energy for each bar. Per 100 g of chocolate, ask children to choose which bars are the 'healthiest' by looking at most cocoa, lowest fat, lowest sugar content. Ask children to present their results and discuss the reasoning behind their choice of healthiest bar. Explore the link between the amount of cocoa and calories in chocolate by using knowledge and understanding of ratio. Ask children to find the ratios of cocoa:calories for all the chocolates and consider how they can be used to compare the chocolate bars. Repeat for other comparisons such as the amount of cocoa and sugar, or fat and sugar. What other connections can they find? Are there any generalisations that can be formed?

Take a look also at Focus on...Fair Trade from Issue 33, which also provides other ideas on how to explore mathematics through chocolate and other Fair Trade products.

And finally…

Chocolate Maths (from NRICH)

Did you know you could calculate your age by chocolate?

1. first of all, pick the number of times a week that you eat chocolate. This number must be more than one but less than ten
2. multiply this number by 2 (just to be bold)
3. add 5 (for Sunday)
4. multiply it by 50
5. add 1 750
6. add the last two digits from the year you last had a birthday. So if your last birthday was in 2010, add 10, if your last birthday was in 2011 then add 11
7. now subtract the four-digit year that you were born (if you remember).

You should now have a three-digit number. The first digit will be your original number (i.e. how many times you eat chocolate each week). The next two digits give your age. Can you explain why it works?

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A little bit of history
The Aztecs

In this article, we are being cross-curricular once again, and looking at some of the ways that you can link mathematics to a topic on the Aztecs. Snippets of Aztec life and mathematics were captured in Issue 17, and we now build on that, looking at this fascinating culture in more depth.

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

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Maths to share – CPD for your school

Enriching 2D and 3D Shape

Children enjoy learning about shape and space but once they have learned the names of these shapes and can describe the properties and sort them in a variety of ways, what other activities can we plan to ensure appropriate progression? In this issue of *Maths to share*, we consider how we can enrich children's knowledge and utilise their skills in shape and space to provide further challenge and learning within this area.

Before they start school, children will have seen and handled many 3D shapes. These early experiences of this aspect of mathematics are often greater than those of any other topics they learn about in subsequent years in school (Paling, 1989). With such early experiences, we should be able to make good use of this background knowledge once they enter school. A first step may be providing opportunities to handle, sort and classify common 3D shapes which will help children to learn the names of these shapes and discuss their properties. Children can then begin to look at the faces of these 3D shapes and learn more about 2D shapes. However, activities also need to be planned that will link the knowledge of the properties of shape with knowledge of properties of position and movement, as well as developing skills of problem solving, communicating and reasoning.

Before the staff meeting

Colleagues may wish to read the NRICH article What's Inside/outside/under the Box? by Jenni Back and Liz Pumfrey, which discusses enriching children's experiences of shape and space. In the article, Back and Pumfrey suggest that:

> *"Shape and space offers wonderful opportunities for enriching children's experiences in mathematics in practical ways, as well as making links with other areas of the curriculum, such as art, religious education and history. If it is simply reduced to making tables about the properties of different kinds of triangles and quadrilaterals then we are missing plenty of mathematical treats."*

Ask staff to consider their recent teaching of a shape and space unit and to bring to the staff meeting any ideas or activities that allowed pupils to use and apply their shape and space skills, or to try out some of the activities described in the article and report back on the outcomes during the staff meeting.

During the staff meeting

Visualisation is an important skill that is often underdeveloped. In Issue 22 we visited the subject of Visualisation and shared many different activities in which children can begin to visualise shapes and mentally manipulate images to produce new ones. Paper-folding activities also provide an exciting way in which to use and apply knowledge of shape.

Explain to colleagues that the following activities provide opportunities for children to develop the mathematical language of shape and space alongside utilising skills of reasoning and persuasion. The most convincing responses will be those where there is a real knowledge of the properties of shapes and an understanding of how this knowledge can be used and applied.

Provide each member of staff with an A4 sheet of paper and ask them to:

- describe and name the shape of the paper
- discuss the properties of this shape.
- explore and investigate this shape further – what else do they discover?

Ask:

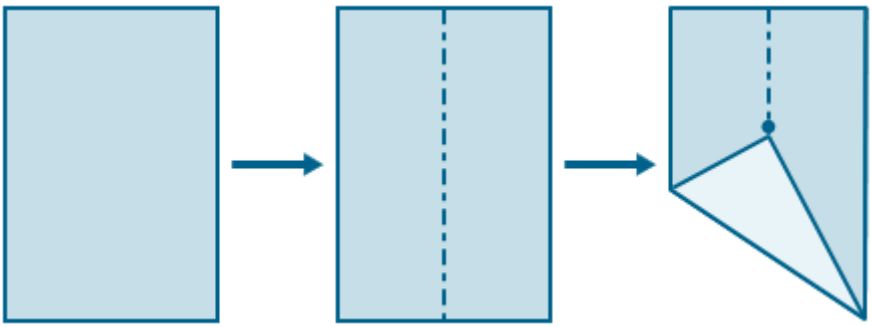
- What shape can you make by folding or bending the paper?
- Can you make another (2D or 3D)? Another? Another? A shape that nobody else in the room would have thought of?
- What can they say about their new shapes?

Explore further the scope of development of shape and space language focusing on the accuracy of its use.

Can colleagues make a square form their piece of paper? How can they convince the group that it is indeed a square? Ask the teachers what vocabulary and knowledge of properties of shape they used to produce a convincing argument that the shape was a square. Establish that they draw on the properties of the original shape (the rectangle) and the properties of the square to help them. Encourage them to use logical and deductive language such as: 'because', 'therefore', 'so' and 'must be'.

What if we started with a triangular piece of paper, would colleagues still be able to use their knowledge of the properties of triangles and squares to construct a square from a triangular piece of paper?

Ask colleagues to take another A4 sheet of paper. Explain that you are going to teach them how to fold the sheet into a triangle. Direct the teachers through the process step by step as described below, demonstrating each step in a way you deem appropriate.



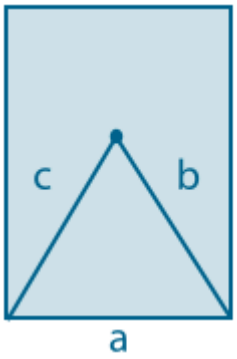
Ask colleagues to place their paper on the table in front of them in portrait orientation.

Fold the paper in half with a vertical fold then open it out again.

Take the bottom left vertex of their paper and place it onto the centre fold line. Move that vertex up or down the fold line until the visible part of the back of the paper forms a triangle with a vertex concurrent with the bottom right corner of the paper (as in the diagram). Mark with a dot the point where the vertex meets the centre fold line.

Ask colleagues to unfold the paper and make two new folds. One fold is to go through the bottom left-hand vertex and the dot; the other fold through the bottom right-hand vertex and the dot.

Say that you want colleagues to decide if the triangular shape they have created on the bottom half of the sheet, with the bottom edge of the sheet as the base, is an equilateral triangle or not. Whilst it might look like an equilateral triangle, this is not enough. How can they use their knowledge of the properties of an equilateral triangle to convince a partner that that it is indeed an equilateral triangle?

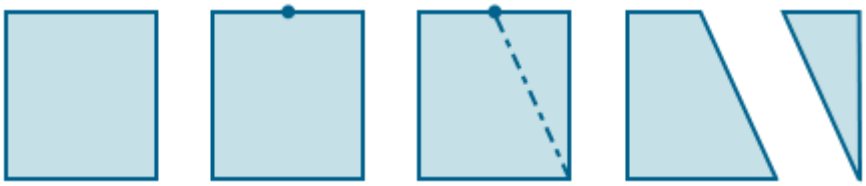


The first fold provides a 'mirror line'. The second fold enables you to use the length of the base of the paper as a measure for the other two sides of the triangle with the dot acting as a marker. The last folds provide the remaining two sides of the triangle. As side 'a' was used as a measure, we know that all three sides are of equal length.

Ask colleagues what knowledge they already had about 2D shapes which helped them to construct a convincing argument.

Other 2D shapes can be made from A4 paper, some of which can be further used to deduce angles using knowledge of the properties of shapes; other 3D shapes can also be created.

Rather than folding the paper, ask colleagues to cut the paper instead.
Start with a squared piece of paper and mark half way across the top edge.



Ask staff to describe the shapes they have made. Can they name them and describe their properties? Can they discuss the relationship between the two shapes? Ask them to focus on:

What is the same about the two shapes? and
What is different about the two shapes?

How can the two shapes be connected? What new shapes are made?

Discuss the question, *Would similar relationships be found if a rectangular piece of paper was used at the start?*

A similar problem could be explored, time allowing, looking at Hexagon Transformations, which asks:

- How could a regular hexagon be cut into two pieces which, when put together, make a parallelogram?
- How could it be cut into three pieces which, when put together, make a rhombus?
- How could it be cut into four pieces which, when put together, make two equilateral triangles?

Reflections and Next Steps
Having had the opportunity to discuss and work through shape problems during the meeting and from What's Inside/outside/under the Box?, ask staff to consider the activities they next plan when focusing on teaching shape, to ensure the use and application of knowledge and skills in a variety of ways.

As a subject leader, consider how you might monitor the progression of teaching and learning of shape throughout school and ensure a range and variety of appropriately challenging activities in all year groups.

Ask colleagues to complete a subject knowledge audit around shape and space using the NCETM Self-evaluation Tools and provide further CPD for any areas requiring further support.

Other References

Maths to share in Issue 8 of the Primary Magazine has a focus on addressing teachers' subject knowledge about shape. It is based on Jenni Way's article for NRICH, The Development of Spatial and Geometric Thinking: The Importance of Instruction, and looks at developing a tangram activity using the van Hiele levels of geometric thought.
Paling, D, *Teaching mathematics in primary schools*, Oxford University Press, 1989.

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ICT in the Classroom – Database Projects

In this issue, we explore how children can use online databases to search for items to match criteria. We also look at creating databases where items can be sorted for a purpose. Large real databases are available to search through internet sites, such as those that advertise items for sale. In Issue 29 we shared ideas for using many online databases. Here we take one of those ideas and expand it into a project that covers a range of data handling objectives and concepts.

Databases can be created either on paper or a computer and are used to collect and organise data. Database software often enables children to quickly create graphs of the information and can calculate statistics such as the mean average and range of the data.

In order for children to understand this method of organising data it is useful for them to investigate what they can find out from an existing database. Younger children will usually need to use a database prepared particularly for children. Those with more experience, and adequate reading and comprehension skills, can use real databases designed for adults to find particular items like homes and cars.

Homes can be searched for under categories including:

- property type
- outside space
- price
- number of bedrooms
- location.

Cars can be searched for under categories including:

- make and model
- fuel type
- age
- price
- mileage
- engine size
- colour
- number of doors.

Try suggesting some questions that can be solved using a property or car sales website such as:

what is the most common (the mode) price of properties within a mile of our school? or,
which car registered in 2011 has the highest mileage?

Maybe the children will be able to work together to find information that helps them investigate and solve more complicated problems such as:

how much more does a four-bedroom property cost than a three-bedroom property? or,
does car colour make a difference to the price?

Encourage the children to draw conclusions and identify further questions to ask.
If each child designs their own property or vehicle and completes a data file then the class has created a new resource to search. This process involves identifying what data to collect in the file and how it will be recorded. Through this, the children use and develop skills of selecting and organising relevant data. Paper copies of the data files can be sorted by the children's criteria into a catalogue or file.

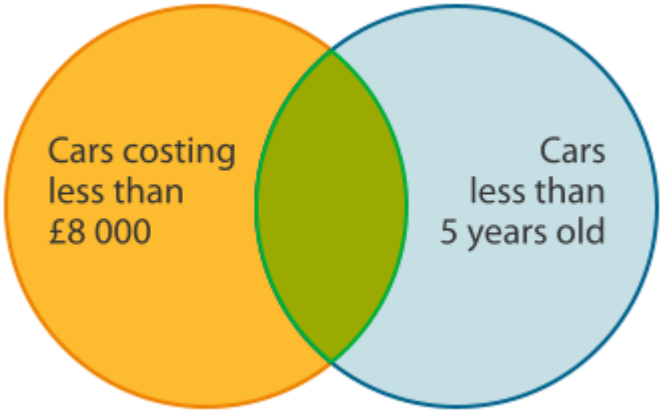
Once you have your own database, or the children are comfortable using one that has been already created, the class can get into the business of solving problems based on the scenario of supporting customers. The engagement of the children can be enhanced through the range of ways that 'customers' bring them their requirements of a car or home. Try phone messages, letters, emails, and any adults that you can convince to role play being a customer to visit the business.

'Customers' should use the precise language of logic including 'and', 'or' and 'not'. Children will need to talk together to decide which is the most relevant product for the customer if none of them exactly match the criteria. They use communication and reasoning skills to explain why that product is the best match. If appropriate, the children can produce a written report of their recommendations, referring to the data they have used, otherwise consider asking them to record a message for the customer.

If children are not familiar with matching objects to criteria in this way you might wish to share the CBBC activity Beat the Boss, which involves the scenario of choosing aspects of footwear or a bicycle to meet the customers' needs.

If you decide to use the online databases as inspiration, but create your own databases using cards, this provides children with an understanding of how the entries are sorted by their criteria. It may be interesting and useful to use a Venn or Carroll diagram such as these:

	< £200 000	Not < £200 000
Garage		
No Garage		



Encourage children to compare their experience of using and creating computer and paper-based databases. Which is easier to search, create, amend, etc?

A project like this can provide excellent work for displaying and celebrating children's mathematics. Consider including printed data files, children's written recommendations, recordings of their messages

or speech bubbles quoting their ideas, photographs of the children collaborating or role playing, and any sorting diagrams produced.

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