Bespoke

MathsHUBS

January 2018 | Issue No. 12 NEWS from the Maths Hubs Programme

Welcome to the latest issue of Bespoke, at the start of a new calendar year. In this issue we detail how the welcome extra Government spending on maths will affect the Maths Hubs Programme, and we go inside the national project that is exploring ways of ensuring continuity of maths learning between Key Stages 2 and 3.

Where will new funding be directed?

Maths continues to be a priority area for DfE funding: in part testament to the success of the Maths Hubs programme. Taking various new funding streams together, the expansion of Maths Hubs work will include:

- A scaling up of existing teaching for mastery work in secondary schools
- A new programme designed to help primary schools that want to establish strong maths leadership and teaching approaches in order to get the most from Maths Hubs teaching for mastery projects
- A significant increase in the scale of work done in Early Years, with the aim of helping all children develop positive attitudes and secure understanding of early mathematics, providing a firm foundation for mastering concepts in Key Stage 1
- In the north of England, an expansion to the capacity of the programme, either by creating new Maths Hubs, or by strengthening leadership structures in existing hubs, to create wider and deeper impact
- Across England, an increased effort to target Maths Hubs work at areas of educational under-performance, including Opportunity Areas

Shanghai Showcase Lessons

You might be picking up this newsletter at a primary school that's opened its doors for a 'Shanghai Showcase' lesson: part of the ongoing England-China teacher exchange. If not, you may still be in time to see a teacher from Shanghai teach a primary class at a school near you. Contact your local Maths Hub to find out if they have an event running in late January. The showcases in November certainly *(see right)* went down well.

> Wow, what a pleasure to watch the precise and exposed learning for all at #SwinfordPrimarySchool by the #ShanghaiTeachers in Maths @MinsterMathsHub @NCETM what amazing progress in a week!! Lots to share @ojsinfo @swinfordschool @NCETM

> Thank you @MathsHubNW1 and Alexandra Park Primary for setting up #shanghaimaths opportunity today - brilliant ideas to take away!

> Thank you @Ldncandwmathshb and @NCETM for another brilliant Shanghai showcase lesson!

Building continuity in learning about fractions

For many reasons, the early Key Stage 3 years can sometimes lead to a stall in learning. A concentration on SATs can get in the way of real progress in Year 6, while Year 7 teaching can sometimes inadvertently repeat much of what has already been mastered in primary school. If both happen, a loss of momentum over several school years can prove a significant set-back. That's the backdrop for the Maths Hubs national project this year that is looking at continuity of learning between Years 5 and 8. In some hubs, work will focus on fractions: moving from the understanding of what a fraction is, to the ability to reason about them as numbers and within calcluations. Here we show some examples of the sort of contunuity with fractions learning that Work Groups will look at.

The Project and Work Group

In every participating Maths Hub, a Work Group, consisting of primary and secondary teachers from pairs of closely linked schools, is exploring ways to structure teaching that ensures pupils gradually build deeper understanding of maths concepts over four schools years. Teachers in the Work Group are funded to visit each other's schools, discuss lessons they see, and meet as a whole group through the year. Among the intended outcomes are that:

- Teachers build an increased knowledge, understanding and experience of the curriculum at KS2 and 3
- Teachers refine their understanding of what pupils at every stage should know about one curriculum area, for example fractions
- Teachers develop sustainable methods of sharing practice and models of working with colleagues in other participating schools
- Teachers are able to point to signs of improved pupil understanding in some areas as a result of Work Group activity.

Building mastery of fractions

Year 5

In Upper Key Stage 2 students should know what a fraction is and what the numbers in a fraction represent: the denominator being the number of equal parts in the whole and the numerator telling us how many of those equal parts we have.They should know that, when comparing and combining fractions, the whole has to be the same for all the fractions being considered. They should also be able to state and explain the generalisation that, for the same whole, the bigger the denominator, the smaller the size of the equal parts. They will also understand that the numerator tells us how many of those equal parts we have.

Year 6 & 7

As students end their time at primary school, their knowledge and understanding will include basic calculation with fractions. They are expected to be able to use their knowledge of equal parts and the relation to the whole to handle fractions with different denominators when adding and subtracting.

Around the transition period, pupils should develop an ever more secure understanding of fractions and not be thrown off course when, in a representation, one fraction of a whole is the same size as another fraction of a different whole *(in the example with 2/7 and 3/9)*.

The use of various images and representations is extremely common in primary schools across the country and provide a good starting point for secondary schools who quickly need to find out where their new intake are at with their maths. If calculation procedures are not secure or remembered, then the representations will allow the students to re-formulate their understanding of fractions, which can provide a stepping stone for the use of the more formal methods required for calculations.

Year 8

In Key Stage 3, 'Fractions' is no longer a heading of its own in the curriculum. Fractions are part of 'Number' so understanding their behaviour as values in their own right is important.

Using the numbers 5 and 6 only once, make this sum have the smallest possible answer:

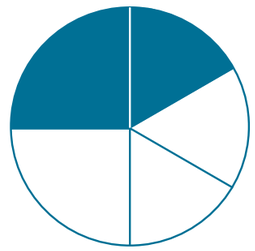
$$\frac{\square}{15} + \frac{\square}{10} =$$

This question, unlike most examples pupils will have previously encountered, does not ask for an exact answer, but is interested in the reasoning that the students have to apply to ensure that the answer is as small as possible.

The students would have to draw on their understanding that, for the same whole, fifteenths are smaller than tenths. Hence, making sure that the number of tenths is as small as it can be, ensures that the total amount is as small as it can be. Having more tenths than fifteenths would have a bigger impact on the size of the total.

This example shows how representation is used to reveal the structure of calculation and to expose the method of using common denominators in order to calculate with fractions with different denominators. However students might also be able to reason that the unshaded part of the circle is a half plus another half of a sixth, which they should recognise as a twelfth, hence moving to an answer of seven twelfths without having converted the quarter and sixth in to twelfths themselves. This flexibility of thinking and ability to make connections will enable subsequent teachers to build on this reasoning with the conventions of converting fractions into common denominators and record the problem entirely symbolically. This representation also demonstrates that it is not necessary to use 24ths as a common denominator but that the lowest common multiple of 4 and 6 is 12.

In this circle $\frac{1}{4}$ and $\frac{1}{6}$ are shaded



What fraction of the whole circle is not shaded?

In this case, the shaded portions are the same size, and students are asked to consider the whole in relation to the parts. If understanding of parts and wholes and the structure of a fraction is secure, then the students should be able to reason that 3/9 is the same as 1/3 and therefore there will be 3 of the green sections in the whole rod. Knowing that 2/7 is less than 1/3 will lead to the conclusion that there will be 3 and a bit purple sections in the whole so the blue rod will be longer. Using common denominators does not help here as the wholes are not the same – we know this because the shaded parts are the same but are different fractions.

Only a fraction of each whole rod is shown.
Using the given information, state which whole rod is longer?

Explain your working.

Alice, Bekah and Clare are explaing why $\frac{2}{3} \div \frac{1}{3} = 2$

Alice says "Because you turn the second number upside down and multiply, so $\frac{2}{3} \div \frac{1}{3} = \frac{2}{3} \times \frac{3}{1} = \frac{6}{3} = 2$"

Bekah says "Because if I share two thirds of a cake between one third of a person then to get a whole person I need to multiply by three, so that means that the person gets six thirds of the cake and six thirds is the same as two."

Clare says "$\frac{2}{3} \div \frac{1}{3}$ means 'how many one thirds are there in two thirds?' Because two thirds is the same as $2 \times \frac{1}{3}$, the answer must be 2"

Which explanation do you find most convincing? Why?

This activity develops students' ability to reason about fractions as dividends and divisors within calculations. Dividing one fraction by another is the classic piece of maths which many adults will quote to you 'turn the second one upside down and multiply' as Alice says. If students have an understanding of what is happening when a fraction is divided by another then, whether or not they remember the rule, they stand a better chance of ensuring that their answer is correct and also being able to reason their way through a problem where the calculation itself may not be the focus.

Students being able to apply their deep understanding of a subject to reason and solve unfamiliar problems is what we are looking for when we say that a child is mastering an area of maths.

Have you heard?

Podcast: Shanghai style observation

Maths Hubs projects, involving small groups of primary schools, are adopting elements of lesson observation and refinement experienced by teachers on the England-China exchange. One exchange teacher who had his lesson unpicked and improved in this way talks about it in an NCETM podcast and also in the NCETM primary magazine.

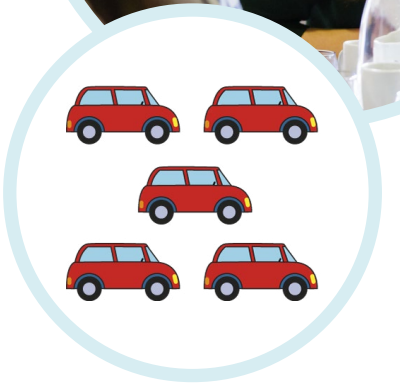
Secondary maths assessment

Materials to help secondary teachers assess the depth of understanding across the KS3 curriculum originated in Maths Hubs work. For each topic area there are questions, tasks and activities designed to assess mastery and – separately-- mastery with greater depth.

Mastery PD materials

Mastery Specialists working on Maths Hubs projects make up the writing team behind new professional development materials for primary teachers. The materials, currently covering number, addition and subtraction in KS1 incorporate newly created representations and form a guide for teachers designing lessons to help children build deep understanding.

Watch the teaser video here.



Get involved!

Primary schools wanted!

Recruitment will begin soon for primary schools to join funded Work Groups led by Mastery Specialists in every Maths Hub area in 2018-19. A central part of the work, over the course of the school year, will be participation in Teacher Research Groups (TRGs) consisting of teachers from six or seven schools in a locality. There's also £2,000 funding to subsidise spending on high quality maths textbooks.

Watch the NCETM website for details.

Secondary Mastery

Wanted: Secondary maths teachers to start a period of funded development as Mastery Specialists, in a significant expansion of the programme started in 2016. Participation will include a commitment by each teacher's school to work on mastery within the school's maths department and in outreach activity with neighbouring schools.

See NCETM news announcements for details and then contact your local Maths Hub.

National Centre
for Excellence in the
Teaching of Mathematics

The Maths Hubs programme is funded by the DfE and coordinated by the National Centre for Excellence in the Teaching of Mathematics