



Welcome to another edition of our new-look and more compact Primary Magazine. This magazine has been serving primary practitioners for 67 editions with a varied collection of different articles related to maths education and mathematics professional development, which are accessible through the [Primary Magazine Archive](#).

Contents

In this edition we have a selection of interesting and useful articles. [New National Curriculum in Focus](#) is dedicated to unpicking the new curriculum and how to understand and develop the requirements of the new programmes of study. In this edition we begin with a focus on *fluency, reasoning and problem solving in Geometry in KS2*.

[Where's the Maths in That?](#) shares ideas for ensuring that mathematics is taught and experienced across the curriculum. In the coming months, this series of articles that will explore opportunities for mathematics and mathematical thinking within the new science programme of study. This month the theme is *Seasonal Changes for Y1*.

Finally, [Maths in the Staff Room](#) provides a simple plan for CPD meetings in your school to be led by a member of your staff. These are short meetings that can be used exactly as indicated, or adapted to meet the CPD needs of the school. Editable resources are supplied to enable flexibility of 'delivery'. In this edition we begin a two-part series focusing on *Level-Free Maths Assessment*.

But first, we have a [News](#) section, bringing news from the NCETM and beyond to keep you up to date with the fast-changing world of mathematics education.

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News



New National Curriculum

Well it's finally here. The new curriculum is now being taught in our primary schools. Over the summer the DfE released a few further pieces of information that you may find useful:

- [National Curriculum and Assessment from 2014](#)
- [Schools winning grants to develop assessment systems for schools.](#)

Also during the summer the [statistical first release](#) for this year's KS2 tests were published, demonstrating that in maths 86% of pupils achieved L4 or better this year and 42% achieved L5 or better.

This year the Assessment and Reporting Arrangements (ARA) will only be available online. The [KS1](#) and [KS2](#) arrangements are now available.



Mayor's Fund Count On Us

The Schools' Coordinator at the (London) Mayor's Fund is currently recruiting schools to participate in their 2014 programme, and is actively seeking to support London primary schools who have an interest and investment in diversifying their numeracy practice. As a brief introduction, Count on Us is a primary school initiative which aims to foster a change in attitude and increase attainment by motivating children to improve their numeracy skills and abilities. The programme will provide extra-curricular opportunities to increase engagement in mathematics. Count on Us aims to improve pupils' confidence towards learning maths and their academic attainment. The programme has received positive feedback so far from participating schools and they are keen to ensure that eligible schools (London-based primary school with above average free school meal eligibility) are aware of the opportunities to be involved next year.

If you wish to find out more then [contact Jenny Rogers](#) at the Mayor's Fund.



Maths Hubs

The first 32 [Maths Hubs](#) have all now started work, and one of the activities already underway is the [England – China Research and Innovation Project](#), the first phase of which is an exchange of teachers between primary schools in England and Shanghai. A party of 71 teachers from English schools spent a fortnight in Shanghai last month, and the first party of Shanghai teachers arrive in England at the start of November. [Locate and find out about your local hub.](#)



NCETM National Curriculum support

Have you explored our [National Curriculum Planning Tool](#) yet? This interactive tool will support you in the following ways: your subject knowledge; making connections within and across the primary curriculum; suggest helpful papers, pupil activities, exemplification of expectations, and links to the [suite of NCETM videos](#). There are also sections on the Bar Model, Teaching Fractions, Progression in Reasoning, and

Developing a Scheme of Work-all accessible via buttons on the main [National Curriculum information page](#).



Mathematics CPD

Don't forget that if you are looking for high quality providers of maths CPD in the next academic year, use our [Professional Development Directory](#) to find CPD Standard Holders (gold rosette) or Accredited Professional Development Leads (purple rosette).

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New National Curriculum in Focus

New National Curriculum in Focus is dedicated to unpicking the new curriculum and how to understand and develop the requirements of the new programmes of study for mathematics

Fluency, Reasoning and Problem Solving in Geometry in KS2

While there is a great emphasis on arithmetic in the new curriculum, the remaining programmes of study still retain an important feature of a broad and balanced curriculum. In this section we will explore some of the changes in the [new National Curriculum](#) for lower KS2 in Geometry, suggest how to refresh subject knowledge for this area of the curriculum, and provide some suggested activities.

Previously known as Shape and Space, this strand is now referred to as Geometry and is a term consistent across all Key Stages (including KS3). The new programme of study requires the following for Y3 and Y4:

Y3 - Properties of Shape

Pupils should be taught to:

- draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them
- recognise angles as a property of shape or a description of a turn
- identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle
- identify horizontal and vertical lines and pairs of perpendicular and parallel lines

Y3 – Position and Direction

Pupils should be taught to:

- there are no specific requirements for Y3 for position and direction.

Y4 – Properties of Shape

Pupils should be taught to:

- compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes
- identify acute and obtuse angles and compare and order angles up to two right angles by size
- identify lines of symmetry in 2-D shapes presented in different orientations
- complete a simple symmetric figure with respect to a specific line of symmetry.

Y4 – Position and Direction

Pupils should be taught to:

- describe positions on a 2-D grid as coordinates in the first quadrant
- describe movements between positions as translations of a given unit to the left/right and up/down
- plot specified points and draw sides to complete a given polygon.

Subject Knowledge

Firstly KS1 teachers must be confident in their own geometric subject knowledge; not just for KS2 but also for KS1 in order to understand how the subject progresses, and to ensure that the foundations that were laid in KS1 enable a seamless journey through the geometry curriculum, and are not building any misconceptions that will cause difficulties later in KS2. The Self-evaluation Tools for Geometry in [KS1](#) and [KS2](#) are a useful way to monitor and develop teacher subject knowledge.

Activities for Fluency, Reasoning, and Problem Solving in Geometry in Lower KS2

Properties of Shapes

In order for pupils to be fluent in the properties of shapes they will need to become increasingly familiar with and confident in using accurate vocabulary. Below is a list of suggested key vocabulary to introduce across Y3 and Y4 and builds on the vocabulary introduced in KS1 (see [Primary Magazine 67](#)).

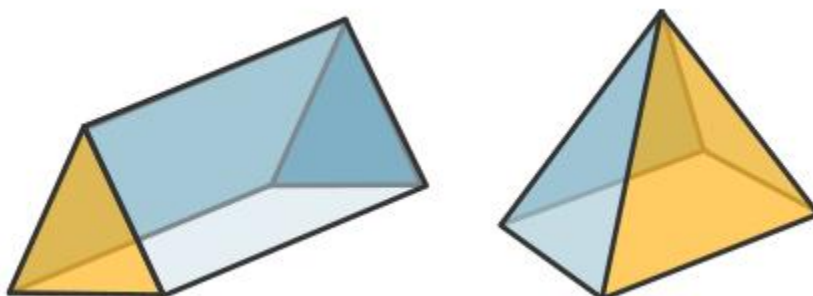
angle, right-angle, horizontal, vertical, perpendicular lines, parallel lines, polygon, polyhedron, acute, obtuse, tetrahedron, quadrilateral, isosceles, equilateral, scalene, parallelogram, rhombus, trapezium

Provide plenty of opportunities for pupils to compare shapes from the same family in different orientations i.e. triangles or quadrilaterals to develop pupils' vocabulary and geometric reasoning skills. Ask the children to identify/describe a shape using the fewest number of properties. For example, describing a square using only two properties as "a shape that has all sides equal and exactly four right-angles". Can this be any shape other than a square? Why? Pupils will also enjoy exploring subsets of shape families e.g. a rectangle is a polygon – quadrilaterals – parallelogram – equilateral – rhombus.

Use these three activities below which are easily adaptable to many geometric situations:

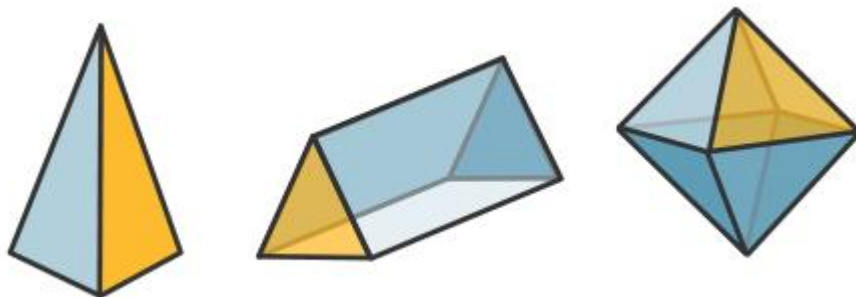
Same and Different

What's the same? What's different about these two 3D shapes?



Odd One Out

Which shape is the odd one out **and why?** (Challenge pupils to find as many different reasons for each shape as possible).



Sometimes, Always, Never

Provide a statement about properties of shapes so that pupils can discuss and decide whether it is sometimes, always or never true. For some examples of statements that you could use see [this set](#) on TES Connect (you will need to be a registered user on TES to access this).

Use different types of grids and geometric paper to explore different 2D shapes that can be drawn. [This activity](#) from NRICH describes how this might work in the classroom. Another example from NRICH is [Quadrilaterals](#). Use this [interactive Geoboard](#) to construct different 2D shapes. Use this on an interactive white board and invite pupils to change a shape to another with just one move/ two moves etc. Alternatively this free [iPad app](#) could also be used. This [challenging activity](#) from NRICH will help pupils to understand how to construct perpendicular lines without using a protractor on dotted paper.

Deepen pupils' understanding of the differences of 2D or 3D shapes by using different sorting diagrams, such as Venn Diagrams or Carroll Diagrams. Tree diagrams are particularly useful in getting pupils to distinguish properties of different shapes. All the sorting diagrams suggested, can be adapted to encourage deeper reasoning, such as leaving out the descriptions/ or questions, adding or removing a shape etc. not suggesting any shapes from the outset or asking pupils to create their own diagram from a limited set of shapes. There is also branching database software that many schools will already have which will have been used for ICT projects in KS2 (Y4) with the old curriculum.

Explore symmetrical patterns using multilink and investigate how many different symmetrical patterns could be made by connecting 2 red, 2, yellow and 2 green multilink cubes. Investigate with different numbers of cubes and with more than one line of symmetry. You can find other suggestions for activities for learning about symmetry from [NRICH](#).

Position and Direction

In order for pupils to be fluent in describing position and direction they will need to become increasingly familiar with and confident in using accurate vocabulary. Below is a list of suggested key words and phrases to introduce in Y3 and Y4, building on the vocabulary introduced in KS1 (see [Primary Magazine 67](#)):

coordinate(s), first quadrant, reflection, translation, tessellation

In Y4 there is a big emphasis on coordinate geometry in the first quadrant. Pupils need to gain experience moving around the grid in the first instance. This could be done using a large table top grid and a programmable toy making each step of the grid equivalent to one 'step' of the programmable toy. The grid could be superimposed over a treasure map. Remember to reinforce that travelling over the grid involves starting from the axis lines and not moving by counting the cells on the grid. Pupils' attention needs to be drawn to the points of intersection on the grid to make sense of the coordinate.

There are lots of interesting [activities and puzzles from NRICH](#) that help pupils to make sense of the coordinate grid in the context of 2D shapes and their translations.

Learning about translations is a great opportunity to explore tessellations. There are lots of real-life examples/ images of tessellations that pupils can explore and discuss the geometric properties of and use to inspire them to create their own. [This resource](#) from Cre8ate maths demonstrates how tessellations feature in real-life and can be used as a class-based project. Tessellations can be created using a set of tiles that pupils can draw around and slide across the page or using geometric ([isometric](#) or [triangular](#) paper). [This applet](#) is a nice piece of software to create simple tessellations you as a teacher may wish to explore this first before handing it to the children.

Further links:

NCETM [National Curriculum Y3 Properties of Shape Activities](#)

NCETM [National Curriculum Y4 Properties of Shape Activities](#)

NCETM [National Curriculum Y4 Position and Direction](#)

National Stem Centre eLibrary: [Y3 & 4 Geometry](#)

NRICH [Properties of Shape KS2](#)

NRICH [Position and Movement](#).

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Where's the Maths in That? – Maths across the curriculum

*In this section of this Primary Magazine we explore how mathematics can be embedded into other subjects in the context of the new curriculum. The subject in this new series is **science** and over the next few months we will explore the different themes for the KS1 and KS2 science programmes of study and how maths can be embedded in and enhance understanding of scientific ideas.*

The In this edition we look at the theme of **Seasonal Changes** for Y1 and how a scheme of work for this might incorporate mathematical skills.

The statutory requirements for **Seasonal Changes** in the Y1 programme of study are:

Pupils should be taught to:

- observe changes across the four seasons
- observe and describe weather associated with the seasons and how day length varies.

Below are some ideas for incorporating maths into this science theme. The unit might be best used as a short piece of work at the beginning of each term or at the beginning of each week so that pupils gain a real-time experience of seasonal changes in their own. Some of the activities below are based on this assumption:

1: Observe changes across the four seasons

Learning about the seasons is a great opportunity to recognise and use the months of the year which is an expectation for Year 1. Pupils should first practice reading and ordering the months of the year. These can then be grouped into threes (September-October-November (autumn); December-January-February (winter); March-April-May (spring); June-July-August (summer)*) to identify and name the seasons of the year. Discuss when each child's birthday is and whether they remember the sort of weather that they have when it is their birthday.

The Woodland Trust provides [this booklet](#) about observable changes in wildlife in autumn and spring and you can contribute to a National Seasons Calendar. You could take the pupils on a signs of season walk around the school grounds or to a nearby location. Pupils could use simple maps to plot where they find signs of the season (i.e. changing colours of leaves, bare trees, blossom etc.). The Woodland Trust also provides [free images](#) for each month of the year to represent the seasons. Pupils could be challenged to bring in a photo of a sign of a season that could be used to contribute to a class pictogram i.e. providing information about the number of signs of a season that pupils in the class have seen, such as the types of animals or plants, seeds etc.

Pupils could create their own stop-frame animation of a deciduous plant changing over time by taking photos of it every day from the same location. Ensure the camera's date is correctly set so that there is a record of when each image was taken. At the end of a season see if the pupils can order a sequence of pictures using one picture from each week. Pupils could label their pictures from 1-10 and write the number on the days of a month-at-a-view calendar.

2: Observe and describe weather associated with the seasons and how day length varies

Observing weather changes over time is a great way of developing awareness of different units of measures. The Met Office has a suggestion for [making a rain gauge](#), which includes using a cm scale that Y1 pupils should become familiar with by the end of the year. They also provide a [downloadable weather diary](#) which could be used as a class diary.

This [measure-the-puddle activity](#) is also a good one to do at different times of the year to observe how puddles evaporate at different rates depending on the temperature. You should help pupils to recognise that this might not be a fair test because the puddles could be different sizes. This activity can be done by taking photos as well as marking with chalk, so the children will have a pictorial record that they can use to discuss the changes and to put in order.

If it snows while in school during the winter (or spring) use this as an opportunity to learn about the shapes of snowflakes. If possible look at the some snowflakes under a microscope before they melt (some digital microscopes will allow you to take snapshots). Help pupils to notice that snowflakes are formed on a hexagonal base and that they have six arms and have six lines of symmetry. Pupils could design their own snowflake crystal using pattern blocks. Or piece these snowflake crystals together with this [online game](#) (uses Flash Player).

If pupils have used stop-frame animation for other activities then they will understand what happens with this next activity. Set up a tablet to capture images over a regular time period. This can be done by downloading a stop-frame app which will enable you to leave your tablet in the same place for an extended period and it will take a snapshot at every interval you have set it up to do. Doing this in the classroom for one whole day (24 hours) a week/ fortnight/ month throughout the school year will enable pupils to observe how the daylight changes. Use this as an opportunity to practice telling the time. Also discuss with pupils what they notice about the daylight in spring and autumn when they go to bed or when they get home from school in the winter.

*Seasons as given by the [UK Met Office](#)

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Maths in the Staff Room – Short Professional Development Meetings

This section provides suggestions and resources for a professional development meeting for teachers that can be led by the maths subject leader or another person with responsibility for developing mathematics teaching and learning in the school

Level Free Assessment: Part 1

Meeting Aims

- Ensure a consistent approach to assessing progress in maths across the school.

Timing

- 2.0 hours

Resources

- Audio/Visual Equipment to play video clip
- [Tim Oates on Assessment Reform](#)
- [Ofsted Guidance](#)

Arrange the staff in mixed year groups/ key stages, as this will be important for the main part of this Professional Development Meeting.

Setting the scene

Share the aim of the professional development meeting.

1. Why have we moved away from levels? (15 mins)

Watch this clip of Tim Oates talking about level-free assessment. Watch up to 6':23".

Tim talks about the importance of assessing pupils' understanding of key concepts during a school year and three reasons for abolishing levels – children self-labelling and placing ceilings on their learning, the risk that children are rushed through the levels rather than establishing deep understanding and ambiguity of levels depending on the method of assessment.

Invite teachers to comment on what they have heard.

2. Identifying Maths Assessment Priorities for the School (1hr)

2.1 (10 mins) Explain to the staff that they will need to come to an agreement about the key assessment priorities for maths in their school. They will need to decide what and how they will assess maths during and at the end of a unit of work and then also for summative purposes at certain points during the school year to track progress and attainment.

Share the [guidance for Ofsted inspectors](#) on how they will use assessment information during inspections in 2014/15.

Draw attention to the statement:

"Inspectors will not expect to see a particular assessment system in place and will recognise that schools are still working towards full implementation of their preferred approach." (p2)

Inspections will look for:

- the **quality of leadership and management** of the assessment system within the school
- the **accuracy** of the assessment judgements being made
- that pupils are making **progress** and that there is evidence to support this
- the effectiveness of how pupils' progress is **reported** to parents and carers

2.2 (40 mins) The following session will focus on selecting summative assessment tasks to track **progress** over the school year.

Share with staff the [overviews from the National Curriculum](#) for KS1 (Y1 & 2), p5; Lower KS2 (Y3 & 4), p17 and Upper KS2 (Y5 & 6), p30 which will help to understand the expectations for achievement*.

Organise the staff into small groups (size will depend on the staff size) and allocate them one of the following curriculum strands to consider. Hand out each group the [progression maps](#) for:

- Number – Number and Place Value
- Number – Addition and Subtraction
- Number – Multiplication and Division
- Number- Fractions (including decimals and percentages)
- Ratio and Proportion.

Ask the staff to identify a couple of 'big ideas' that should be tracked throughout the each year in each strand? (i.e progression in place value of increasingly larger / smaller numbers.)

Using the identified 'big ideas' from each strand, ask the staff to attempt a summative statement for pupils in each year group that they will be assessed against.

E.g. for number and place value, Y1: at the end of Y1 all pupils should be able to count, recognise, represent, write and compare numbers to 100.

By the end of this task there will be a set of expectations for achievement.

2.3 (10 mins) gather everyone together to present the ideas with the aim of agreeing these.

3. Finding Assessment Tasks (45 mins) [either in the staff meeting or done in year groups after the staff meeting]

The aim of this session is to find two or three questions for each year group that the teachers will use to assess each key 'big idea' that was identified in the last activity. Now

working in year groups, teachers look through a selection of tasks that could be used to assess pupils' attainment in that area. The staff meeting can end once teachers have identified some suitable tasks.

Further links

Number and Place Value

- [NRICH Place Value KS1](#)
- [NRICH Place Value KS2](#)
- [BEAM Place Value Activities](#)
- [SMILE Place Value and the Number System.](#)

Addition and Subtraction

- [NRICH Addition and Subtraction KS1](#)
- [NRICH Addition and Subtraction KS2](#)
- [BEAM Calculation Games 5-7](#)
- [BEAM Calculation Games 7-9](#)
- [BEAM Calculation Games 9-11](#)
- [SMILE Reckonings.](#)

Multiplication and Division

- [NRICH KS1 Multiplication and Division](#)
- [NRICH KS2 Multiplication and Division](#)
- [SMILE Multiplication](#)
- [SMILE Multiplication Makes Sense](#)
- [SMILE Division.](#)

Fractions, Ratio and Proportion

- [NRICH Fractions KS1](#)
- [NRICH Fractions KS2](#)
- [NRICH Ratio and Proportion KS2](#)
- [BEAM Fractions Games and Activities KS1](#)
- [BEAM Fractions Games and Activities KS2](#)
- [SMILE Fractions](#)
- [SMILE Ratio](#)
- [SMILE Proportion.](#)

In the next Issue, Part 2 of this Professional Development Meeting will explore how to use these tasks as part of a school tracking system to monitor progress through the school year.

* The DfE plans to publish performance descriptors for the end of each key stage during autumn 2015. At the time of going to press these materials have not yet been published. When these are released you may wish to use these materials in place of the Key Stage overviews.

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