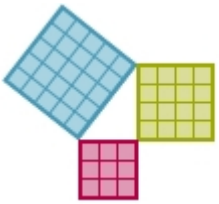
Primary Magazine
Issue 18



National Centre
for Excellence in the
Teaching of Mathematics

Welcome to the 18th issue of the Primary Magazine. Our famous historian is Pythagoras and we explore the art of Clarice Cliff. We explore ratio and proportion in Something to share and our Focus is the New Year. Up2d8 considers whether there is a strategy that works for winning the lottery.

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From the editor

Have you ever thought where your career path is leading you? Are you happy to stay a classroom teacher indefinitely or are you thinking of a change of some sort? Are you aiming toward the deputy or head teacher role? Maybe you would like to progress in your career but don't want to go along the headship path. What other alternatives are there? Have you considered becoming a subject leader, leading teacher, an AST, a primary mathematics consultant, university mathematics lecturer?

Over the next few issues we will be hearing from teachers who decided to take on one of these roles as part of their professional career development. In this issue, we hear from Helena, a primary mathematics consultant from London.

November 19 saw the announcement from the QCDA that the outcomes of the primary curriculum consultation have been accepted and that the new primary national curriculum should be established in law. Three weeks prior to this announcement, the revised level descriptors were accepted by ministers. The DCSF is now leading a close collaboration between QCDA, the National College, the National Strategies and Becta to work on guidance and support for the new curriculum to ensure that it is well received in schools across the country. In January 2010, QCDA will be re-launching the national curriculum website, which will feature new interactive design tools, illustrate case studies and guidance. Until then you can access the latest news about the primary curriculum at thinkingprimary.co.uk. How will the new curriculum affect what you are doing in your school? We would be really interested to hear, so please tell us in the Primary Forum.

NCETM Regional Projects Programme

- would you like to set up a small-scale, classroom-based research or teacher enquiry project to help you develop your teaching skills?
- are you interested in working with a group of colleagues, either in your own school/college or as part of a cross school/college network?
- are you willing to let others know what you did and what you learned from the process at the end of your project?
- and would you like some support to help you get started and keep on track?

The National Centre is committed to the idea of collaborative teacher enquiry as part of the landscape of professional development. A Regional Project might just be the way to get started on this. If you have an idea that you think will make a difference contact your Regional Coordinator, who can advise you on the best way to submit a bid for some money to help fund your work.

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Excellence in Mathematics Leadership

On 27 November, the NCETM launched Excellence in Mathematics Leadership (EiML), a really useful tool to assist mathematics subject leaders in their roles in school. Let us know what you think of it in the Primary Forum.

Mathematics Specialist Teacher Programme

Are you interested in becoming a Mathematics Specialist Teacher (MaST)? If so, you might find the new Self Assessment Tool helpful. It is a short self assessment relating to the three themes of the MaST programme: pedagogy, subject knowledge, and working with colleagues. When you have completed the questions you will be given an indication as to whether you might be eligible to join the MaST programme right now or at some point in the future.

Early Years Magazine
Issue 1

Early Years Magazine

The beginning of December saw the launch of our Early Years Magazine. In the first issue there is a focus on the developments to date of early mark making which includes research from Ian Thompson. There is also a case study which tells us about how mathematics has been embedded into the early years at Lakenham Primary School and some news on how Clover Hill Infant and Nursery School have used Numicon. We're sure you'll enjoy reading it!

And finally, for your diary…

Are you in a position to support others in developing their teaching of mathematics? Are you interested in working with a group of like-minded teachers who can exchange ideas to develop teaching skills? If so our Influence and Impact Conferences are just for you. Here are the dates for the forthcoming conferences in your region:

- Newcastle 25/26 January 2010
- Manchester 28/29 January 2010
- Birmingham 1/2 February 2010

- Exeter 4/5 February 2010
- Peterborough 8/9 February 2010
- London 11/12 February 2010

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Up2d8 maths

In this issue of Up2d8 we look at the lottery, following the news story last month of the largest win in the Euromillions lottery. There were two winning tickets for the £91.1 million prize. One had been bought by a syndicate of seven IT workers from Liverpool, who thought they were being made redundant when the phone rang that morning! They had much better news though when they were told that they had won £45m on the lottery. The other ticket was won by a married couple from Wales. According to The Sunday Times Rich List, they will find themselves with wealth at the level of celebrities such as DJ Chris Evans, celebrity chef Jamie Oliver and film star Sir Michael Caine. The spreads provide a great opportunity to explore such mathematical concepts as data handling including probability and problem solving involving money and calculating.



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:

- locate where the lottery winners come from on a map of the UK. Are they familiar with these places? You could compare where they come from to where your school is and work out the distance from one place to the other. If you give the children a route map from the internet or an atlas, the children could measure the distance from their location to Liverpool using string and then convert to kilometres or miles or both using the scale.
- you could provide them with blank 'cheques' and ask them to complete these for their friends with different amounts of pounds.
- give each child a set of digit cards from 0 to 9 and ask them to build numbers up using your instructions, eg. 'put 3 in front of you, make it say 43, 243, 5243, 85 243, 985 243. and 7 985 243'. All they are doing is listening to single digits and placing them where you say. They don't need knowledge of place value but it does build self-esteem, knowing that they can make such big numbers! You could say some in the middle for the older children e.g. make 45, now 465, 4 265. You could also ask questions such as, swap the 7 and the 2, is the number smaller or bigger? Roughly how much smaller? (five million) Your questioning could be more complex for older children, testing their knowledge of place value, eg. swap the 9 and the 4, roughly how much smaller now? (500 000). This is a great activity for children of most ages, even the youngest if working in a small group.
- play bingo. Ask the children to predict the winner. Use real bingo cards and allow the children to decide how many bingo cards they feel they can manage. Alternatively, fold a piece of A4 paper into eight and invite the children to choose their own numbers. Play with numbers to 30 with younger children and numbers that fit certain criteria for older ones, eg. multiples of three, square numbers.
- choose four appropriate clipart pictures. These could be linked to your current topic. Print out five sets of the pictures. Place one set in a large envelope. Give children a set each and ask them to arrange the pictures in a line, in the order they think they will come out of the envelope. Display the pictures one at a time. Has anyone been able put them in the matching order?
- young children love big numbers, but find it difficult to imagine a million. Some helpful story books are:
    - *How big is a million?* by Anna Milbourne ISBN 0746077696
    - *How much is a million?* by David M Schwartz ISBN 0688099335
    - *Millions to Measure* by David M Schwartz ISBN 0060848065. *Uses imperial measures.*

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

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[Download this Up2d8 maths resource] - in PowerPoint format.

[Download this Up2d8 maths resource] - in PDF format.

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The Art of Mathematics
Clarice Cliff (1899 - 1972)

Her life

Clarice Cliff was born in Stoke-on-Trent in 1899. She is one of the most important pottery designers of the twentieth century.

At 16, Clarice began working for the A J Wilkinson Company in Burslem, England, near where she had grown up. Colley Shorter, the managing director of the company, recognized her talent straight away and sent her to the Royal School of Art in London to develop her skills.

When she returned from London, the company set up a separate studio so that Clarice was given an even greater opportunity to create her own designs. Clarice used basic pottery shapes and decorated them in vibrant colours including blue, black, orange and yellow, using geometric patterns.

Some of the most famous of Clarice's pieces are the 'Age of Jazz' figures which are regarded as among the most important Art Deco pieces to come out of the potteries. There is a good example on the Liverpool Museums' website.

The 'Crocus' pattern became one of her all-time best sellers. In the 1930s, the business expanded as demand for Clarice Cliff china increased, and additional artists were employed to paint Clarice's designs by hand.

Clarice died listening to the radio in her own home in 1972. She was discovered by her gardener.

Today, Clarice Cliff's work is extremely collectable. In 2008, despite the financial depression, collectors paid £6 000 for a 'Triple Bonjour' vase in the *Blue Firs* pattern at Bonham's, London.

Information from the Odeon Art Deco website.

Activities

EYFS/Key Stage 1

Using images on an Interactive Whiteboard or projected onto a screen, look at Clarice Cliff designs and use a range of questions to support children's learning in 3D and 2D shape. Pictures are available from the Gallery on the Clarice Cliff website.

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

- I spy something that has a square/curved/triangular face. Can you see a cup/vase that is cube/pyramid shaped?
- can you see a cone anywhere?
- can you see a shape that looks like a tin of beans/a cereal box? Imagine holding a tin of beans, and turning it round and round in your hands. How many circles can you see?
- can you pick up shape that looks like the handle of the cup…
- how can you describe a shape for someone else to guess?
- look at this collection of objects. Shut your eyes while I cover one up. Open your eyes. Tell me which object I have hidden, describe its properties.

This could be done as a peek-a-boo activity if using an interactive whiteboard. Choose an object without letting the children see it, and show a tiny part of it above the screen, perhaps a corner or an edge. Ask the

children to take turns to guess what the shape might be. Each time anyone makes a guess, they must say why they think it might be that shape before being told 'yes' or 'no':

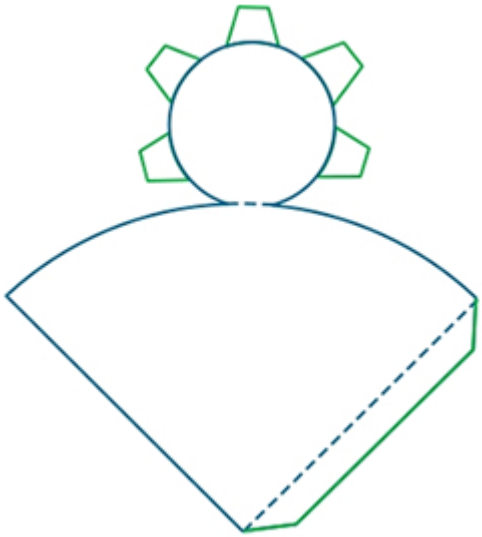
- what might the shape be? Why do you think that?
- what other shape could it be? Why?
- is there a right angle showing?
- is that angle greater or less than a right angle?
- is the part of the shape that you can see symmetrical?
- is the whole shape symmetrical? How many lines of symmetry does it have?

Children could then try to replicate the objects using plasticine, clay, playdoh or salt dough.

Key Stage 1/Lower Key Stage 2
Activity 1
Children could investigate Clarice Cliff objects in pairs. Given pictures of the objects, they could discuss the shapes they are formed from. They could then find corresponding 3D shapes using old tubs, cartons and plastic bottles to replicate the object. They could then paint the finished object in the characteristic, geometric patterns so typical of Clarice Cliff.

See what Curdworth Primary School in Warwickshire did.

Activity 2
Prepare a range of nets that match some of the shapes in Clarice Cliff designs. Have a look at the sifters on the 'Gallery' page. Ask the children to match the net to the object. They could then assemble the net and paint the finished object in the characteristic, geometric patterns.



Key Stage 2
Children could investigate the Clarice Cliff objects in pairs. Given pictures of the objects, they could discuss the shapes in each object. The children could the draw the nets of the shapes that would make that object.

In this example, the children could draw a net for:

- a cylinder for the teapot
- a tetrahedron for the spout
- a triangular prism for the handle
- a cuboid for the handle on the lid

…or any other interpretation that they see.

They could then assemble the nets and paint the finished object in her characteristic, geometric patterns. When decorating, you could ask children to focus on one 2D shape as the cornerstone of their design.

Focus on…New Year around the world

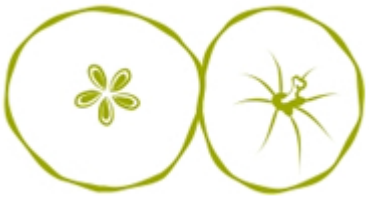
It was the Romans who began celebrating the New Year on 1 January, in 153 BC. It was only then that the month of January came into existence. January is named after Janus, the god of gates and doorways, beginnings and endings. He is usually depicted with two heads looking in opposite directions. According to a legend, he received the gift to see both the future and the past as a reward for giving hospitality to another god. So Janus represents contemplation on the happenings of an old year while looking forward to the new.

Before then, the New Year was usually celebrated on the vernal equinox, 25 March, as spring took hold. It took 1900 years and a reform of the calendar before the date became fully accepted across the world. Now, people celebrate the beginning of the New Year at the stroke of midnight, as the date becomes 1 January. But midnight does not happen at the same time everywhere. Although the clocks all read midnight, this will not happen at the same time across the world because of the Earth's time zones. As communication and the need for some standardisation of such things as travel timetables increased, standard time zones were established.

The Earth takes approximately 24 hours to rotate on its own axis. A line of longitude is an imaginary line (arc) along the surface of the Earth, running between the North and South poles. Each point along the line has the same longitude. Time zones have been defined by dividing the Earth into 24 wedged-shaped sections, each 15° of longitude apart. However, in some places, the geography of the region, either political or physical, results in some rather irregular zones. The line of longitude that passes through the Royal Observatory in Greenwich is accepted as 0°, the prime meridian. The 180° longitude is on the opposite side of the globe. Local time differs by one hour from one time zone to the next. In some areas, zones are subdivided into half-hour or even quarter-hour differences. Daylight saving time can complicate the picture, but for the purposes of considering the arrival of New Year around the globe, the standard time zones shown on a map like the one above are sufficient. For more detail on time zones, including a table of comparisons between the rest of the world and London at 12:00, go to Wikipedia.

Almost all countries have their own New Year traditions. Most celebrate the renewal of life and regeneration after discarding the old. People might make a great deal of noise to drive away evil spirits. In order to start the year with a 'clean slate', in the past, people have made certain that they had cleared any debts. New Year resolutions represent our efforts to change or improve our lives in some way. People often say that they are "turning over a new leaf" in the New Year. Many cultures believe that anything in the shape of a ring or circle brings luck, because it symbolizes "coming full circle". So the Dutch eat doughnuts on New Year's Day to bring good luck.

In Greece, people bake New Year's Bread, called *Vasilopita*. After baking, a coin is inserted through a slit in the base. The person who finds the coin will have good luck in the forthcoming year. Gold or silver coins could be baked in the bread, but the nickel content in today's coins makes them unsuitable, so the coin is added later. The bread is served at midnight on New Year's Eve. The head of the household cuts the bread and the lucky family member getting the coin is said to have good fortune in the coming year.



Czech Christmas traditions include slicing an apple in half sideways. If the core forms a star shape, you will enjoy health, happiness and success in the forthcoming year. A four-pointed star means illness and a cross, death. Since the star shape occurs in pretty much all healthy apples, most people should be safe. However, it is possible that this is where the expression about being the bad apple derives from. Children enjoy the tradition of sailing boats made from walnut shells. Melting a small amount of lead, pouring it into a saucer of cold water and interpreting the shape allows you to predict the future.

On 31 December in Ecuador, each member of the family donates a piece of clothing such as a shirt, trousers, shoes, or hat. The family then makes a straw man to represent the old year by sewing the clothes together and stuffing them with straw. A member of the family writes out a last will and testament naming all the faults of each family member. At the stroke of midnight, the will is read, the straw man is burned and all the listed faults disappear.

One of the most famous traditions in the United States is only a little over 100 years old. It is the dropping of the New Year ball in Times Square, New York City, at 11:59 pm. Thousands gather to watch the ball make its one-minute descent, arriving exactly at midnight. This tradition first began in 1907. The original ball was made of iron and wood; the current ball is made of Waterford Crystal, weighs 1 070 pounds and is six feet in diameter.

A great book called *All in a Day* by Mitsumasa Anno (ISBN 0-698-11772-7) is available to highlight New Year around the world. In it, ten artists illustrate the similarities and differences between children in eight different parts of the world over one 24-hour day, beginning at eight different times on New Year's Eve and New Year's Day. It is a little old-fashioned, but children will recognise some familiar drawing styles and characters, including Eric Carle and Raymond Briggs.

Some useful websites to find out about any country's traditions include:

- Father Times
- 123New Year
- Wikipedia
- The Holiday Spot

Key Stages 1 & 2

Most of the following activities are suitable for both Key Stages:

- use the map above or a similar one to find irregular time zones. Can the children explain why a particular zone is irregular?
- when Year 2010 starts around the world, the time and date website offers a countdown to 2010. By clicking on Change to this zone for the first place in the table, *Kiritimati* (*Kiribati* - Christmas Islands) it makes it easier to see when the first New Year arrives and how much later it will occur in various places. By selecting places an hour later, children can track the arrival of New Year around the globe. Children could begin by marking Kiribati on a map of the world, labelling it with a zero, then use the lines of longitude to help locate and plot one of the places on their map of the world, marking the points with the number of hours later. Challenge Key Stage 2 children to plot places for every half hour
- the all recipes website has a simple recipe for *Vasilopita*. Print or display a copy of the recipe. How much of each ingredient would you need to make enough for your class... year group... school? Make at least one Vasilopita for everyone to try. Check for nut allergies before using the almonds: if necessary, simply leave them out. Find out more about Greek (and other) traditions at the Father Times website
- you have £50 to spend on a New Year's Eve party for 10 people. This must include food, drink, decorating the room and entertainment. Draw up a budget
- explore New Year traditions in a country of your choice. Find out how much it would cost for you or a group of four friends to go there to join in the fun, from 30 December to 2 January. You will need to get there, have somewhere to stay and £100 of spending money.

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Starter of the Month

Foundation Stage
In the Foundation Stage, practice counting backwards from 5 or 10, ending with 'Blast off!' Make simple firework rockets to wave at blast off. Build on last month's Starter by asking 10 (or 5) children to do a silent countdown. The first child shows their 10 card, the next 9, and so on until everyone joins in with 'Blast off!'

Key Stage 1
In Spain, people traditionally eat 12 grapes at midnight on New Year's Eve to secure 12 happy months in the coming year. Challenge the children to recite the months in order, beginning with January. Extend the challenge by having 12 children and 12 grapes. The first child begins with January and eats their grape, the next says February and eats theirs, and so on until the twelfth grape is eaten. You may need a good supply of grapes and to rotate the children so that everyone gets at least one grape, but not too many!

Ask questions using ordinal language. Which is the sixth...eighth...third...month? Children can ask questions of each other too. For example, my birthday is in the ninth month, so when is my birthday?

Key Stage 2
Next year is 2010. This is a lovely number to play with. Display a series of questions such as:

- which numbers is 2010 divisible by? How can you tell without actually working it out?
- explore with a calculator – which numbers multiply together to make 2010? How many different ways can you find? Do not restrict yourself to two numbers, but no repeats allowed
- what would you do with £2 010? 2 010p?
- how many days have elapsed since 1 January 0000?
- how many Mondays in 2010? What about the other days?
- Children could pick a question to consider with a partner. Take feedback after five minutes. The feedback might include a solution or what information is needed to work out a solution.

A little bit of history – Pythagoras

Pythagoras was born on the island of Samos in Greece in 570 BC. He died in 495 BC. You might like to plot these and a few AD dates on a timeline and see if the children can work out the differences between different BC and AD times and also the age Pythagoras was when he died.

He is often thought of as a great mathematician and was known as the 'father of numbers', however some people have questioned the scope of his contributions to mathematics. Very little is known about him because none of his writings have survived and it is thought that many of the accomplishments credited to him may actually have been down to his colleagues and successors.

Over the years, because of the lack of information about him, Pythagoras became a bit of a legend and various myths arose surrounding him, for example, that the god Apollo was his father, that he had a golden thigh and that he could be seen in different places at the same time! There were several sources of factual information, which is what people have relied on in their studies of him. These came from his followers.

From these sources, historians have deduced that he was the son of Mnesarchus, a gem engraver or merchant, and his wife Pythias. He was born in Samos, the Greek island in the eastern Aegean. He lived there for 40 years and then spent many years travelling the world, finally settling in Croton in Italy.

It seems that he had a lot teachers assigned to him from many countries around the world, for example Chaldea, Greece, Egypt and the Orient. They taught him in their languages, which must mean he was, to some degree, a linguist. It is said that the Egyptians taught him geometry, the Greeks arithmetic and the Chaldeans astronomy. They may well have also given him his desire to travel. It is believed that Pythagoras travelled extensively visiting such countries as Egypt, Arabia, Phoenicia, Babylon and India in order to collect all the knowledge he could.

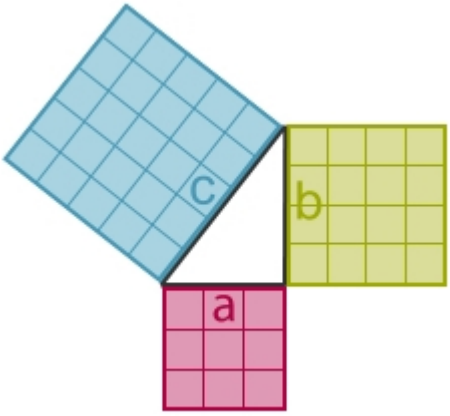
Many mathematical and scientific discoveries have been attributed to Pythagoras, including his famous theorem, as well as discoveries in music, astronomy and medicine

Let's look at two of them now:

The famous Pythagoras' Theorem

Pythagoras found that in a right-angled triangle, the square of the hypotenuse (side opposite the right angle) is equal to the sum of the squares of the other two sides.

He proved this by drawing squares from the sides of the triangle. He found that the two squares alongside the perpendicular sides of the triangle (a and b) had the same area as the one alongside the hypotenuse (c).



Why not ask the children to check it out! Sides a = 3cm, b = 4cm, c = 5cm so the adjacent square areas would be 9cm2 and 16cm2 which equals 25cm2, which is 5cm.

Can they come up with the simple formula for this: a2 + b2 = c2?

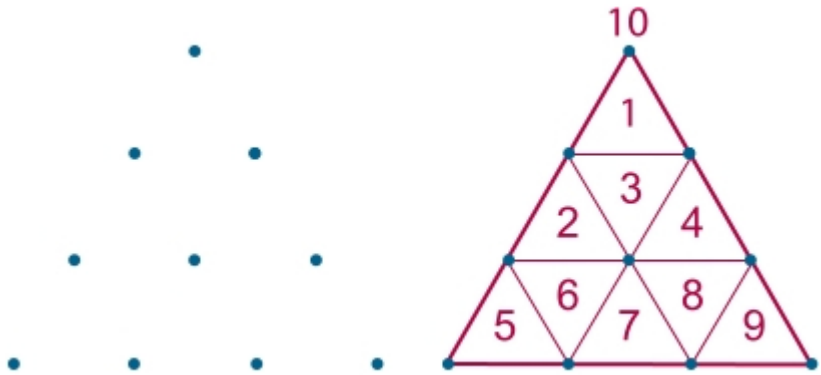
Try out some more examples on the Maths is Fun website.

You could provide the children calculators, give them the lengths of the perpendicular sides of a right angled triangle and ask them to work out the hypotenuse.

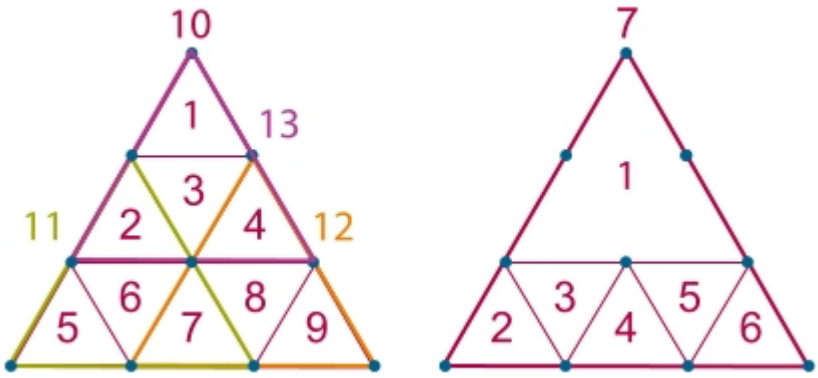
Tetractys

Pythagoras devised the tetractys which is a triangular figure made of four rows of dots which add up to the perfect 10. It was a sacred pattern for the followers of Pythagoras.

Today we can use it for a triangle investigation! Try this: show the dot pattern and ask the children to make 10 triangles:



Next, ask them how many triangles they can see. Can they see the 13 that there are?



Can they remove three internal lines to leave seven?

Pythagoras is also famous for various musical theories and investigations such as this one:

According to legend, Pythagoras was passing some blacksmiths at work. He thought that the sounds they were making when they hit their anvils were beautiful and harmonious. He decided that whatever scientific law caused this to happen must be mathematical and could be applied to music. He went to the blacksmiths' to learn how this happened by looking at their tools. He discovered that it was because the anvils were simple ratios of each other, one was half the size of the first, another was two thirds the size and so on.

Why not try an experiment with water in glasses filling them to capacities that are proportions of the first and see what happens!

For more of the discoveries of Pythagoras and a lot of fun, visit the Primary Magazine Issue 14, and watch *Donald in Mathemagic Land* (Parts 1, 2 & 3).

You can find more information about Pythagoras on these websites:

- Wikipedia
- University of St Andrews School of Mathematics and Statistics
- History for Kids

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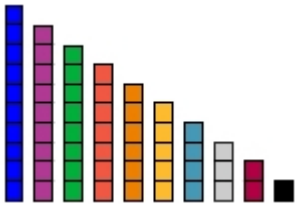


National Centre for Excellence in the Teaching of Mathematics

Maths to share – CPD for your school

Mathematics Subject Knowledge – Ratio and Proportion

For many, both pupils and teachers, the topic of 'ratio and proportion' causes considerable conceptual problems. Indeed, although the ideas are introduced from Year 4 in the Primary Mathematics Framework, pupils are often still struggling with the basic concepts by the end of Key Stage 2. This 'Maths to Share' aims to equip teachers with the subject knowledge and appropriate activity ideas for the classroom to support children in gaining a true understanding of this topic.

Before the meeting

Before the meeting, ask colleagues to consider how confident they are in teaching the following four ratio and proportion statements from the Key Stage 2 calculation section of the Self-evaluation Tools. Encourage them to explore the examples given online with each statement:

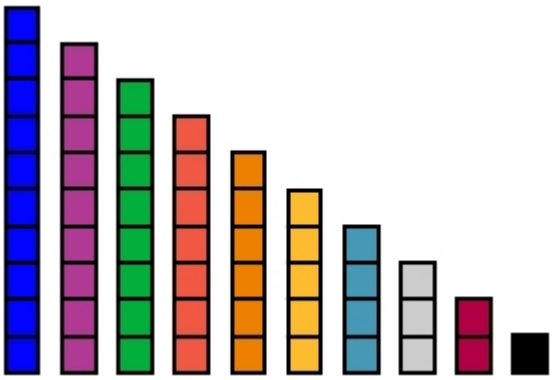
- Solve problems involving direct proportion
- Express a proportion as a percentage, both with and without a calculator
- Divide a quantity into two parts in a given ratio
- Appreciate the difference between ratio and proportion.

At the meeting

Start the meeting with an open discussion of colleagues' feelings about teaching ratio and proportion. How confident do they feel? Were there concepts featured on the Self-evaluation tool that cause particular concerns?
Allow everyone a few minutes to scan the article Ratio or Proportion?. Does this create any further discussion or questions? Allow time for comments.

Ratio

Explain to colleagues that you will first consider the concept and vocabulary associated with ratio.



Ensure pairs of colleagues have a coloured staircase (ideally cut into separate strips) to share. This could be replicated in the classroom with multi-link cubes formed into 'towers'. Colleagues should focus on the red and yellow strips, and compare their lengths. Explain that the ratio of their lengths of yellow to red is 5 to 2. Demonstrate the usual notation of 5:2. Ask colleagues to select two other strips and rehearse the ratio language used to compare them. Now choose the grey and orange strips. Discuss the ratio (3:6) and then show (by cutting the individual units of the strips) how for each one of the grey

units, there are two orange, and that the base ratio can be shown as 1:2. Ask which other strips they could choose to result in the same base ratio.

Show colleagues the first part of the clip from Teachers TV, showing Year 4 pupils using this staircase image to support them in developing a mental image for ratio. Explain how pupils in the classroom could be given a selection of multilink cubes, and asked to create the towers to match a given ratio. Is this something colleagues think they could use?

Allow them to watch the remainder of the clip, where the teacher introduces the idea of mixing a 'smoothie' to look at the ratio of the required ingredients. The idea of using a recipe to scale values up and down using a given ratio is a useful one in the classroom. Teachers TV hosts a clip looking at how small scale kitchen recipes are scaled-up for mass production in the factory. Another common context in which ratio is introduced to pupils is through the mixing of paint. The *Lesson Starters* series includes a nice visual film clip posing a problem where more paint is required; needing to be mixed from two colours in a given ratio. Again, another good one for inspiration in the classroom!

Summarise that ratio is about comparing two or more distinct quantities, for example when comparing ingredients involved in a recipe, or mixing paint.

Proportion

Unlike ratio, proportion is not concerned with comparing one part to another, but with comparing a part to the whole. For example, in the previous video clip of mixing paint, the discussion was around the number of tins of white paint compared to the number of tins of blue (a ratio). Proportion however, is concerned with the number of tins of blue paint out of the total, eg. 2 out of 5 tins are blue.

Select three colleagues and choose a feature to focus upon to demonstrate proportion. Examples might include the proportion of the group wearing glasses or trousers, or the proportion with blond hair etc. Emphasise that the proportion is out of the 'whole' (the group selected), and might be stated as '1 out of 3 wears glasses' or 'one third of the group is wearing glasses'. You may prefer to use an activity sheet showing groups of cartoon faces to use for this activity.

Ask colleagues to think about the link between the teaching of proportion and the teaching of fractions. Which should come first? Could they, or should they be taught simultaneously? Allow time for discussion. Maths to Share from Issue 17 of the Primary Magazine focuses on fractions, decimals and percentages. It might be appropriate to direct colleagues towards this.

Suggested Resources
Show colleagues a 'flip-flop', a flexible visual aid made up of various pictures arranged in a grid formation. These can be easily made or purchased from educational publishers. Ask colleagues to use the language discussed so far to answer questions relating to the flip-flop. The questions below relate to the flip-flop on the resource sheet:

- how many shirts are there altogether?
- what proportion of the shirts is white? (8 out of 16, ½ or 0.5)
- what is the ratio of striped shirts to green? (2 to 6, 2:6, 1 to 3, 1:3, for every striped shirt, there are 3 green)
- what proportion of the shirts is green? (6 out of 16, 6/16 or 3/8, 0.375)

The last answer can be clearly demonstrated by splitting the grid into 8 equal parts, and then showing how the green shirts could cover three of those parts.

Other useful resources for teaching the language of ratio and proportion in the classroom include playing cards ('What proportion of the pack is red?', 'What is the ratio of picture cards to non-picture cards?') or dominoes (What proportion of the dominoes has more than 7 spots?). Different coloured dice can be used very effectively by asking pupils questions relating to the ratio of colours, or the proportion of dice showing an even number for example. A large photograph suitable for whole class work to start this activity is available to download. The Interactive Teaching Programme 'Number Grid' can be a useful visual tool in exploring the proportion of the numbers that are odd for example, or the ratio of prime to non-prime numbers. The only restriction is the teachers' imagination!

The Pitch & Expectations section of the Primary Framework Library on the Standards Site, is an excellent source of questions and activity ideas for use in the classroom. See pitch and expectations resource sheet for some ratio and proportion examples. It is often the case that questions requiring an understanding of ratio or proportion do not explicitly use those terms, and children (and teachers) can happily solve them without realising what they're doing!

Putting the teachers to the test!

Explain that you are planning to visit the planet Zog, where the currency is the Zig. The local travel agent offers an exchange rate of £8 = 5 Zigs with no charge. You have £320 to exchange. How many Zigs can you buy?

Allow colleagues time to consider the question and think about the methods they might use. Discuss these as a group. A support sheet is available to download showing the three main methods (informal scaling, scaling by finding the scale factor, and the unitary method).

Further reading and ideas

- a trickier problem for colleagues who really want to challenge themselves
- lesson 2 of this video clip shows Year 5 pupils working with Leonardo da Vinci's 'Vitruvian Man' image to test their own theories of proportion
- The Art of Mathematics in Issue 12 of the Primary Magazine looks at Antony Gormley's 'Angel of the North' statue in Gateshead, Tyne & Wear. Activities are suggested, focusing on the proportions of the figure, and encouraging pupils to reconsider their judgments.