Primary
& Early Years
Magazine 63

National Centre
for Excellence in the
Teaching of Mathematics

Welcome to Issue 63 of the Primary Magazine. In this issue, The Art of Mathematics features the Brazilian artist Mira Schendel, and in A Little Bit of History we feature Edith Cavell. Focus On... has the second in our series on mathematics outside the classroom, and Maths to Share looks at the use of spreadsheets.

Contents

Editor's extras

In *Editor's Extras* we have news of a new mathematics vocabulary book, an update on the development of the Maths Hubs programme, a couple of suggestions for conferences later in the summer term, and some interesting (to some people anyway) maths facts!

The Art of Mathematics

The Art of Mathematics explores the life and work of the artist Mira Schendel who was a Brazilian artist best-known for her drawings on rice paper, but who was also a painter and sculptor. If you have an artist that you would like us to feature, please let us know.

Focus on…

In this issue we have the second in our series of articles on mathematics outside the classroom for EYFS, KS1 and KS2. In this issue we share an article about making links with mathematics and PE – both inside and outside! If you have anything that you would like to share, please let us know.

A little bit of history

In this, the second in our series on some of the history topics that are suggested in the national curriculum, we feature Edith Cavell, famous for her work protecting soldiers in the First World War. If you have any history topics that you would like us to make mathematical links to, please let us know.

Maths to share – CPD for your school

In *Maths to Share* we look at the use of spreadsheets as a teaching and learning tool through an article by Gina Cohen of Sunbird Advisors. If you have any other areas of mathematics that you would like to see featured please let us know.

Editor's extras

The National Curriculum

Have you seen the Glossary linked to the section of our website devoted to helping you prepare to implement the new National Curriculum? The glossary lists alphabetically, and defines, all the mathematical words to be used in maths lessons, from Reception through to Key Stage 3. It's a key complementary element to all the other related sections on our site, including resources, videos, progression maps, and research articles. Collectively, we hope they'll be a big help for teachers and schools preparing to adjust lessons and schemes of work to match the new curriculum.

To go with the glossary, you may be interested in a year-by year mathematical vocabulary e-book, which the publishers Rising Stars have produced and are now making available to all schools, free of charge. Instructions on how to download your copy are on the Rising Stars website.

Maths Hubs

More than 270 schools across England have expressed an interest in taking the lead role in 30 new, locally-based Maths Hubs across England. The Maths Hubs programme, announced in March and funded by the DfE, is being coordinated by the NCETM.

Around 80 of the schools, including a number of primaries, have now been invited to submit full applications to fill the role, an essential part of which will be to form a collaborative group of partner schools, other institutions and individuals with expertise in maths education - all for the benefit of maths teaching and learning in schools and colleges across a broad geographical area.

The schools chosen for the lead role in each of the hubs will be announced in early June.

Summer Events

Here are details of two events towards the end of the summer term which might attract your interest:

- Counting and Calculation - a journey through practical mathematics is a weekend event (21/22 June) at the University of Oxford, organised by The British Society for the History of Mathematics and the university's continuing education department
- Practitioner research in mathematics education is a one-day event on 12 July, convened by British Educational Research Association (BERA) in collaboration with the British Society for the Research into Learning Mathematics (BSRLM).

And finally…

Just for a bit of fun…what do you think about these mathematics facts from Murderous Maths?

1. if you multiply 1089 x 9 you get 9801. It's reversed itself! This also works with 10 989, 109 989, 1 099 989 and so on

2. 19 = 1 x 9 + 1 + 9, 29= 2 x 9 + 2 + 9. This also works for 39, 49, 59, 69,79, 89 and 99

3. 153, 370, 371 and 407 are all the sum of the cubes of their digits. In other words $153 = 1^3 + 5^3 + 3^3$

4. if you divide any square number by 8 you get a remainder of 0, 1 or 4

5. 2 is the only number that gives the same result added to itself as it does multiplied by itself

6. if you multiply 21 978 by 4 you get 87 912

7. there are 12 988 816 different ways to cover a chessboard with 32 dominoes (whoever worked that out might want to get out a little more)

8. 69 squared = 4761 and 69 cubed = 328 509. These two answers use all the digits from 0 to 9 between them

9. you can chop a big lump of cheese into a maximum of 93 pieces with 8 straight cuts

10. in the English language 'forty' is the only number that has all its letters in alphabetical order

11. 1 ÷ 37 = 0.027027027… and 1 ÷ 27 = 0.037037037...

12. $13^2 = 169$ and if you write both numbers backwards you get $31^2 = 961$. This also works with 12… $12^2 = 144$ and $21^2 = 441$

13. 1 ÷ 1089 = 1.111918273645546372 81… and the numbers in the 9 times table are 9, 18, 27, 36, 45, 54…

14. 8 is the only cubic number that is one fewer than a square number

15. the number four is the only number in the English language that is spelt with the same number of letters as the number itself

16. 1 x 9 + 2 = 11, 12 x 9 + 3 = 111, 123 x 9 + 4 = 1111 and so on.

On their website they had a vote for the most pointless fact. Which one do you think won?

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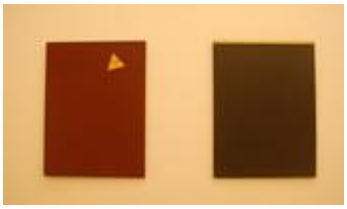

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The Art of Mathematics
Mira Schendel

Mira Schendel was born Myrrha Dagmar Dub in 1919 in Zürich, Switzerland. Her father, Karl Leo Dub, was a fabric merchant, and her mother, Ada Saveria Büttner, was a hat maker. Soon after she was born the family moved to Italy and she was brought up as a Roman Catholic, possibly so that she and the family would fit in with Italian society. The family had a Jewish background and this was to cause her problems when she was older.

In the late 1930s, she began to study philosophy at university in Milan. Unfortunately in 1938, during the time when the fascist Prime Minister Benito Mussolini was in power, racial laws were introduced that meant Mira's Jewish background was discovered and she was designated a Jew. As a result, she was stripped of her Italian citizenship and forced to leave university. She decided to escape from Italy in 1939 and travelled through Switzerland and Austria, finally joining a group of refugees heading to Sarajevo, in what was then Yugoslavia (now Bosnia and Herzegovina). She spent the war in Sarajevo where she married Josep Hargesheimer, a Croat. The couple returned to Italy where she worked for a while for the International Refugee Organisation in Rome. She wanted to move to either North or South America and applied to emigrate to various countries over there. In 1949 she was successful and settled with Josep in Porto Alegre, Brazil. In 1953 she left Josep and moved to São Paulo, Brazil. São Paulo was an immigrant city and Mira joined a group of immigrant intellectuals with whom she could discuss ideas about aesthetics and philosophy. Here she met a German immigrant, Knut Schendel, the owner of an important bookshop, Canuto's, a hub for São Paulo's intellectuals. In 1957 Mira and Knut had a daughter whom they named Ada.

It was in São Paulo that she began to paint seriously and she became a prolific modernist painter and sculptor. The modernist artists felt that the traditional forms of art were becoming outdated and they wanted to do things differently. Mira used paint with talc and brick dust. She used rice paper as her 'canvasses' after receiving some as a gift in the early 1960s. She worked quickly and in just over a year had made about 2000 monotype drawings (type of printmaking made by drawing or painting on a smooth, non-absorbent surface). In these works she often combined multiple languages, using words and phrases from her principle spoken languages - Italian, German and Portuguese and other words in French, English, Croat and Czech and some mathematical symbols.

She died in 1988 at the age of sixty-nine.

Between 25 September 2013 and 19 January 2014 the first exhibition of her work was held at Tate Modern. You might like to view some of the work they exhibited.

Information sourced from:

- Wikipedia.

Now for some mathematics!

Show Graphic Object

Ask the children to describe what they can see. Agree that it is a picture of letters, numbers, signs and symbols. You could give pairs of children a copy of the painting and ask them to write the capital letters that they can see on paper. They could then sort these letters according to whether they have no lines of symmetry, one line or two lines. They could then draw the lines of symmetry on those that have them. Can they find any numbers that show symmetry? You could ask them to write the digits from 0 to 9 on paper and discuss whether these show symmetry and to mark on the appropriate lines.

You could then ask them to look for any mathematical signs that they can see and to draw these on their paper too. Can they see, for example, the greater than, less than and equals signs? This would provide a good opportunity to rehearse what these mean: > is greater than, < is less than, = is a sign of equivalence (not the answer to a calculation!). You could write a set of numbers or units of measure on the board, such as 200g, 1kg 400g, 0.5kg, 900g and ask them to make up number statements using some of these and all three symbols, 0.5kg < 900g, 1kg 400g > 200g, 0.5kg + 900g = 1kg 400g. Obviously you will need to make these appropriate for your children.

You could talk about other signs and symbols and also abbreviations that are used in mathematics that are not in the painting, for example %, £. Make a list of these and then ask the children to make their own version of Mira's picture that is made up from these, the signs and symbols in Mira's painting and numbers.

Show Letters and words

What does the picture remind the children of? Do any suggest an envelope? If not, you could suggest this.

This is a good painting to explore triangles. Ask the children to identify which type they are and explain how they know. Can they estimate the sizes of the angles? Which ones must be the same size and why?

You could give them a copy of the painting and a protractor and ask them to measure their sizes. You could set problems, such as, if the largest angle on the triangle is 90° what must the other two be, if one of the equal angles is 70°, what must the other two be?

You could then, after establishing that the four triangles form a square, give the children different sizes of square paper and ask them to fold them to make a pattern like Mira's. Do they think that the angles will be the same size as those they have measured? Why do they think as they do? They could then investigate this to see if their thinking was correct or not.

Discuss what fraction of the square each triangle is and how they know.

They could then explore triangles on different sizes of rectangular paper, fold, or draw a line, from corner to corner to form diagonals and four triangles. Do they still make isosceles triangles? Are all the triangles made the same fraction of the whole rectangle? Ask them to prove their thinking.

Some children might think might think that they are different fractions because they don't look to be the same size, as in this example:

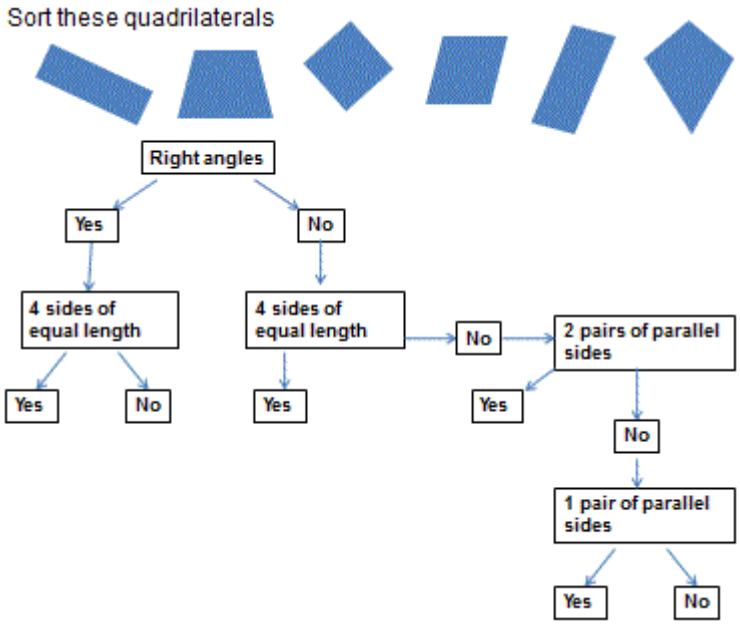
However, if they cut the pieces out and explore by folding they will find that each part is equivalent to two eighths which is the same as one quarter. This is a good activity to do if children think that fractions of shapes are only the same if they look the same and they don't consider the area or size.

Show this untitled painting

What shapes can the children see this time and how many of them? Establish that there are two white and two black quadrilaterals. Ask the children to tell you what makes them quadrilaterals and then to name as many named ones as they can. The common named ones are rectangle, including square, parallelogram, rhombus, trapezium and kite. You could give or show the children pictures of these and discuss their properties. Do those in the picture match up with any of the named ones? Agree they don't and explore why.

Focus on the properties of parallelograms and rhombuses: opposite sides are parallel and in a rhombus all sides are equal. Can the children recognise that rectangles, including squares, are also parallelograms and a square is also a rhombus?

You could ask them to sort the quadrilaterals using a decision tree diagram. Do an example like the one below together and then ask them to make up their own criteria for sorting:



You could give the children copies of the painting and ask them to identify any parallel and perpendicular lines in the quadrilaterals Mira has drawn. They could find the perimeter of each shape and compare them. You could ask the children to investigate how they could find the area of each. You may need to explore

the idea that the area of a triangle can be viewed as half the area of a rectangle first. Fold a piece of paper in half diagonally to demonstrate this. Do they know the formula for finding the area of a rectangle? You could explore this using square paper. Ask them to draw a rectangle and then find its area by counting the squares. Help them to see that to count the array of squares they multiply the rows by the columns which would be the length by the width of the whole rectangle. They could then draw a line diagonally from one corner to another to make two triangles. Ask them to work out what they would do to the area of their rectangle to find the area of each triangle. They could then figure out the formula for the area of a rectangle (l x w) and then a triangle, which at this stage could be ½ (l x w).

Show Still waves of probability

This was created by Mira in 1969. How many years ago was that? Ask the children to think of an efficient mental calculation strategy to find out. The most obvious would probably be to use counting on.

Use this painting to explore polygons. Which shapes can they see? Looking carefully, they should be able to identify circles, squares, hexagons and octagons. Can they see concentric circles? The children could make patterns from concentric circles.

You could explore parts of a circle: radius, diameter and circumference. The children could investigate the relationship between the radius and the diameter and the diameter and the circumference (approximately 3x the diameter – give them string to investigate this). You could give them different-sized cylinders or compasses to create circles. They could then find the lengths of their radii, diameter and approximate circumferences using these relationships.

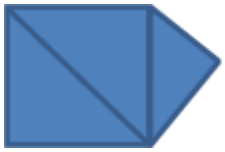
They could create their own circles in the way suggested in previous issues - for example, Constantin Brancusi.

Look at the properties of regular and irregular hexagons and octagons. They could work out the angles inside these shapes through this investigation:

A triangle has a total angle size of 180°

A quadrilateral can be made by putting two triangles together so has a total angle size of 180° x 2, which is 360°

A pentagon can be made by putting three triangles together, so has a total angle size of 180° x 3, which is 540°



Repeat this for hexagon, heptagon and octagon. Can the children come up with a formula for finding the angle size of a 100-sided shape and then an 'n' sided shape?

You could ask the children to make a picture like Mira's but using their own shapes.

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

Focus on…

In the second of our series on mathematics outside the classroom we are sharing another article from the Mathematical Association, which makes connections between mathematics and PE. In this article, Maths and Physical Education in Primary Education – 'More than just counting beanbags'?, Dominic Haydn-Davies, Emerick Kaitell, Victoria Randall and Julie Shaughnessy describe activities that can be carried out by all children in the EYFS, KS1 and KS2.

- read Maths and Physical Education in Primary Education – 'More than just counting beanbags'?

We hope that you found this article helpful. Many thanks to the MA for allowing us to make use of this article. You might be interested in finding out more about the MA and other mathematics subject associations. If so, we have information about all of them and the benefits of joining. You might also be interested in exploring our Learning Maths outside the Classroom microsite.

We hope that you found the series interesting. If you have anything you would like to share with us, please let us know.

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

The programmes of study for history in the national curriculum suggest that children in KS1 should be taught about:

- *events beyond living memory that are significant nationally or globally [for example, the Great Fire of London, the first aeroplane flight or events commemorated through festivals or anniversaries]*
- *the lives of significant individuals in the past who have contributed to national and international achievements. Some should be used to compare aspects of life in different periods [for example, Elizabeth I and Queen Victoria, Christopher Columbus and Neil Armstrong, William Caxton and Tim Berners-Lee, Pieter Bruegel the Elder and LS Lowry, Rosa Parks and Emily Davison, Mary Seacole and/or Florence Nightingale and Edith Cavell]*

A little bit of history has featured articles on The Great Fire of London, Christopher Columbus, Florence Nightingale and Mary Seacole, and Neil Armstrong.

The Art of Mathematics has featured articles on Pieter Bruegel the Elder and L S Lowry.

You might be interested in these: they consist of a brief history of the person or event, followed by suggestions for mathematical links that you can make.

In this issue, we have the second in our series looking at some of the other historical topics that are included in the history programmes of study. This month we take a brief look at Edith Cavell.

Edith Cavell was born on 4 December 1865 in Swardeston, a village four miles north of Norwich.

You could print out a copy of a map of England, locate your school on it and Swardeston (or Norwich if that is easier) and ask the children to find the distance between the two places as 'the crow flies'. Once they have the measurement in centimetres, they convert according to the scale on the map to find the distance in miles. You could let younger children use a calculator. They could then convert this measurement to kilometres, again using a calculator if appropriate. They could explore different routes to travel there. They could do this by using string to place along the chosen route, then measure it and convert to miles. Which is the shortest route that they can find? You could ask them to work out how long it would take to get there if travelling at, say, 60 miles per hour.

Edith's parents were the Reverend Frederick Cavell and Louisa Sophia Warming. When they met each other, Frederick was training to be a minister in London and Louisa was his housekeeper's daughter. They were not allowed to marry until Louisa had completed some extra education and was thought fit to be a parson's wife!

Edith was the eldest of four children. She had two sisters, Florence and Lilian and a brother called Jack. The girls had their early education at home. Later in 1881, Edith spent a few months at Norwich High School, and between the ages of sixteen and nineteen she went to three boarding schools: Kensington in Bushey, Hertfordshire, at the time a school for poor clergy families, Clevedon, near Bristol, and finally Laurel Court, Peterborough. At Laurel Court she was taught French and appeared to have a flair for the

language, learning it quickly. This was helpful to her when she spent some time as a governess at one of her postings with a family in Brussels, between 1890 and 1895.

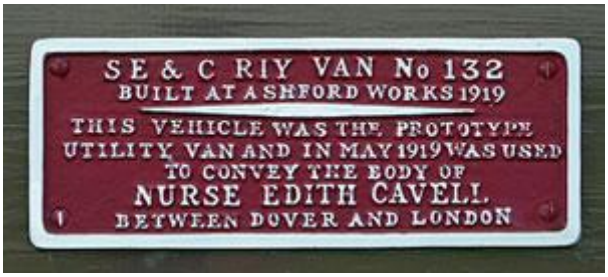
In 1895 she returned home to nurse her sick father. It was this experience that made her want to pursue a career in nursing. She trained from 1886 to1898 and then held various nursing jobs. In 1907, she was offered a position as the matron of a new nursing school in Brussels. She developed a very successful training programme that produced well qualified nurses for three hospitals, 24 communal schools and 13 kindergartens. She also opened a clinic.

You could ask the children to make up a mathematical fact file about Belgium. This could include monthly or mean temperature and rainfall, population, area of land, how many countries border it (and which they are), and currency. The children could make comparisons with the same information for England. Which country has the greater population, area of land? The children could make a currency ready reckoner to compare Euros and Sterling.

When World War I broke out in August 1914, Edith was visiting her widowed mother back home in Norfolk. She returned to Brussels where her clinic and nursing school were taken over by the Red Cross.

In November 1914, after the German occupation of Brussels, Edith began sheltering British soldiers and secretly sending them out of occupied Belgium to Holland. Wounded British and French soldiers and also Belgians and French of military age were hidden from the Germans and provided with false papers by Prince Reginald de Croy. From there, they were guided to Cavell, and other nurses in Brussels. The men were given money and guides to take them to the border with Holland. All this meant that Edith was in violation of German military law and the German authorities became increasingly suspicious of her actions. She was arrested on 3 August 1915 and charged with harbouring Allied soldiers. She was held in prison for 10 weeks, the last two in solitary confinement. She was then court-martialled, prosecuted for aiding British and French soldiers, given the death penalty and shot dead on 12 October 1915, despite several countries pleading for her release.

Ask the children to work out how old Edith was when she died, using a counting on strategy.You could print out copies of the Edith Cavell timeline from History's Heroes, cut out the statements out and give to the children to order horizontally to make a timeline of her life



Edith's remains were returned to Britain after the war and a state funeral was held at Westminster Abbey. On 19 May 1919, her body was reburied at the east side of Norwich Cathedral. A graveside service is still held each October in her memory and in the Church of England calendar 12 October is the day appointed to commemorate her.

There are many memorials: at least 19 medical and nursing facilities, 26 streets, and 16 schools around the country and in other parts of the world which have been named in her honour.

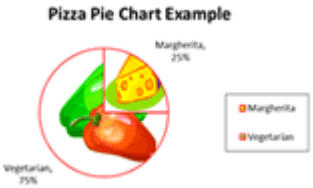
You could ask the children to find the names of these and locate the areas in the UK and the countries around the world where they are found. You could then ask them to compare their distances from your school as suggested at the beginning of this article.

Information sourced from:

- edithcavell.org.uk
- History's Heroes
- Wikipedia.

We hope that this article will be helpful if you study Edith Cavell with your children. 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*.



Maths to share – CPD for your school

Spreadsheets

In this issue of *Maths to Share* we take a break from the National Curriculum to share an article on using spreadsheets as a teaching and learning tool in the classroom.

It would be a good idea to book the ICT suite for your meeting or have laptops available for colleagues to work on in pairs.

Give copies of this article (download as a PDF document here), by Gina Cohen of Sunbird Advisers, to colleagues to read before the meeting. Then spend the meeting trying out the activities that she suggests. Once you have tried them out, ask colleagues to consider other mathematical topics for each year group that can be effectively taught, consolidated or rehearsed using a spreadsheet activity.

During the meeting take the opportunity to review how computers are used in mathematics lessons in your school. Are they used simply for interactive teaching programmes, resources and games or do colleagues use them in other ways. This might be an area that needs developing in your school.

Do you have any spreadsheet experts on your team? If you do, you could invite them to deliver your session with you.

Bringing Maths to Life using Microsoft Excel
by Gina Cohen of Sunbird Advisers

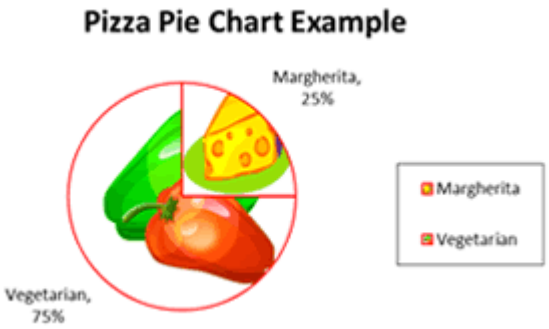
As many of you will know, a great way to assist the teaching of Mathematics is to use computers as a teaching tool. What might be less widely known is that an excellent software package to use is Microsoft Excel. Microsoft Excel is the leading spreadsheet software tool and it enables users to create charts, format data and compute calculations easily.

Sunbird Advisers provides training to teachers enabling them to use Excel to bring maths to life and help the children visualise maths in a fun, engaging and dynamic way.

There are two ways that Excel can be used in a classroom, one as a teaching tool by the teacher on the interactive whiteboard, the other is by teaching the children themselves how to use Excel and then for them to apply their Excel knowledge to maths in the ICT room.

Creating your own pizza

One great way of using Excel to help visualise maths is through the use of charts. It is already well documented that a good way to illustrate percentages is by showing them as pizza slices, but with this tool you can go one step further and actually use Excel to create the pie (or pizza!) charts. An example of this is shown below:

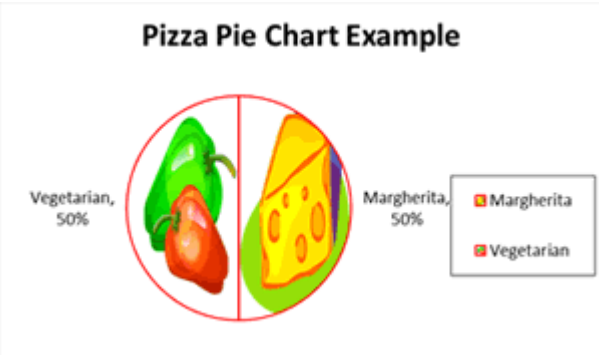


To create this pie chart in Excel, the data needs first to be typed into an Excel document:

	Pizza	
	Margherita	25%
	Vegetarian	75%

Once the data is in Excel, then the data needs to be highlighted and then go to the Insert tab, and select the type of chart that you require, in this example, a simple 2-D pie chart was selected. The big advantage of using Excel to create a pie chart is that pupils can instantly see the effect of changing the data. As soon as the data is changed, the pie chart will update:

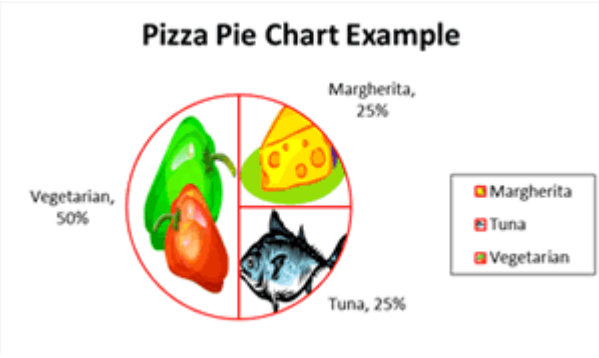
	Pizza	
	Margherita	50%
	Vegetarian	50%



As shown above, as the data is changed to be half Margherita, half Vegetarian, the pie chart is automatically updated.

It is also very easy to add additional data, for example changing the pizza to have three different toppings, and the pie chart will instantly update:

	Pizza	
	Margherita	25%
	Tuna	25%
	Vegetarian	50%



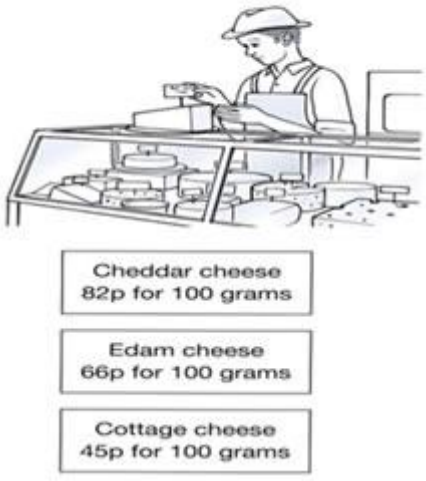
Children can practise changing the data and watching the pie chart update. To assist learning further, it would be a good idea for the children to work out beforehand what they think will happen to the pie chart and then they can see if they are correct.

In the example above, instead of using the standard Excel colours to create the pie chart, clipart was used, to help aid the children to visualise the pizza even more.

One of the world's most powerful calculators

Excel can also be used to compute calculations, instead of using a calculator. Below is a recent SATs maths question. This question could be attempted using pencil and paper and then another great way of bringing maths to life, and making the lesson more interesting to children to help consolidate their learning, would be to then calculate this using Excel to check their answers.

These are the prices of cheese in a shop.



The question data could be added into Excel:

	A	B	C	D
1		Cheese	Price (p)	Quantity
2		Cheddar cheese	82	100
3		Edam cheese	66	100
4		Cottage cheese	45	100

Once the data is in excel, the calculation can be easily made, by multiplying the 82p by 2 and multiplying the 66p by 1.5.

In Excel, all formulae begin with an equals sign =, the multiply sign is the star * and divide sign is /.

Instead of writing out a formula long-hand you can simply reference the appropriate cell, so, to calculate the price of 200g of cheddar cheese the formula would simply be =C2*2 and the formula for the 150g of edam cheese is =C3*1.5.

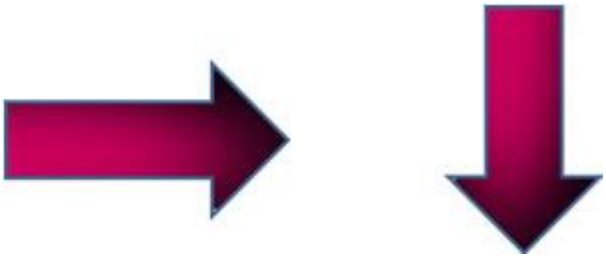
As the data is in pence, the answers will also show in pence, to change these to pounds, simply divide the answers by 100:

	Price (p)	Price (£)
200g cheddar cheese:	164	1.64
150g edam cheese:	99	0.99
	263	2.63

Covering all angles

Another interesting use of Excel to help bring maths to life is the use of angles.

A shape can be easily added to Excel by going to the Insert tab and selecting Shapes and then choosing, for example, an arrow. If you then right-click on the shape and select "size and position", the rotation of the arrow can be changed, for example, to 90°. This is a very popular way of demonstrating visually the effect that angles have on everyday objects – again bringing maths to life:



There are a great many more fun and popular ways of using Excel as an effective teaching tool. As someone who is and has always been passionate about maths, I am so pleased to have developed a way of making the subject more accessible to children up and down the country. We know that maths does not need to be dry or dull, and by using Microsoft Excel we can together show this to our pupils as well!

If you would like more information about how to integrate Excel into your classroom, please contact gina.cohen@sunbirdadvisers.com or visit the Sunbird Advisers website.

Many thanks to Gina for sharing her article with us. We hope that you have found it helpful. If you decide to use it for staff professional development, please let us know - we'd love to hear what you did.

Explore further!
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