Hampshire County Council

Improvement and Advisory Service

SUMMER 2025

Hantsmaths

In this issue:

Contents

Editorial

Welcome to the summer edition of *Hantsmaths*. We hope the start of the summer term is going well and that all pupils, teachers and leaders are feeling motivated and confident as we enter the term in which many end of year assessments take place. I would like to take this opportunity to wish all pupils and schools well for the upcoming SATs tests and GCSE exams.

In this issue, we revisit the fantastic primary conference delivered to us by Gareth Metcalfe this year as part of the Primary Maths Core Provision package. The focus for the conference was scaffolding problem-solving and enabling pupils the opportunity to reason aloud their understanding of a problem. Gareth has recently created a new resource called, *Deconstructing word problems*, and he was able to share some of his new material with us, enabling leaders to see and experience different ways in which pupils can be encouraged to understand mathematical structure, identify common misconceptions and make connections between questions that are like one another.

I would like to take this opportunity to thank Sophie Laverick and Beth Callow from Orchard Lea Federation for their fantastic article that shared the impact of faded scaffolds at their school. The mathematics leaders share with us how the introduction of faded scaffolds has closed the gender gap between girls and boys within their school and the difference it has made to pupils' independence. It is great to see that this strategy is making such a difference to pupils and that it also supports teacher assessment and teacher confidence. Thanks so much for sharing such great examples.

I would also like to thank Grace Abraham, the Mathematics Leader and Year 2 Teacher from Calmore Infant School, for her fantastic article focusing upon the development of oracy in mathematics. Grace shares with us the journey that the school has been on to develop oracy and the implementation process. This is an inspiring article that reflects upon the time which is required to implement oracy well and the impact that is already being seen across the school.

Another thanks goes to Michelle Marum, the Mathematics Leader from Wallisdean Junior School, who shares with us the success of Number Day and how the school has helped to raise funds for the NSPCC. Different mathematical tasks were completed in all year groups, and it sounds like the children had a lot of fun!

Jo Lees writes an inspiring article focusing upon sustainability in mathematics and how the use of models can help people make decisions about sustainability by providing quantitative reasoning skills. Jo shares with us where we can find a wealth of resources that focus on climate change and how these themes can be incorporated into the secondary curriculum.

As a mathematics team, we have been thinking carefully about the teaching of number facts. Livvi Goodburn, shares with us strategies on how secure number foundations can be secured at Key Stage 1.

In this article, Livvi models how concrete resources and pictorial diagrams can enable pupils to see calculations and examples of how to connect number facts to real life contexts.

I hope that you enjoy this edition of *Hantmaths* and that it helps provide ideas and possible actions for the classroom.

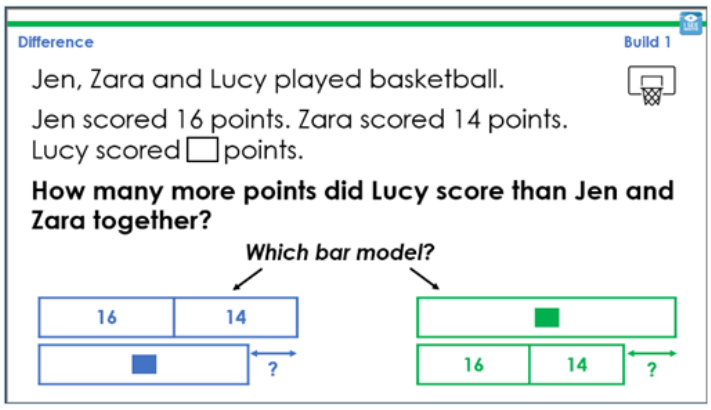
Kate Spencer

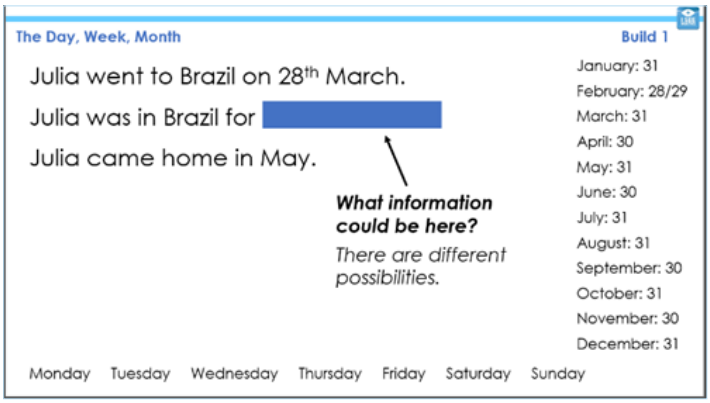
Primary Lead Inspector/Adviser for Mathematics, HIAS

Developing the teaching of problem-solving – 2025 conference

As part of our core provision package this year, we were excited to welcome back Gareth Metcalfe to speak with mathematics leaders across Hampshire. Gareth previously delivered a conference for us in 2019, but Covid meant that this had to be virtual. We knew that when we invited Gareth back for a face-to-face conference, leaders would benefit further from Gareth's knowledge and expertise, and he did not disappoint!

Gareth delivered a fantastic conference focusing upon mathematical reasoning and teaching routine and non-routine problems. He spent time considering how to build the culture and routines that will encourage all children to talk about complex mathematical ideas. The focus on oracy and mathematical talk throughout his presentation, demonstrated how much children can learn from one another. Gareth shared strategies such as providing pupils with a question and asking them to discuss which pictorial image represents the problem. Another idea was to ask children to read the first part of a problem and then discuss what could be the next section, making children pay attention to language and structure. Gareth talked about the slow-reveal process, which is a strategy that we have heard before, but instead he introduced the idea of focusing upon the slow reveal of part of a sentence so that pupils focused upon what has come before. This is a clever strategy of asking children to read and comprehend what has been written to make sense of what could come next.

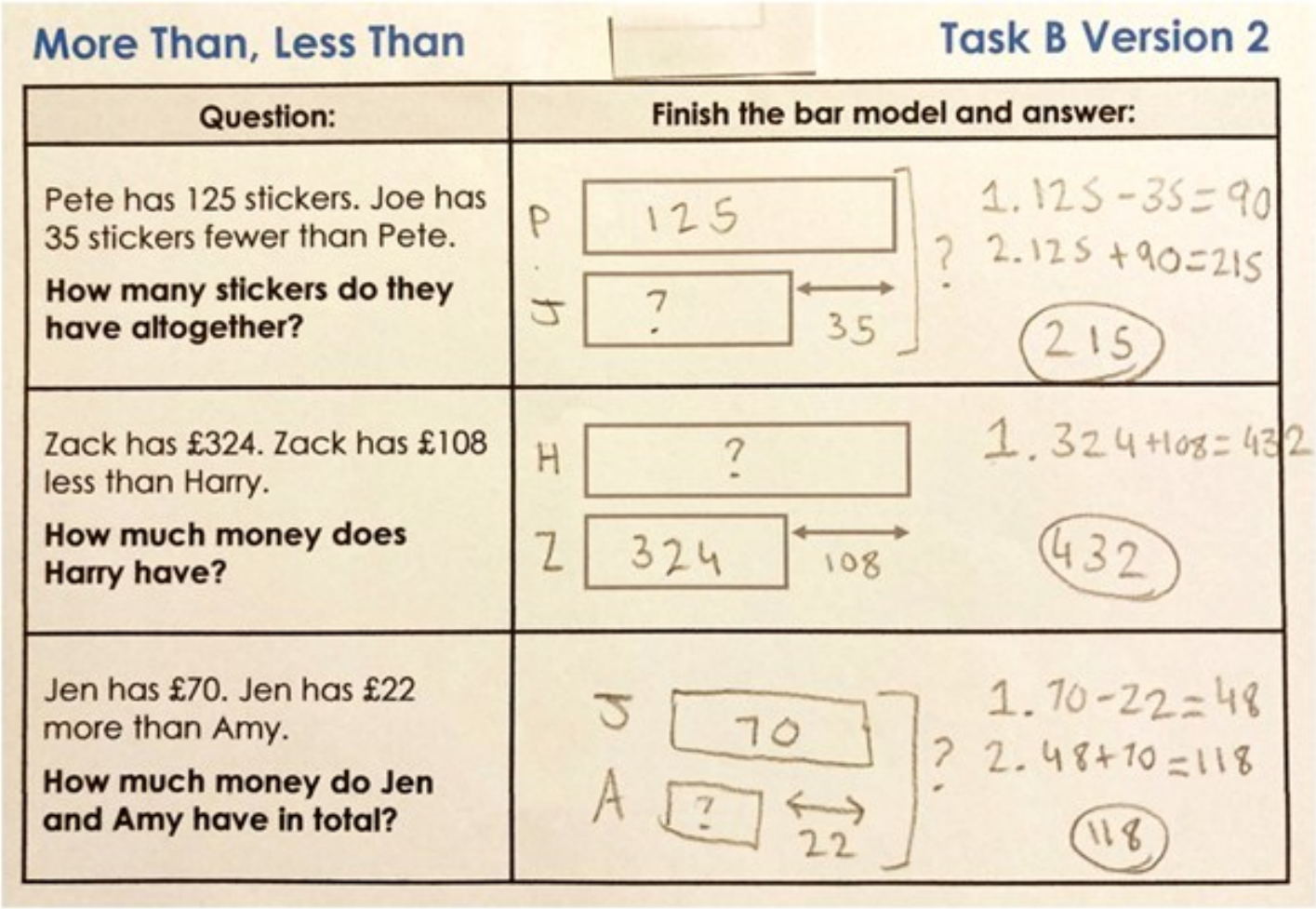




When using Gareth's resources in schools and with children, a particular favourite of mine is the questions that require children to explain the mistakes. These questions enable pupils to talk about common misconceptions and why these errors may have occurred. During the conference, Gareth shared with us a range of tasks that focus on misconceptions and common errors, and demonstrated to leaders how these tasks could be used to develop good mathematical discussion.

During our core provision sessions, we have discussed the use of intelligent practice within task design. Gareth's *small difference* questions are a great example of how to encourage pupils to look closely at questions and consider how small changes can make a difference to the given answer. This strategy enables children to find connections and apply known facts to solve more complex problems.

During the presentation, Gareth shared with leaders strategies on how to ensure pupils do not focus on answer getting when problem-solving but instead focus on understanding and comprehending a problem. He referred to the following quote by Givvin and Stigler (2019), ***"Removing opportunities to calculate improves students' performance on subsequent word problems."*** We have recently been focusing upon routine and non-routine problems during our core provision sessions and how to teach pupils to independently understand problems. Gareth suggested that we take away the *answer getting* aspect of the problem to enable pupils to focus on making connections between problems.



More Than, Less Than **Task B Version 2**

Question:	Finish the bar model and answer:
Pete has 125 stickers. Joe has 35 stickers fewer than Pete. **How many stickers do they have altogether?**	P 125; J ? 35; ? 1. 125 − 35 = 90 2. 125 + 90 = 215 215
Zack has £324. Zack has £108 less than Harry. **How much money does Harry have?**	H ?; Z 324 108; 1. 324 + 108 = 432 432
Jen has £70. Jen has £22 more than Amy. **How much money do Jen and Amy have in total?**	J 70; A ? 22; ? 1. 70 − 22 = 48 2. 48 + 70 = 118 118

I particularly liked the examples that were shared with us that used faded scaffolds whilst encouraging children to focus on the structure of a problem. The part completed problems enables children to start from a place of confidence. The small differences between each question enables children to make connections, and the task design encourages pupils to solve a problem independently.

Every idea and strategy that Gareth shared with us has been used with children in schools and then adjusted based upon the feedback from pupils and teachers. His ideas and strategies will support children to become independent problem-solvers and mathematicians that are able to discuss and reason their choices when completing a question. A lot of Gareth's work that was shared at the conference can be found in his new resource called, *Deconstructing word problems*. This is a brilliant resource that comes with varied tasks and support on how to deliver the activity. For more information on any of Gareth's work, you can visit his website: www.iseemaths.com.

I want to conclude this article by extending a heartfelt thank you to Gareth Metcalfe for his truly inspiring conference. I am eager to visit schools soon and witness firsthand the implementation of some of Gareth's practical ideas and suggestions.

Kate Spencer

Primary Lead Inspector/Adviser for Mathematics, HIAS

References

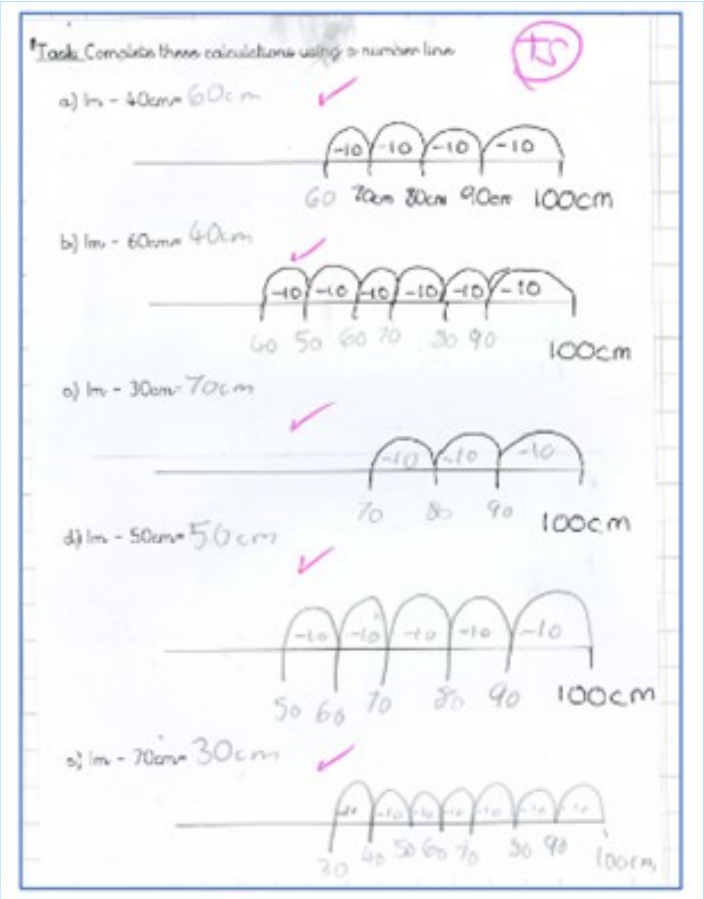
- Givvin KB, Moroz V, Loftus W, Stigler JW (2019) *Removing opportunities to calculate improves students' performance on subsequent word problems.* https://pmc.ncbi.nlm.nih.gov/articles/PMC6635520/ Cogn Res Princ Implic.

The impact of faded scaffolds at Orchard Lea Federation

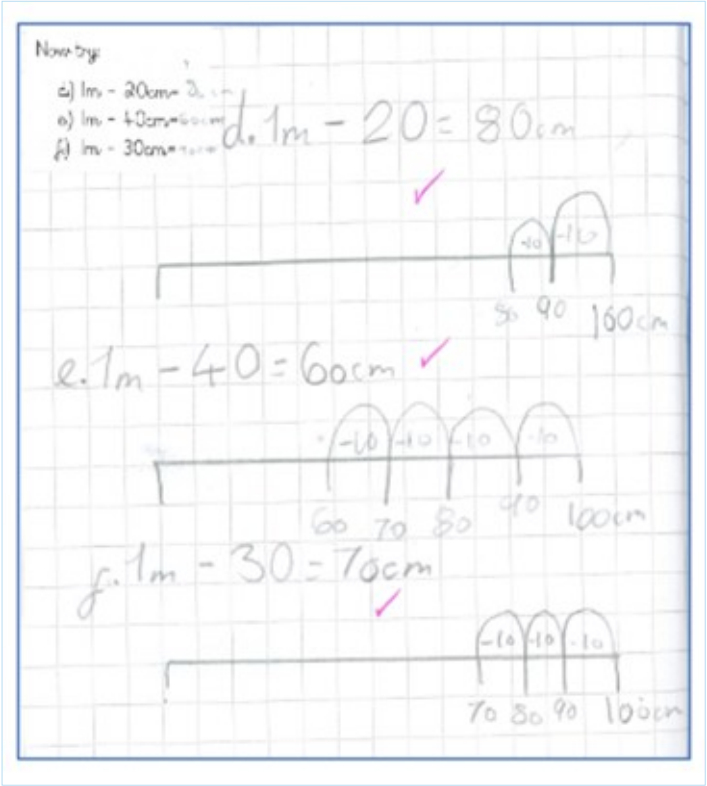
At Orchard Lea Federation, we recently received training from HIAS on implementing faded scaffolds across the Federation to better support pupils working just below age-related expectations. Here it was explained the intent behind the resource in allowing a scaffold to be removed at a slower pace to allow children to understand each step, prevent pupils from becoming overwhelmed and to promote independence. This approach has been highly successful, already boosting children's confidence, engagement, resilience, and attainment in maths.

Girls in maths

One significant impact of using faded scaffolds has been their role in closing the attainment gap between girls and boys in mathematics. This year, our school has focused on supporting girls in mathematics, following data that revealed a 10-20% attainment gap between boys and girls.



To address this, we have implemented a range of strategies, with faded scaffolds playing a key role. Pupil conferencing revealed that many girls lacked confidence and feared making mistakes, often preferring to stay with the teacher until they felt certain they could complete a task correctly. By implementing faded scaffolds, we have provided structured support and modelling before gradually encouraging independent work. By successfully completing the faded scaffold, the girls gained confidence and were eager to begin independent tasks with a greater sense of self-assurance and autonomy.



Increased independence

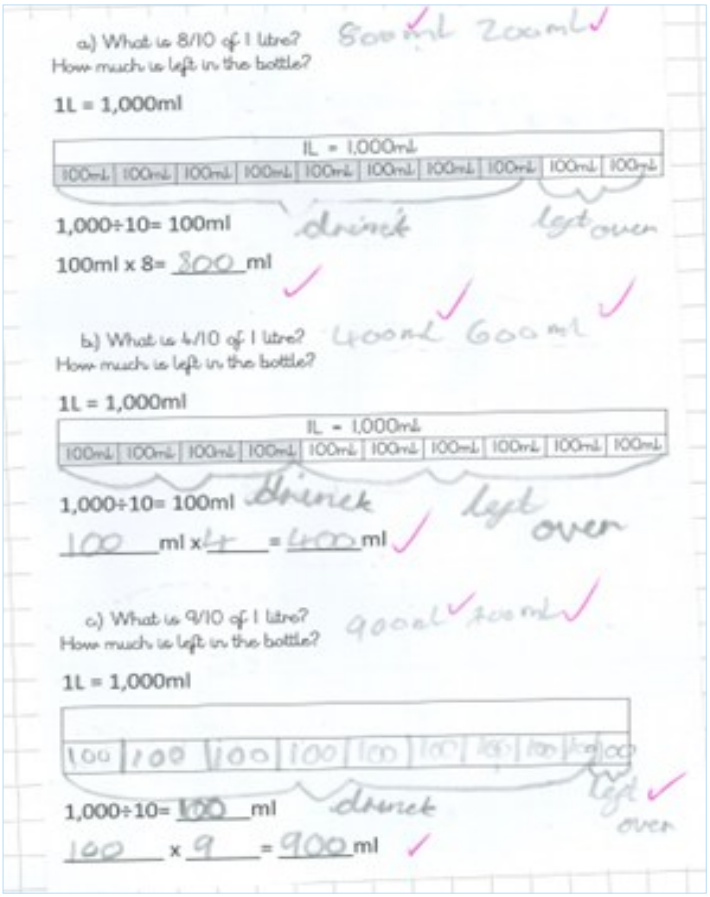
Another key benefit of using faded scaffolds has been an increase in children's independence and a reduction in over-reliance on teacher support. Before implementing this approach, a significant amount of teacher and learning support assistant (LSA) time was spent switching between supporting special educational needs and disabilities (SEND) pupils and those working just below age-related expectations.

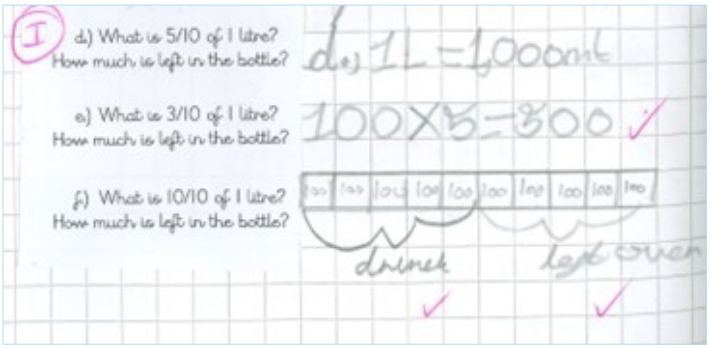
However, as a school, we have found that by gradually reducing steps and cognitive load, children's confidence has grown, making them less dependent on adult support. They now refer back to the structured scaffolding, enabling them to complete tasks independently. Pupils who have started the lesson using this resource have then frequently been moved onto the intelligent practice with enthusiasm, a clear understanding of steps and how to present their working out.

Teacher assessment

Another key impact of using faded scaffolds has been in supporting teacher assessment. As a school, we have worked to strengthen teachers' ability to make accurate judgements in maths. Faded scaffolds have contributed to this by providing clear evidence of children's progress – showing both their supported work and their ability to complete independent tasks.

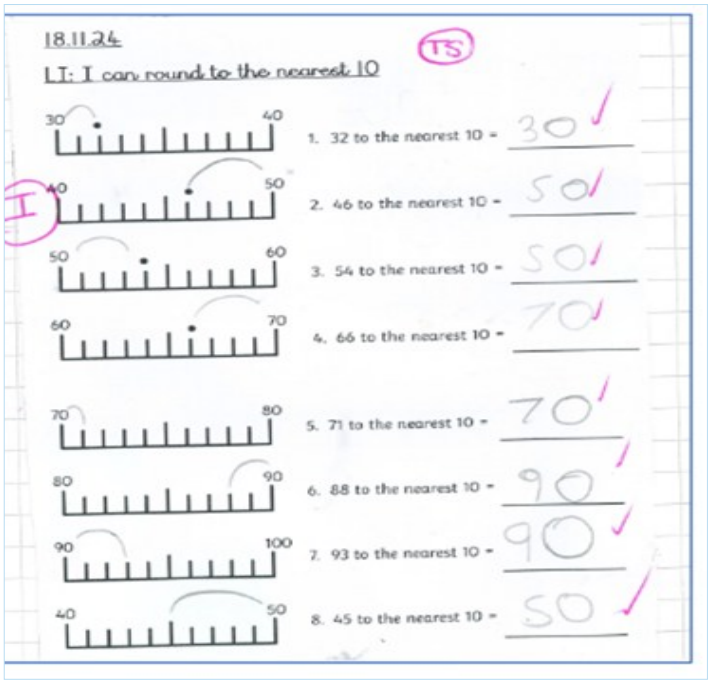
This has enabled teachers to more accurately assess whether children are working at age-related expectations.

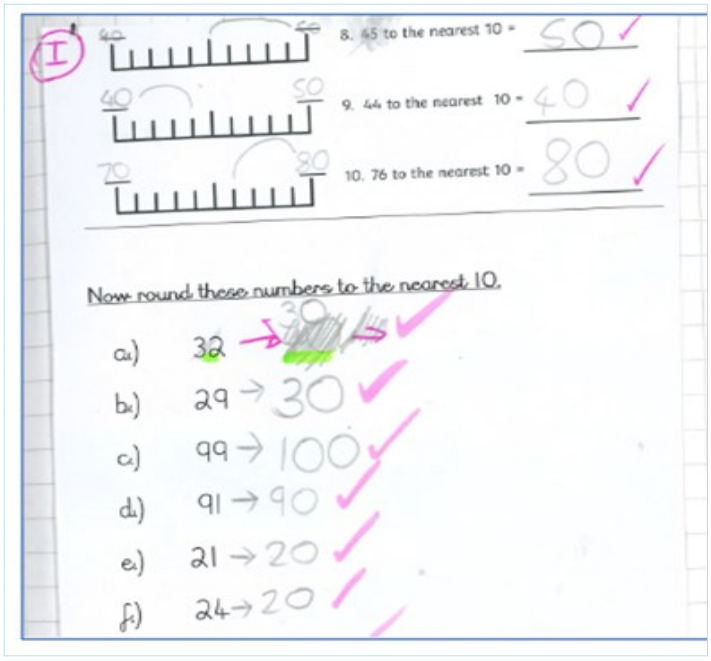




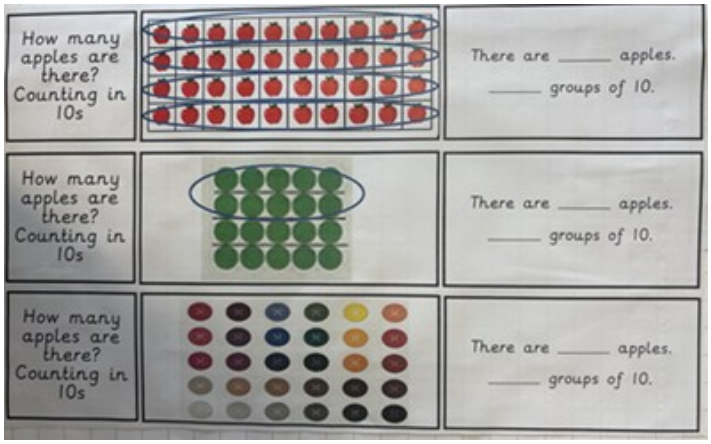
Teacher confidence

Another key impact of using faded scaffolds has been the increase in teacher confidence when planning and supporting pupils working just below age-related expectations. Previously, these pupils were often supported through adult support within age-related tasks, which led to an over-reliance on teacher support. Teachers now have greater confidence in planning and ensure that these pupils are supported through adapted task design, fostering independence and reducing reliance on adult support.





The faded scaffolds have provided a good example of task variation which has changed the way we now plan our maths lessons.

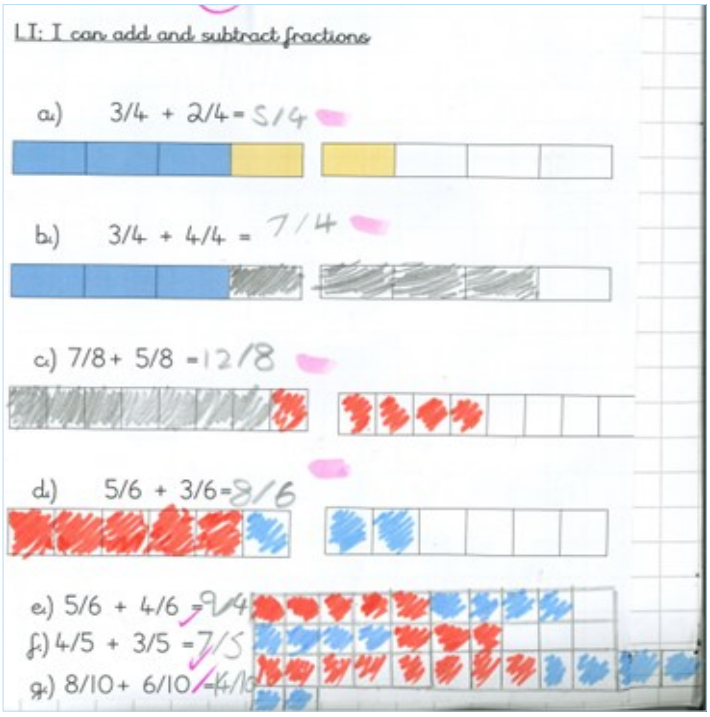


They have become an embedded resource within our school with staff now having the confidence to create their own faded scaffolds for everyday lessons.

Supporting pupils with SEND

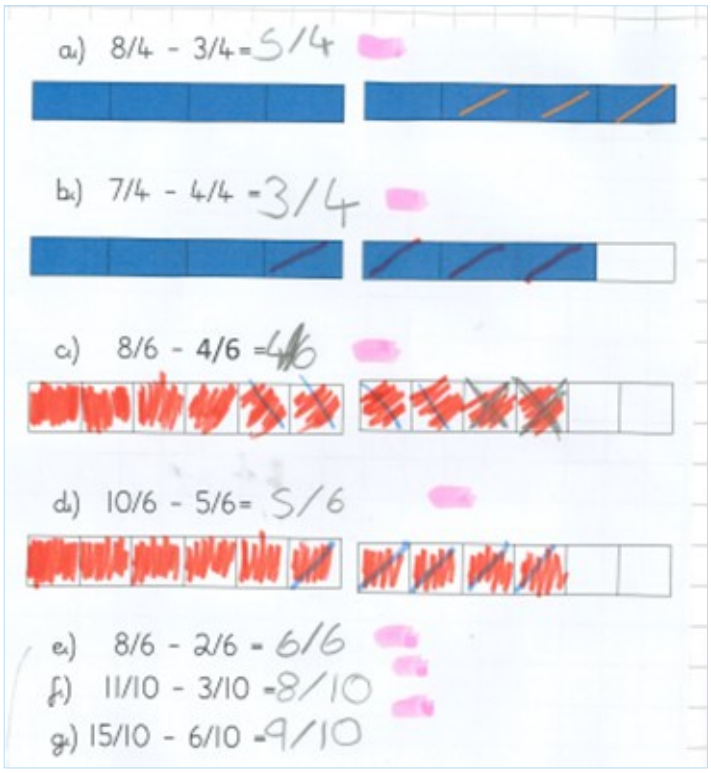
In addition to using the faded scaffold for our close-to pupils, we have also adapted it for our SEND pupils.

Like their peers, these pupils often relied heavily on adult support and were consistently given fully scaffolded tasks, limiting opportunities to work independently.

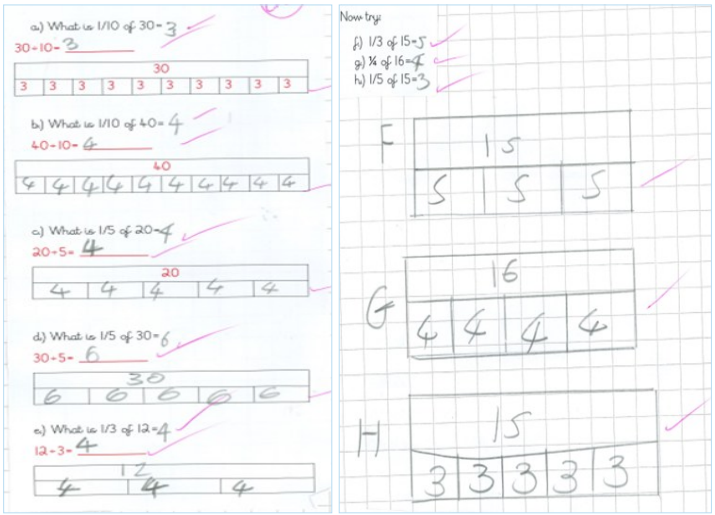


Faded scaffold.

This faded scaffold closely resembled the one designed for our close-to pupils; however, we tailored it to meet the specific needs of our SEND pupils. Adjustments were made, such as adapting the numbers based on the objectives they were working on, ensuring the support was appropriately matched to their learning needs. By gradually reducing support, we have encouraged greater autonomy, enabling SEND pupils to engage effectively and build confidence in their abilities.



Faded scaffold.

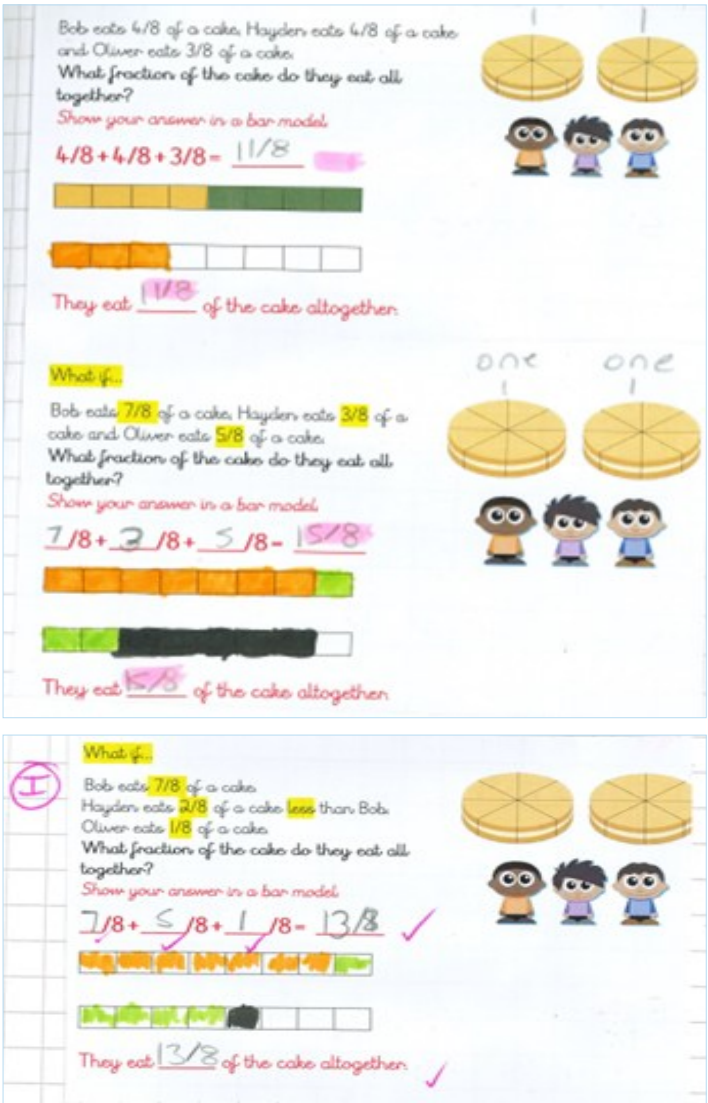


Independent practice.

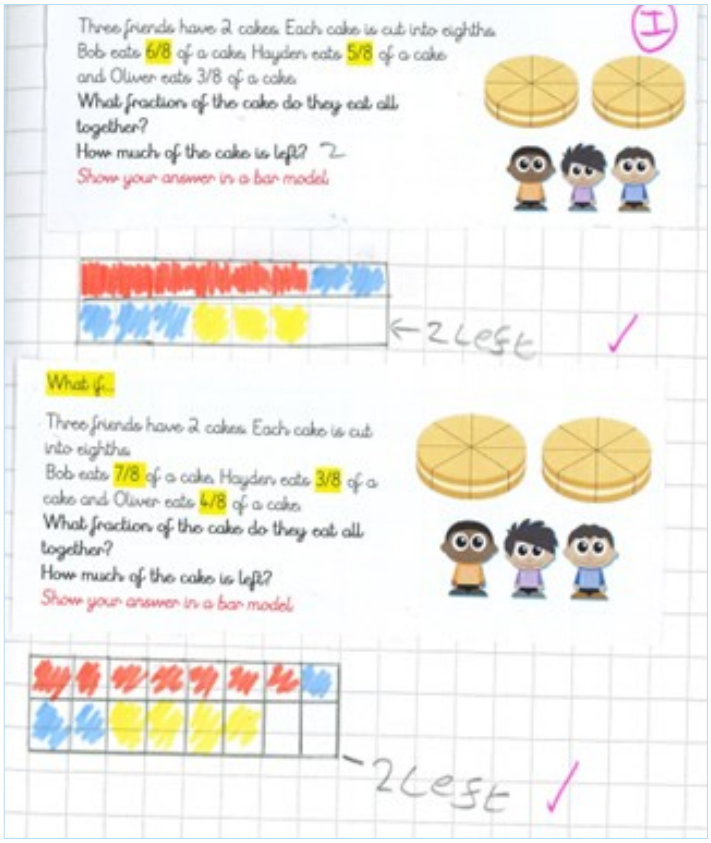
Problem solving faded scaffold

At Orchard Lea Federation, we have used the concept of faded scaffolds to create resources in order to support SEND and close-to pupils in problem-solving. As a school we ensure that all children access reasoning and problem-solving tasks by varying the problems (changing numbers, steps required to complete).

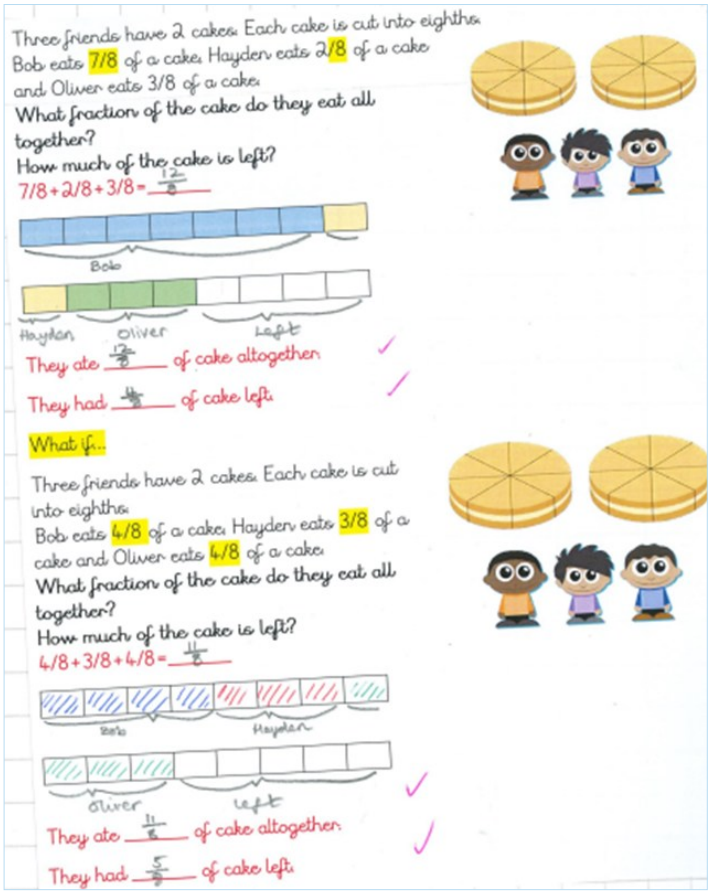
By modelling the necessary steps, this approach has helped overcome key learning barriers, enabling students to access problem-solving tasks alongside their peers while reducing cognitive load. The structured support allows children to tackle problems with greater independence and confidence, often progressing to complete tasks without any scaffold.



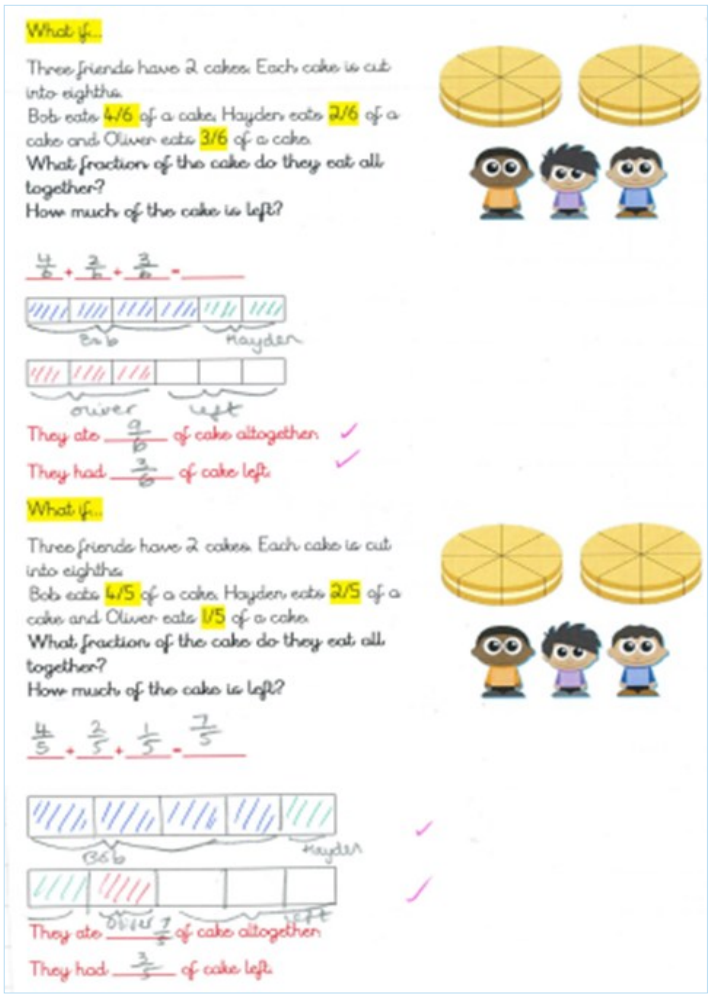
SEND problem solving using the faded scaffold.



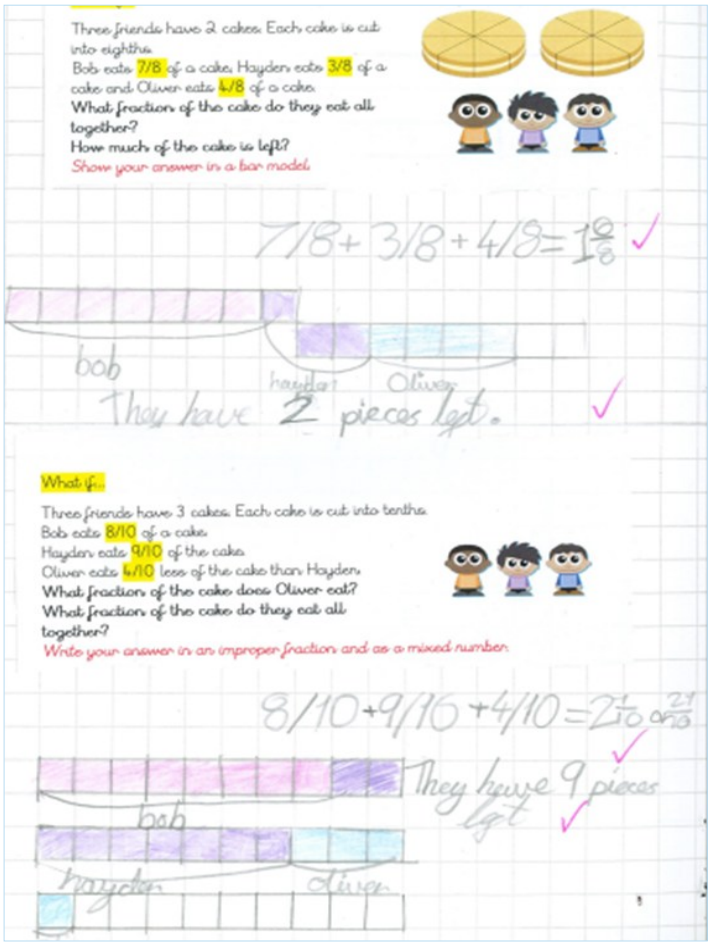
SEND problem solving using the faded scaffold.



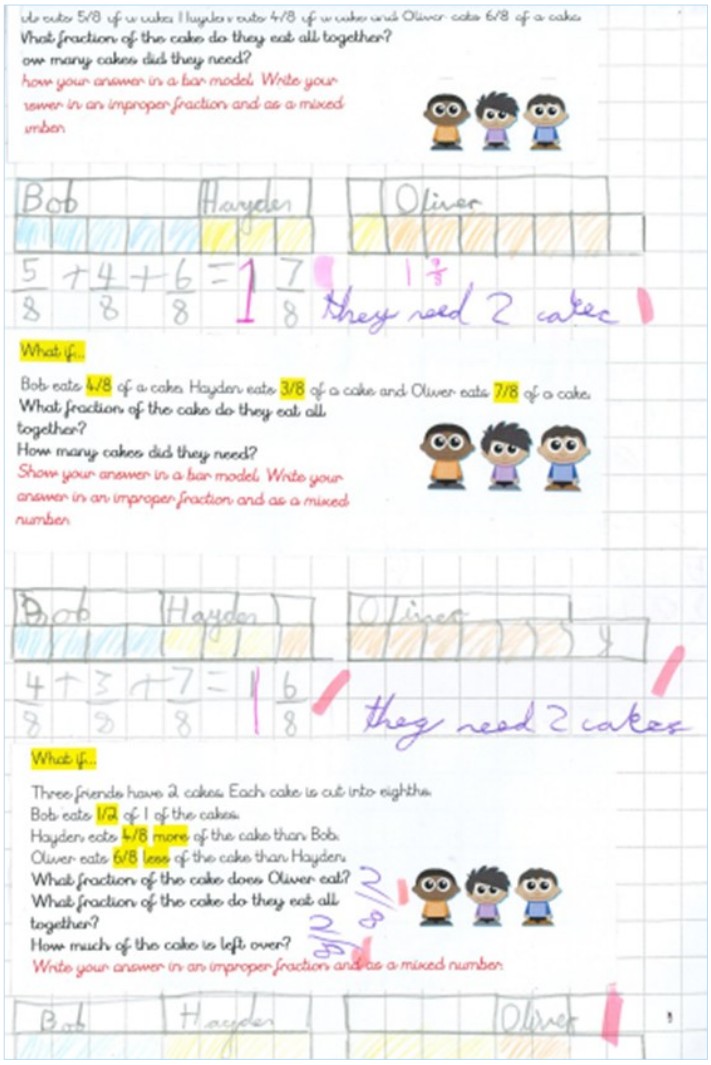
Close to – faded scaffold.



Close to – faded scaffold.



Age-related expectations (ARE).



Greater depth (GD).

Sophie Laverick and Beth Callow

Mathematics Managers, Orchard Lea Federation

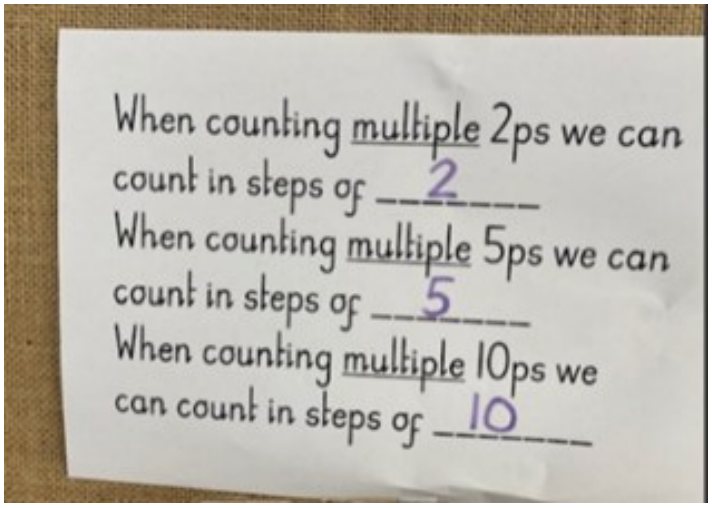
Our mathematics oracy journey – Calmore Infant School

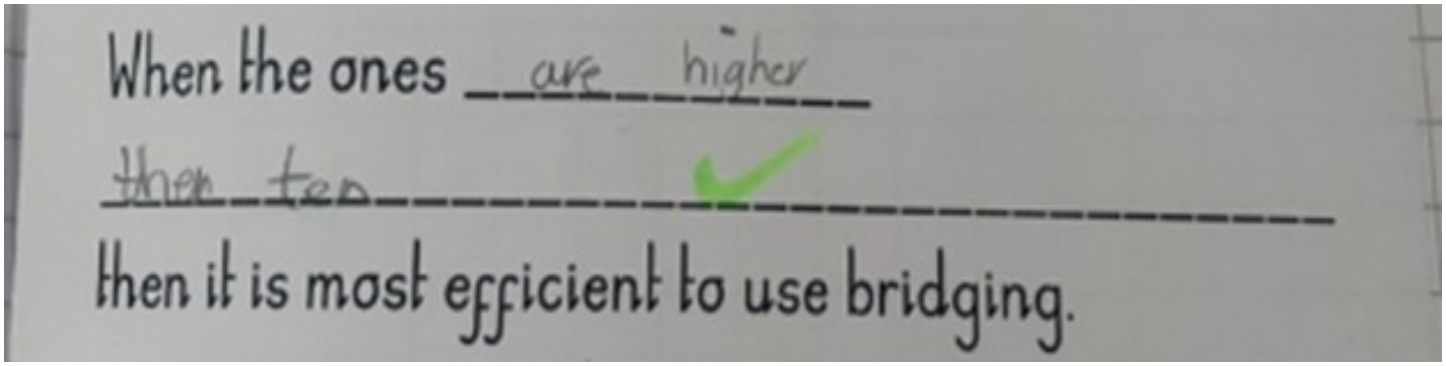
Along with many other schools in Hampshire and nationally, a huge current focus of ours is oracy. We recognised a common trend in how children were lacking communication, speech and language skills needed to access the curriculum at a deeper level. We have thought carefully about how we can improve children's language across all subjects and in maths. We have been working with Solent Maths Hub as part of the teaching for mastery programme to improve opportunities and the quality of speech and language in maths at our school.

The idea of *talk partners* is something we had previously used but as a staff team, however, we noticed the quality of conversation was poor and often children did not know what to say to one another. Children were also unsure how to effectively converse and we realised we had to take oracy back to basics, we had to teach children how to converse with each other in order for them to have rich maths discussions. We set some non-negotiables with the children that should be followed in order to be a good talker and a good listener. We spoke about how we need to be facing each other, making eye contact and focussing our brains on what our partner is saying. The children are partnered with another child and they become talk partners across all subjects to ensure a relationship is formed and continually built upon. After a few weeks of practising basic conversation skills, the children were ready to talk about maths. We now use talk partners as a vital part of maths, especially during input times. The children have many opportunities to discuss what they think and share their ideas with their peers.

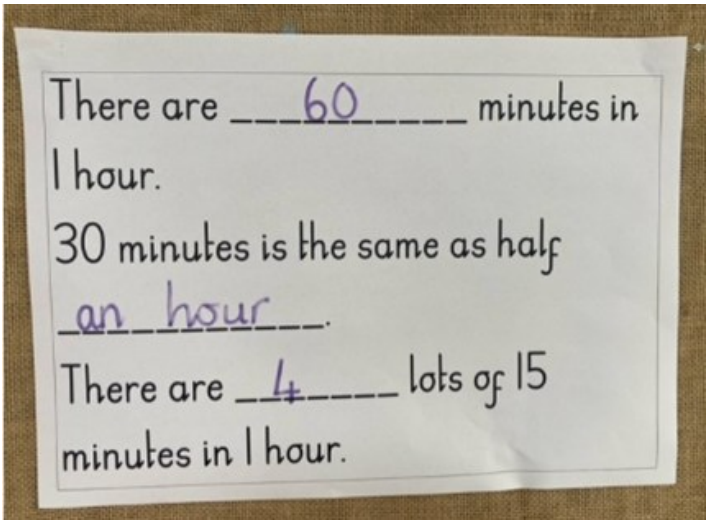
Instead of *hands up*, children will be encouraged to talk to their partner and share their ideas before potentially sharing with the class. This is also a more inclusive approach as there is increased participation in mathematical thinking and instead of one person sharing their answer or idea, everyone shares with each other.

Once the basics of speaking and listening in maths were embedded, I delivered some training as part of a staff meeting around the benefits of using stem sentences in maths to support rich mathematical discussions. I was able to demonstrate to staff how they could support our children, not only with engaging in meaningful mathematical talk but also in developing children's reasoning and articulation of their metacognitive processes. We found using stem sentences that generalised or summarised the concept to be the most effective as children were able to refer back to these as a retrieval point as well. We ensured we started with simple stem sentences that required children to fill in the blank parts or the ending.





We also wanted to encourage children to speak in full sentences when answering maths questions or explaining their reasoning. Stem sentences are powerful in doing this as they give children a starting point to begin to explain their reasoning and often provide them with the correct key vocabulary needed to explain their thought process. An example of how this has worked well was when teaching intervals of time to Year 2. The lesson started with this sentence stem and a bar model was used to demonstrate equivalent intervals of time.



As part of the plenary, the children were asked if they could give any examples of intervals of time that were equivalent to one hour. Child A answered:

"Two lots of 30 minutes."

I then asked the child if they could use the stem sentence from the beginning of the lesson to give their answer in a full sentence and explain to me how they know. This was their new answer:

"Two lots of 30 minutes are the same as 1 hour because 30 minutes and 30 minutes adds up to 60 minutes which is an hour."

The child's new answer demonstrated their reasoning as well as allowing them to draw on their known number facts (30+30=60) to show their full understanding of the concept. Since we have had an increased focus on stem sentences, staff collectively have noticed a difference in children's abilities to reason and have found they are doing this more naturally without prompt due to them having the correct vocabulary and confidence to do so.

As a mathematics leader, I have to ensure I am supporting staff in teaching and using precise mathematical vocabulary to ensure it is embedded and is not an *add on* to lessons. During the initial staff meeting, a discussion arose which suggested there was uncertainty around the vocabulary that should be taught in each year group. For example, should the word **commutative** be taught in Year 1? Year 1 are likely to come across the concept when exploring addition facts/number bonds within 20 but it is not explicitly taught until Year 2, according to the National Curriculum.

These professional conversations allowed me to understand the barriers that staff may face when implementing a new *talk rich* mathematics curriculum. To support staff, I have created a maths vocabulary progression document which outlines key vocabulary and when it should be taught. Of course it allows for fluidity as there will be opportunities that arise to explore concepts linked to vocabulary but my intention is that it will give staff a guide as to the vocabulary expectations and will hopefully provide them with confidence to use and teach the key vocabulary that we want our children to use.

As always, when introducing new initiatives, it is important that expectations of impact and time frames are realistic and we are still very much on the journey with lots more to explore. However, this is a journey that we are excited to be on and we know long-term, will have a massive impact on teaching and learning.

Grace Abraham

Mathematics Leader and Year 2 Teacher,
Calmore Infant School

Number Day – Wallisdean Federated Schools

Wallisdean Federated Schools were delighted to join hundreds of other schools to support and raise money for the NSPCC by taking part in Number Day on Friday 7 February 2025. It was a great way to make maths fun and bring about a positive, *can-do* attitude towards it. Many children chose to take part in *dress up for digits* for a donation and came to school wearing an item of clothing with a number, mathematical shape or pattern.

Wallisdean Pre-School had fun playing around with numbers and shapes. They used number puppets to sing rhymes, used playdough to form their dough into a numeral and had great fun building towers with the numbered bricks. They also went on a hunt digging in the sand tray looking for the hidden numbers. They drew around shapes and tried to match the different shapes to the shadows and had a fun music and movement session dancing and moving to number songs.

In Year R, they made their own foot ruler by carefully drawing around their feet and cutting it out. They then measured the length of a variety of objects using their foot ruler, estimating how many they thought it would be first.

In Year 1, they completed the adding animals activity. The children looked at a picture and had a go at creating their own stories by adding sentences. They represented their sentences in different ways using part-part whole models and tens frames.

In Year 2, two money games were played; coin pairs where they had to turn the coins and amounts over and try to match them – the player with the most cards at the end was the winner! Coin snap was also played. Some children had a go at Milo's money challenge where they had to work out how long it would take for Milo to save up for his toys. In addition to this, the children at Wallisdean Infant School, completed a big maths activity. Certificates were awarded for the highest score from each class.

In Wallisdean Junior School the children took part in a range of mathematical activities. These included: Who wants to be a mathionaire? Number garden, Number bots enter the scrapyard, Olex mystery and the magic of compounding activity. All the children took part in the *NSPCC Rocks* challenge on rockstars – they had the exciting challenge of correctly answering as many multiplication and division questions as possible in a maximum time of one hour. Classes and pupils competed against each other and certificates were awarded for the top three scoring classes and top three scoring pupils across the school and in each class. Some children even continued the challenge at home! We were proud to reach the position of 325th across the country!

Overall, Number Day was a great success and the money raised will help to fund vital services for the NSPCC such as Childline.

Michelle Marum

Mathematics Leader, Wallisdean Junior School

Mastering number facts: a foundation for Key Stage 1 success

Number facts are the foundation of mathematical understanding. At Key Stage 1, securing these foundational skills is crucial for pupils to confidently progress through the curriculum and beyond.

Mastery of basic number facts reduces cognitive loads, allowing pupils to tackle more complex problems with greater confidence.

As part of the Department for Education (DfE) Ready to progress appendices, the full set of addition calculations that pupils need to be able to solve with automaticity are shown (see image below).

Pupils must also be able to solve the corresponding subtraction calculations.

Number bonds, adding 1, doubles, near doubles and bridging are all skills which require explicit teaching and regular opportunities to practise. This is essential for understanding more advanced mathematical concepts like multiplication, division and fractions.

+	0	1	2	3	4	5	6	7	8	9	10
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+10
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	2+10
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7	3+8	3+9	3+10
4	4+0	4+1	4+2	4+3	4+4	4+5	4+6	4+7	4+8	4+9	4+10
5	5+0	5+1	5+2	5+3	5+4	5+5	5+6	5+7	5+8	5+9	5+10
6	6+0	6+1	6+2	6+3	6+4	6+5	6+6	6+7	6+8	6+9	6+10
7	7+0	7+1	7+2	7+3	7+4	7+5	7+6	7+7	7+8	7+9	7+10
8	8+0	8+1	8+2	8+3	8+4	8+5	8+6	8+7	8+8	8+9	8+10
9	9+0	9+1	9+2	9+3	9+4	9+5	9+6	9+7	9+8	9+9	9+10
10	10+0	10+1	10+2	10+3	10+4	10+5	10+6	10+7	10+8	10+9	10+10

Strategies for mastering number facts

Concrete experiences

Concrete manipulatives like counters, rekenreks, tens frames and number lines will enable pupils to develop *number sense*, understanding of the cardinality of numbers, their various compositions and their relative positions in the linear number system.

Language focus

"I know that double 3 is equal to 6, so 4 plus 3 is equal to 7."

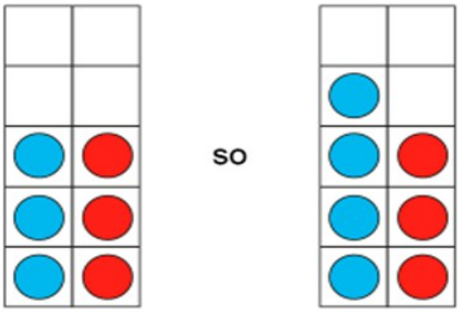
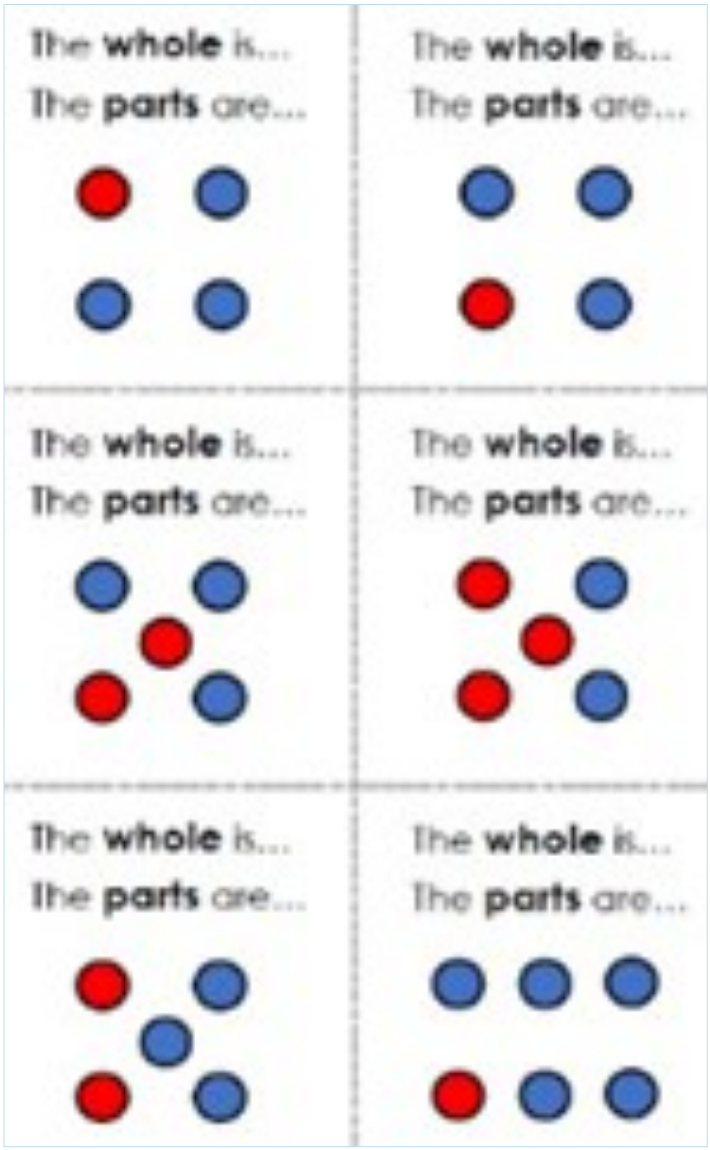


Figure 10: tens frames with counters showing derivation of a 'near-double' addition calculation

Ready to Progress, 1NF-1.



I See Maths.

Visual representations

Using pictorial models and images such as hundred squares, part-whole models and dot patterns aids memory and recall. Effective subitising practice using a variety of models and images will support pupils' understanding of the cardinal principle. Combining the ability to immediately recognise amounts up to four (perceptual subitising) and knowledge of number bonds, different arrangements of visual representations will emphasise the different composition of numbers.

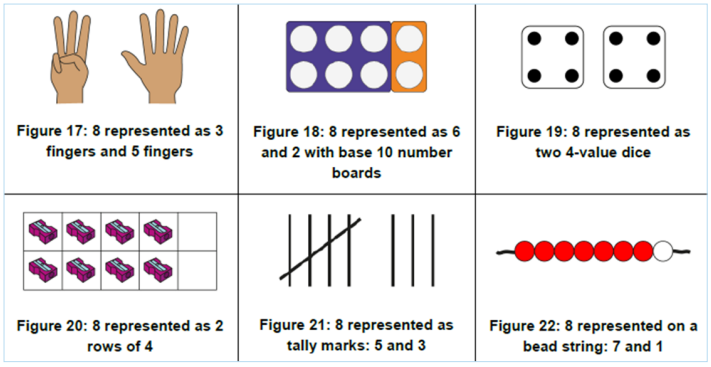


Figure 17: 8 represented as 3 fingers and 5 fingers

Figure 18: 8 represented as 6 and 2 with base 10 number boards

Figure 19: 8 represented as two 4-value dice

Figure 20: 8 represented as 2 rows of 4

Figure 21: 8 represented as tally marks: 5 and 3

Figure 22: 8 represented on a bead string: 7 and 1

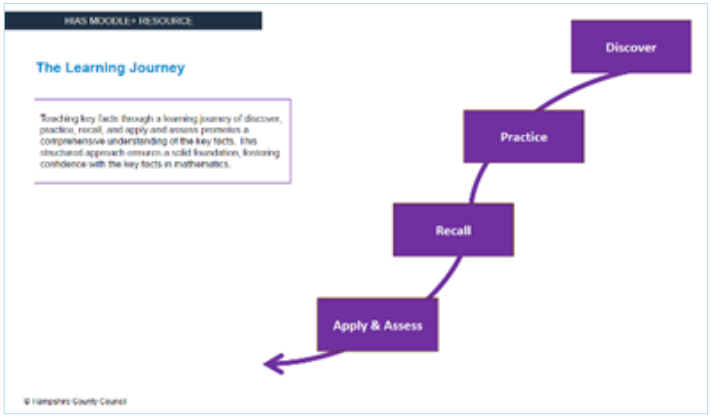
Ready to Progress, 1AS-1.

Regular practice

Consistent, short practice sessions are more effective than infrequent, long ones. Our new Moodle+ resource, *Mastering key facts in Key Stage 1* offers a range of suggested tasks and activities designed to support the development of essential number facts through a learning journey of discover, practice, recall, and apply and assess.

Available to Moodle+ subscribers: https://maths.hias.hants.gov.uk/enrol/index.php?id=521.

To find out more about what Moodle+ has to offer and to subscribe: https://maths.hias.hants.gov.uk/course/index.php?categoryid=85.

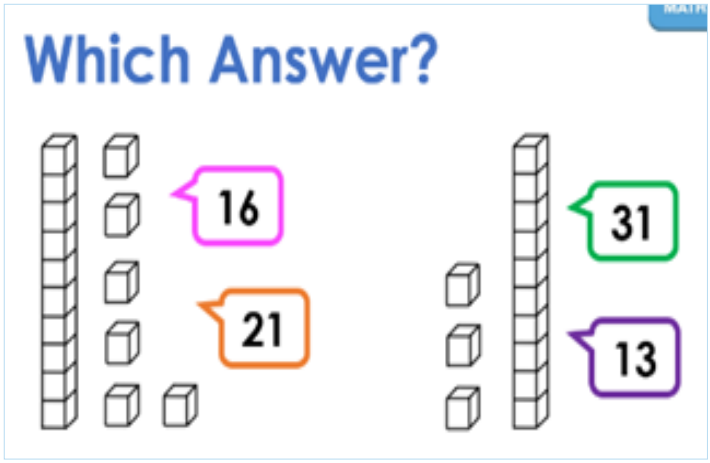


Number talk

Facilitate short, focused discussions about number relationships. Encourage pupils to share their strategies and reasoning, fostering deeper understanding.

At the 2025 mathematics conference, Gareth Metcalfe outlined strategies to raise the internal narrative:

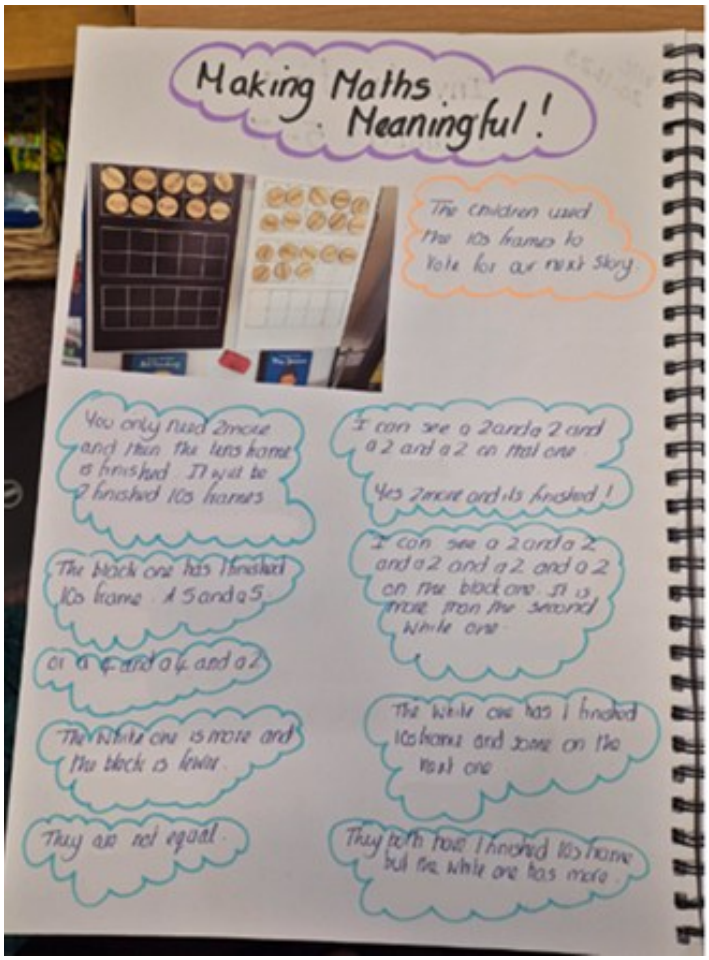
- utilise manipulatives and visual representations
- create a culture of mathematical thinking
- focus on the *why* and not the *how*.

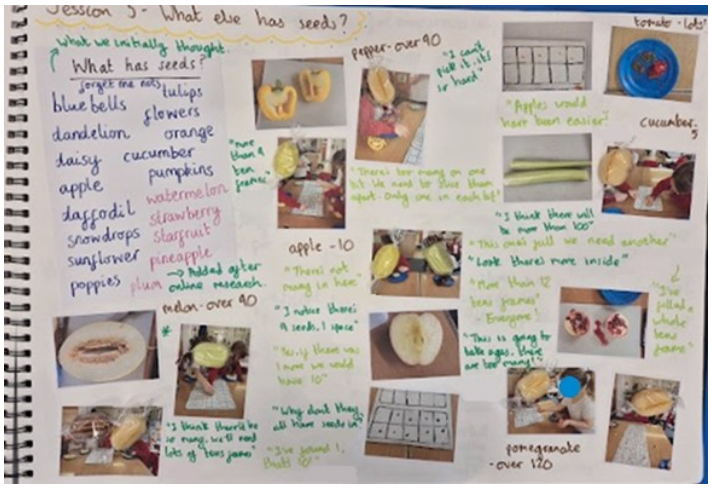


I See Maths.

Real-life contexts

These Early Years Foundation Stage (EYFS) big books illustrate how to connect number facts to real-life situations. Drawing on training from Karen Wilding, EY Maths 3-7, children delve into mathematical concepts across various contexts, with questions designed to deepen their understanding.





Varied questioning

Use a variety of question types to encourage flexible thinking.

Instead of just asking *what is 5 + 3?*, try *what number is 3 more than 5?* or *how many different ways can you make 8?*

Assessment and monitoring

Set up systems for tracking and monitoring number facts knowledge through quick quizzes, observations and oral questioning.

Use assessment data to identify areas where pupils need additional support.

Provide targeted interventions and appropriate scaffolds to address individual needs.

By implementing these strategies, teachers and learning support assistants can create a strong foundation for mathematical success in Key Stage 1 and empower pupils to become confident and fluent mathematicians. Number facts are not just about rote learning and memory; they are about developing a deep understanding of number relationships that will support pupils as they progress through their mathematical journey.

Olivia Goodburn

Mathematics Teaching and Learning Adviser, HIAS

References

- Mathematics guidance: key stages 1 and 2 (Ready to Progress Years 1 to 6): https://assets.publishing.service.gov.uk/media/6140b7008fa8f503ba3dc8d1/Maths_guidance_KS_1_and_2.pdf.
- I See Maths - Gareth Metcalfe Primary Maths Consultancy: www.iseemaths.com/.
- EYMaths Home Page: www.eymaths.co.uk/.
- Moodle+: Mastering Key Stage 1 Key Facts Document: https://maths.hias.hants.gov.uk/course/view.php?id=521.

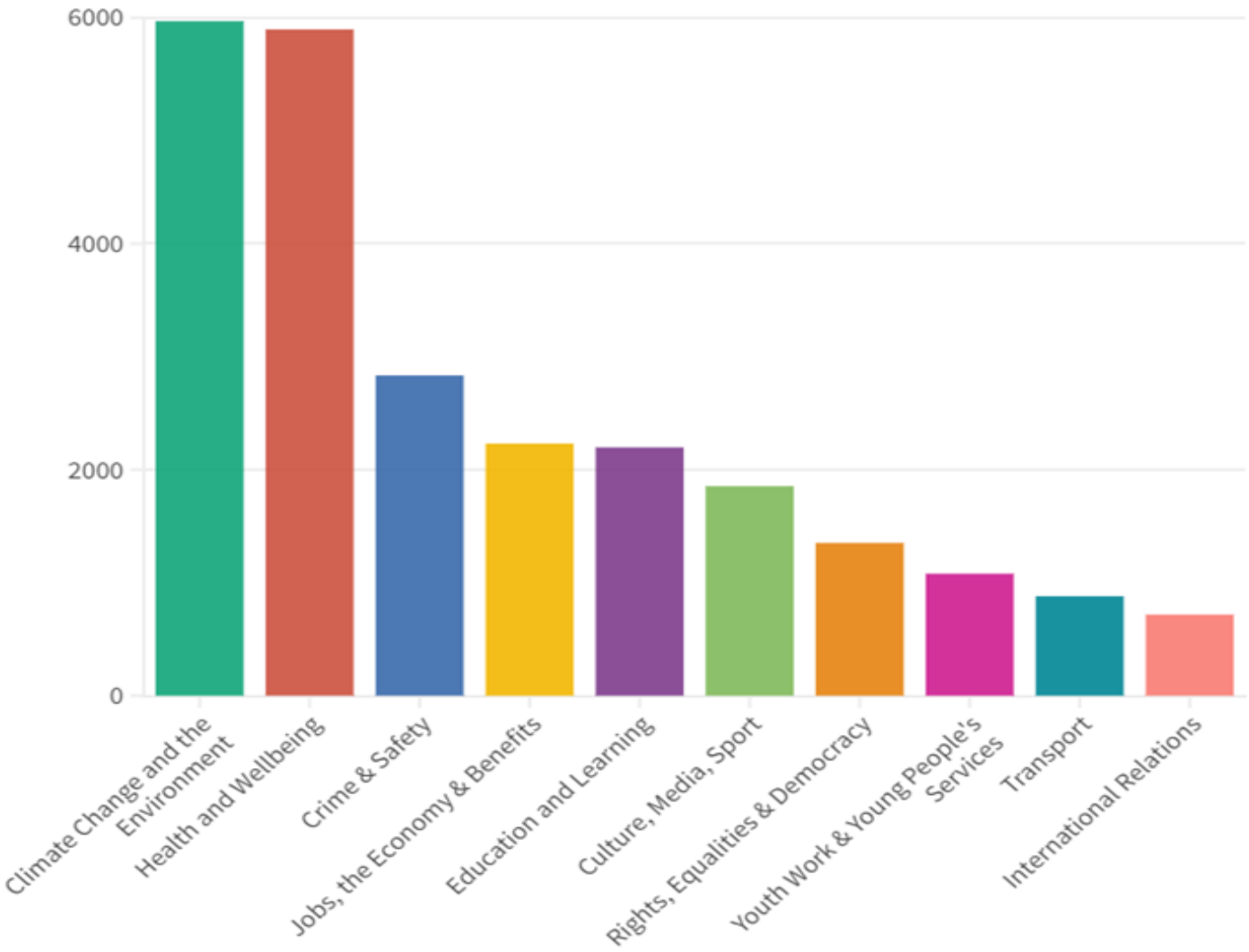
Sustainability in mathematics

Sustainability in schools

In recent years, the growing concern over climate change has become a defining issue of our time. From unprecedented heatwaves and devastating wildfires, to rising sea levels and severe storms, the impacts of a warming planet are becoming increasingly evident. *"The biggest ever standalone public opinion survey on climate change, The People's Climate Vote 2024 (https://peoplesclimate.vote), shows 80 percent – or four out of five – people globally want their governments to take stronger action to tackle the climate crisis."* (Source: www.undp.org/press-releases/80-percent-people-globally-want-stronger-climate-action-governments-according-un-development-programme-survey.)

This heightened awareness is not just confined to scientists and environmentalists; it has permeated all sectors, including the education sector. School leaders and our students are increasingly alert to the need to support and promote climate education and to mitigate the impact our school buildings and community have on our environment. Earlier this year Hampshire's young people voted climate change and the environment as their top concern. More than 25,000 young people across Hampshire took part in the UK's biggest youth consultation (www.hants.gov.uk/News/20240522youthclimate).

The Make Your Mark 2024 Hampshire survey results



Source: Make Your Mark | Hampshire Youth Parliament (hampshireyp.org).

DfE sustainability and climate change for schools' guidance

The 2022 policy paper from the DfE[1] set an ambitious vision of the UK becoming the world's leading education sector in sustainability and climate change by 2030 (DfE, 2022) as outlined below:

"Vision: the United Kingdom is the world-leading education sector in sustainability and climate change by 2030.

"In England, we will achieve this through the following strategic aims:

1. *excellence in education and skills for a changing world: preparing all young people for a world impacted by climate change through learning and practical experience*
2. *net zero: reducing direct and indirect emissions from education and care buildings, driving innovation to meet legislative targets and providing opportunities for children and young people to engage practically in the transition to net zero*
3. *resilience to climate change: adapting our education and care buildings and system to prepare for the effects of climate change*
4. *a better environment for future generations: enhancing biodiversity, improving air quality and increasing access to, and connection with, nature in and around education and care settings."*

Source: www.gov.uk/government/publications/sustainability-and-climate-change-strategy/sustainability-and-climate-change-a-strategy-for-the-education-and-childrens-services-systems.

This guidance is not statutory. Instead, it sets out a key initiative for all schools to have a **nominated sustainability lead and a climate action plan in place for 2025**. The guidance breaks down the vision to provide **five areas** where schools and educators should focus:

1. **climate education**
2. green skills and careers
3. educational estate and digital infrastructure
4. operation and supply chains
5. international.

Climate education and sustainability in mathematics

"If you want to help solve many of the big problems facing the world, including climate change, you can really help if you start with a good understanding of maths. The science and engineering needed cannot progress without it. I know this from my own experience of working on climate modelling for many years…"

Professor Vicky Pope, Chair of MEI, https://mei.org.uk/about-mei/what-we-do/current-projects-and-programmes/climate-change-and-sustainability-as-context-in-maths-teaching/.

Mathematical insight is key to understanding the world around us and our impact on it. A good maths education is vital to begin solving some of the problems our world faces.

Following the publication of the Department for Education's strategy for sustainability and climate change[2] in April 2022, schools are increasingly including climate and sustainability within their development plans and looking for ways to engage students with those issues.

What do we mean by sustainability in mathematics?

In mathematics, sustainability is best described as the use of mathematical models and methods to address and understand sustainability issues. Mathematics can help people make decisions about sustainability by providing quantitative reasoning skills.

- **Mathematical models** can describe environmental and social realities using abstract equations, graphing, diagrammatic prompts and real-life manipulatives. Mathematical modelling can link across the curriculum to many areas such as science and geography, enabling predictions and hypotheses to form around the cause and effect of climate change.

- **Quantitative reasoning skills** such as logical thinking, statistics and calculation linked to problem solving enable us to understand sustainability concepts and make sense of the world around us.
- **Evaluating sustainability** in quantitative terms can be achieved through mathematical modelling. This involves considering the indicators and processes concerned with climate change and the interrelations between these factors.

What should a mathematics curriculum with sustainability integrated look like?

- Consider relevant topics in your existing scheme of work across each key stage. Integrate tasks and skills using mathematical modelling involving number, ratio and proportion, algebra, geometry, probability and statistics.
- As with all real-life maths, sustainability issues need to be introduced in a seamless way, without appearing artificial or contrived. There needs to be a focus on core skills and fluency throughout. The National Curriculum for England (2013) has three core aims that support the integration of sustainability and real-life contexts:
  - fluency – *"become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately"*
  - problem-solving – *"reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language"*
  - reasoning – *"can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions."*[3]
- Students can be encouraged to engage with sustainability themes and explore their own questions.
- Students should be given opportunities to record measurements, compare values, and think about how to reduce waste.

Key Stage 3 curriculum mapping

This example has been created by Microsoft Co-Pilot. It adheres to the National Curriculum and was asked to ensure that there is progression in complexity of sustainability education over the three years:

	Year 7	Year 8	Year 9
Autumn	**Number and PV**: understanding large numbers and their impact on resources and sustainability. **FDP**: calculating percentages related to recycling rates and energy consumption. **Geometry**: exploring shapes and their properties through the design of sustainable buildings.	**Number and PV**: calculating the impact of population growth on resource consumption. **FDP**: analysing the efficiency of different energy sources. **Geometry**: investigating the use of geometric shapes in sustainable architecture.	**Number and PV**: evaluating the economic impact of sustainable practices. **FDP**: calculating the cost savings of renewable energy. **Geometry**: exploring the role of geometry in environmental engineering.

	Year 7	Year 8	Year 9
Spring	**Algebra**: introduction to algebraic expressions using real-world sustainability problems. **Statistics**: collecting and analysing data on local environmental issues. **Ratio and proportion**: understanding ratios in the context of sustainable resource allocation.	**Algebra**: solving equations related to environmental data. **Statistics**: interpreting graphs and charts on global warming and climate change. **Ratio and proportion**: applying ratios to understand the distribution of natural resources.	**Algebra**: modelling environmental data with algebraic equations. **Statistics**: conducting surveys on public attitudes towards sustainability. **Ratio and proportion**: understanding the ratios involved in sustainable agriculture.
Summer	**Measurement**: measuring and comparing carbon footprints. **Probability**: exploring the likelihood of environmental events and their impacts. **Geometry**: designing eco-friendly spaces using geometric principles.	**Measurement**: comparing the energy efficiency of various appliances. **Probability**: assessing the risk of natural disasters and their effects on communities. **Geometry**: planning sustainable urban developments using geometric concepts.	**Measurement**: analysing the water usage of different households. **Probability**: predicting the outcomes of environmental policies. **Geometry**: designing sustainable transportation systems using geometric principles.

The wealth of climate education resources for mathematics

Once you have conducted your audit and identified opportunities to explore climate education and build in further progression of knowledge over time the sheer volume of organisations offering teaching resources could seem quite daunting. The following organisations are well worth considering as a place to start.

1 **NRICH**[4]**:** this well-established organisation has an extensive range of tasks and enquiries that support climate change study within the mathematics curriculum. Put 'climate change' into the search facility to find lots of tasks with age guidance. **For example: Food web:** https://nrich.maths.org/problems/food-web. "*A simple ecosystem consists of ample **grass**, a herd of 50 **deer**, a nest of 2000 **rabbits**, a cast of 10 **hawks** and a sleuth of five **bears**. Deer and rabbits are herbivores, hawks only eat rabbits and bears eat both deer and rabbits. Draw a food web, showing how the animals in this ecosystem are fed and what the transfer of energy is.*

Discuss what would happen to the ecosystem if...

- *The deer began reproducing rapidly.*
- *Some of the rabbits migrated out of the area.*
- *The bears were hunted by humans.*

The average weight of the animals in this ecosystem is given in the table below:

Animal	**Weight**
Deer	150kg
Rabbit	1kg
Hawk	1kg
Bear	500kg

In the autumn, a bear needs to consume as much as 40kg of food a day as it prepares for its winter hibernation. A hawk will eat up to 1kg of food at a time, although it can then go without food for a day or two.

Rabbits reproduce quickly: a single female can produce up to 800 children, grandchildren and great-grandchildren over a season (February to October in the northern hemisphere, July to February in the southern hemisphere).

Is this eco-system sustainable over time?"

For example: carbon footprints: https://nrich.maths.org/problems/comparing-carbon-footprints.

"The data in this interactivity comes from the book How bad Are bananas?[5] by Mike Berners-Lee.

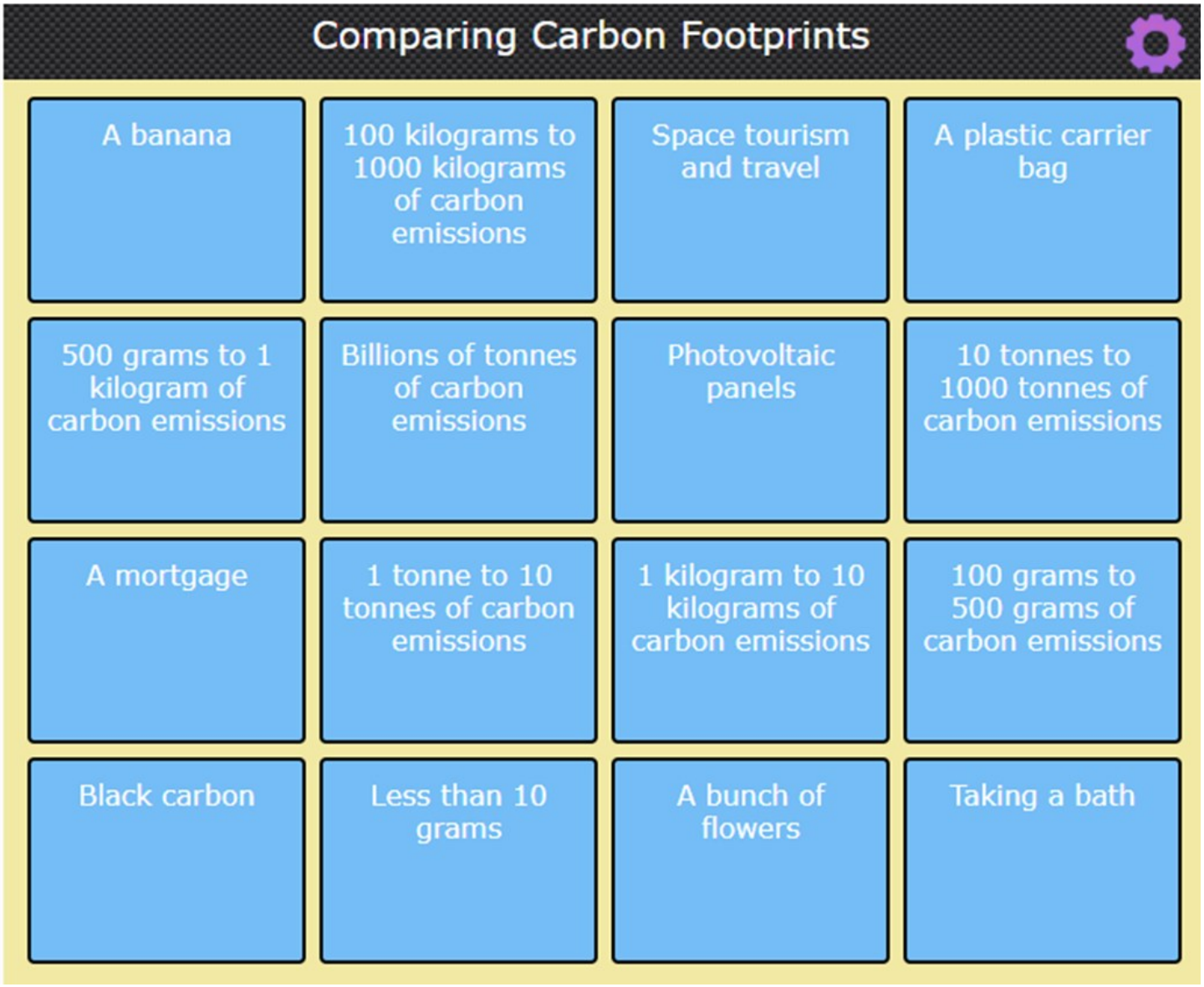
Here is a chance to gain a better understanding of how our lifestyle choices affect our carbon footprint.

In this interactivity you will be asked to pair up items or activities with the amount of carbon used when producing or engaging in them.

When you have matched a pair correctly you will be able to read some more information about that item/activity.

There are many more cards than appear in a single game, so you may like to play several times so that you have a chance to see all of the cards.

To find out more about carbon footprints you might like to watch Mike Berners-Lee's Ted talk www.youtube.com/watch?v=0XQWkA_eeDk."



2 **MEI (Mathematics Education Innovation)[6]**
MEI have produced a range of resources that use climate and sustainability as a context for mathematical learning. They are helpfully organised into seven sections:

- Maths and climate change resources: https://mei.org.uk/resource/08983010-4175-4f54-80e0-08d9ab607fb9/
- Where maths meets… Urban regeneration: https://amsp.org.uk/resource/9cd93e8a-921b-4117-807b-08dab675489b/
- Where maths meets… Climate science: https://amsp.org.uk/resource/0dd4fd76-76a8-4fa9-807e-08dab675489b/
- Where maths meets… 'green' engineering: https://amsp.org.uk/resource/fbaf2ec1-1041-4548-5f08-08dabcb692fe/
- Where's the maths in that? Climate edition: https://amsp.org.uk/resource/0533d5e4-5318-4e99-ec12-08dabcbf9009/
- Your food's carbon footprint: https://teacher.desmos.com/activitybuilder/custom/5ec15f336fd0330fa3c3edf6
- Visualising the climate crisis: https://amsp.org.uk/resource/bee4f07a-6a00-458a-ec11-08dabcbf9009/.

For example: Key Stage 3 – Trees for net zero (extended resource)[7]

*"**Brief overview of session logic***

- *Why trees are good.*
- *People are planting trees – estimates around what the numbers look like in terms of land use.*
- *Some companies encourage you to offset flights by planting trees – how many trees for one flight?*
- *How much carbon do trees capture and store?*
- *How does the amount of carbon captured and stored by a tree change during its lifecycle?*
- *What happens to that carbon when a tree dies?*
- *Can you plant a tree to offset a flight?*
- *What is net zero?*

Mathematical opportunities offered

- *Estimation and proportional reasoning.*
- *Developing a sense of scale of large numbers.*
- *Interpretation of data, statistics, graphs, infographics in context.*
- *Critiquing graphs.*
- *Analysing and comparing data in order to develop and present a conclusion.*
- *Making assumptions.*
- *Making predictions.*
- *Reading scales."*

Download the resources

- Session plan: www.metlink.org/wp-content/uploads/2021/12/01_MEI_RMetS_KS3_trees_for_net_zero_session_plan.docx.
- Presentation: www.metlink.org/wp-content/uploads/2021/12/02_MEI_RMetS_KS3_trees_for_net_zero_presentation.pptx.
- Carbon storage graphs: www.metlink.org/wp-content/uploads/2021/12/03_MEI_RMetS_KS3_trees_for_net_zero_carbon_storage_graphs.docx.
- Carbon storage tables: www.metlink.org/wp-content/uploads/2021/12/04_MEI_RMetS_KS3_trees_for_net_zero_carbon_storage_tables.docx.
- Blank axes: www.metlink.org/wp-content/uploads/2021/12/05_MEI_RMetS_KS3_trees_for_net_zero_blank_axes.docx.

"Another world is not only possible, she is on her way. On a quiet day, I can hear her breathing."

Arundhati Roy (Indian Author and Man Booker Prize winner)

In this area you can find resources to support your teaching about the Climate Crisis. Materials will be added to over time here and are especially suitable for KS2 and KS3, but many will also be adaptable for younger children as well as for older young people.

HIAS resources

Do not forget to take a look on the HIAS Moodle pages for further guidance and lesson inspiration. There is a dedicated page called Climate Unity where you can find further links to resources as well as access all the previous Hampshire wide climate themed events for students such as the annual conference https://re.hias.hants.gov.uk/course/view.php?id=128.

Jo Lees

Inspector/Adviser for Secondary Mathematics, HIAS

Email: jo.lees@hants.gov.uk

References

1 www.gov.uk/government/publications/sustainability-and-climate-change-strategy/sustainability-and-climate-change-a-strategy-for-the-education-and-childrens-services-systems.

2 www.gov.uk/government/publications/sustainability-and-climate-change-strategy.

3 www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-in-england-mathematics-programmes-of-study.

4 https://nrich.maths.org/.

5 https://howbadarebananas.com/.

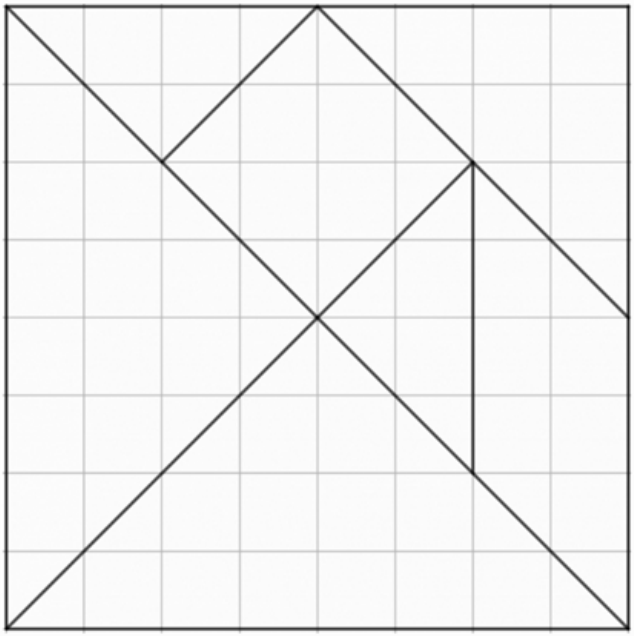
6 https://mei.org.uk/about-mei/what-we-do/current-projects-and-programmes/climate-change-and-sustainability-as-context-in-maths-teaching/.

7 www.metlink.org/resource/key-stage-3-trees-for-net-zero-extended-resource/.

Primary puzzle

A tangram is an ancient Chinese puzzle where you make pictures using mathematical shapes.

Make a set of tangram pieces from squared paper as shown below:



Can you make each of these pictures using your seven pieces?

You can try some more tangram puzzles in the World of Tan (https://nrich.maths.org/14074) problems.

There are puzzles using a different set of tangram shapes in the problem, Square Tangram: http://nrich.maths.org/public/viewer.php?obj_id=5528&part=.

Or why not try designing some Tangram pictures of your own?

If you want to learn how to make a tangram, see: https://nrich.maths.org/5355.

Tangram Pictures | NRICH

Secondary puzzle

*"This question is about **isosceles** triangles with an **area of 9 square units**.*

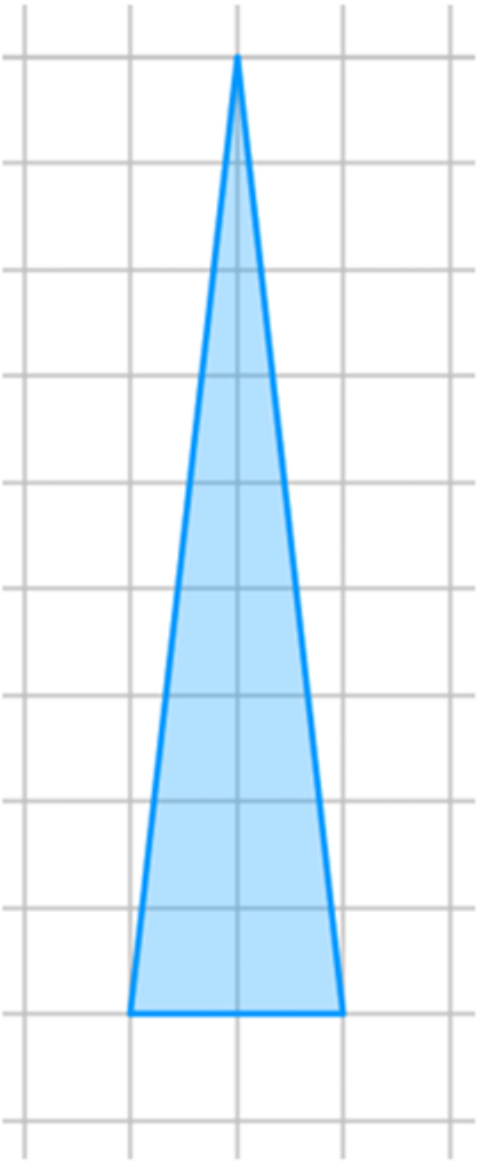
*Each vertex of the triangle must be at a grid point of a square grid, so all the vertices will have **whole number co-ordinates**.*

*One of the vertices must be at the point **(20, 20)**.*

How many different triangles satisfy these four conditions?

Try to find them all.

Can you explain how you know that you have found them all?"



nrich **Isosceles Triangles**

Isosceles Triangles | NRICH

Primary puzzle – solution from autumn 2024 edition

"We had some really good ideas sent in, some that were illustrated well using the computer. From Kent College we had Primrose and Charlotte, Sophie and Nia, Stephanie, Nandini and Hazel.

Well here we have a superb piece of work, sent in by Abi and Charlotte from the same school, that I would advise people to look at for working investigatively on this activity.

When we first looked at the problem we decided to test the difference between the amount of sweets each table needed, and we came up with these results.

Amount of people at the table.	8	12	16	20
Amount of sweets needed at table.	36	78	136	210

We looked at the results to see if there was a pattern in the difference between the amounts of sweets. Despite the fact there wasn't a pattern there we were determined to find a pattern. So we looked further into the problem and saw a pattern between the differences.

Amount of people at the table.	8	12	16	20
Amount of sweets needed at table.	36	78	136	210

42 58 74

16 16

From that we could guess the next two amount of sweets needed.

Amount of people at the table.	8	12	16	20	24	28
Amount of sweets needed at table.	36	78	136	210	300	406

42 58 74 90 106

16 16 16 16

When we saw this we thought of why it could have happened. Then we realised that a square has four sides and four squared is 16 so to get proof we checked with a triangle.

Amount of people at table.	6	9	12	15
Amount of sweets needed.	21	45	78	120

24 33 42

9 9

There is a pattern. So the difference between the difference between the difference is always nought."

NRICH.

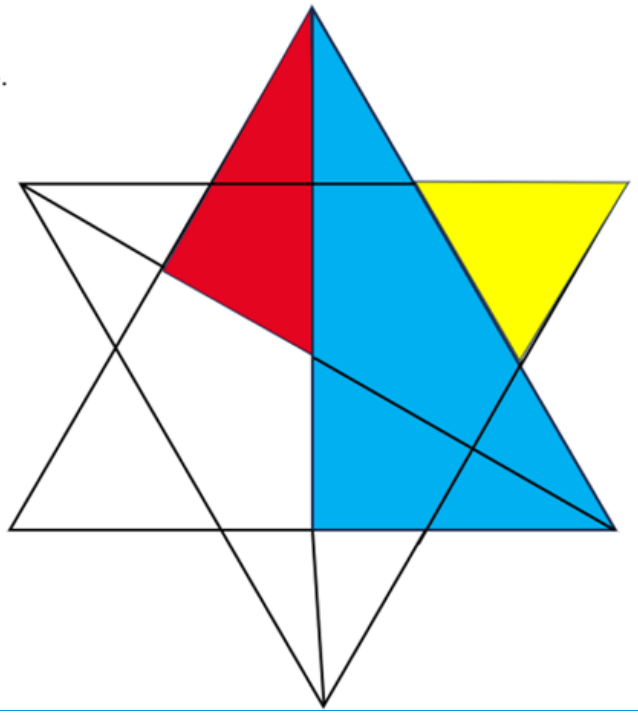
Secondary puzzle – solution from autumn 2024 edition

Star parts (mathematical pie No 218)

The six-point star is constructed from two congruent equilateral triangles and has rotational symmetry order 6.

The yellow area is 100cm^2

What are the values in cm^2 of the blue and red areas?



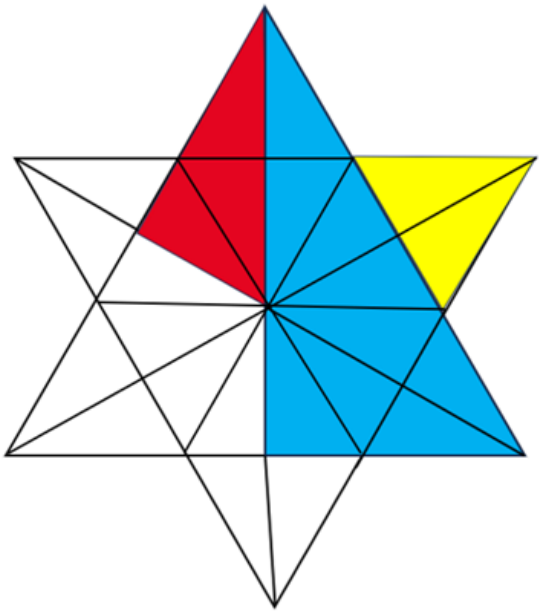
Solution

Divide the diagram into a full set of congruent right-angled triangles as shown.

Then the yellow area is made of two triangles, each one having an area of 50cm^2.

The blue area contains 9 triangles and so has an area of 450cm^2.

The red area contains 3 triangles and so has an area of 150cm^2.



www.m-a.org.uk

Courses

Details of our upcoming mathematics courses and networks are provided below. Visit our mathematics courses Moodle page or scan the QR code for our full catalogue of mathematics professional learning opportunities.

How to book

All training can be booked via the Learning Zone. To search for a specific course, type the keywords provided in the *Find Learning* box, then click *See Classes* for details of available dates and times.

Learning Zone guidance

Visit our Learning Zone Moodle information page for Guidance on accessing the Learning Zone and managing bookings.

https://hias-moodle.mylearningapp.com/mod/page/view.php?id=481.

Need help?

To speak to a member of the HTLC bookings team, please contact:

Email: htlc.courses@hants.gov.uk.

Primary

Primary Mathematics: Planning for Mixed-Year Groups

This two-session course provides teachers with practical strategies to effectively plan and deliver engaging maths lessons in a mixed-year group classroom, adaptable to any curriculum model or scheme of learning.

- 3 July and 16 October 2025
- *Math Mixed Year*
- Sub £245 / SLA £140 / Full £294

Maths Magic: Mastering Planning and Teaching

This course focuses on enhancing mathematics teaching through effective planning and teaching learning strategies. Teachers will be supported in creating learning journeys that foster deeper understanding and adjust their teaching methods based on real-time assessments. The course concludes with an adviser visit for observation, feedback, and further individualised support.

- 6 October, 14 October 2025 + each school will book in individually for a 0.5 visit
- *Maths Magic*
- Sub £735 / SLA £621 (includes the half-day visit) / Full £882

Primary Mathematics: Effective Teaching of Times Tables 2025

The aim of this course is to explore and develop ideas, pedagogies and associated subject knowledge to promote and enhance the teaching of times tables in the classroom. Teachers will engage in mathematics from the primary curriculum and explore mental strategies in order to support pupils' conceptual understanding to mental fluency.

- 14 October 2025 and 3 February 2026
- *Effective Teaching*
- Sub £235 / SLA £140 / Full £282

Inclusive Classroom – Adapting Planning for SEND Maths Pupils 25-26

This course is designed for mainstream teachers who want to develop their skills and confidence in adapting maths planning to meet the needs of pupils who are working significantly behind their peers. The course will focus on practical strategies for creating inclusive maths lessons focusing on the planning process.

22 October and 3 December 2025

Inclusive Classroom

Sub £270 / SLA £165 / Full £324

Primary Mathematics: New Mathematics Managers 2025-26

Over three face-to-face half-day sessions this course will explore key issues in leading and managing mathematics teaching and learning in the primary years. Delegates will develop their understanding of their role as mathematics subject leader.

As part of the course a bespoke individual virtual session of one hour will be booked during the summer term with each participant to discuss their own professional needs and support them with their mathematics action plan.

7 November 2025, 23 January and 6 March 2026

Mathematics Managers

Sub £510 / SLA £255 / Full £612

Pathway to Progress – A Mathematics Intervention Programme (*Webinar*)

A one-hour virtual training webinar on *Pathway to Progress* – A mathematics intervention programme. Currently available for pupils in Year 1, 2, 4 and 6.

This intervention is designed to give pupils the foundations and skills to enable them to make accelerated progress and secure age-related expectations at the end of Key Stage 1 and the end of Key Stage 2.

20 November 2025

Maths Intervention

Sub £60 / SLA £45 / Full £72

Effective Guided Group Work for 'Close To' Pupils

To enhance teachers or learning support assistants' knowledge and understanding of effective guided group work strategies to enable pupils to reach independent practice.

Learning outcomes:

- exploring how to implement the *I do, we do, you do* strategy
- ensuring pupils show a good level of understanding through sufficient independent practice
- developing faded scaffold examples to enable pupils to gain confidence on their journey to independence
- constructing intelligent practice questions which enable pupils to identify mathematical structures and practice the thinking process
- checking for understanding by asking *better* questions.

2 December 2025

Guided Group

Sub £130 / SLA £75 / Full £156

Secondary

Secondary Mathematics Network

The primary aims of the subject network meetings are to:

- ensure a clear understanding of the national picture and its application in local and school contexts
- support effective subject leadership as appropriate to each school's individual context
- develop skills, expertise and capacity within school subject leaders and their teams through quality strategic CPD and the sharing of good practice
- deepen understanding of subject specific pedagogy and knowledge that underpins good progress and attainment for *all* pupils
- facilitate school to school networking and develop strength across the system.

1 July 2025

Summer 2 Maths

Sub £75 / SLA £40 / Full £90

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Moodle: http://maths.hias.hants.gov.uk/

Also from HIAS!

Publications: If you enjoyed reading this curriculum update why not take a look to see what other publications are produced by the Hampshire Inspection and Advisory Service. You will find a list of publications on our website at:

www.hants.gov.uk/educationandlearning/hias/curriculum-support.

Moodles: Have you visited the HIAS Moodles? The Moodle sites include top-quality resources, training and course materials – see: https://hias-moodle.mylearningapp.com/. Do not forget to sign up to our site news pages so we can keep you up to date with the latest news and training opportunities from the HIAS subject teams.

Moodle+ offers access to a wide range of high-quality resources for subject leads and teachers for all key stages in primary and secondary and is available by subscription. For more information email HIAS Publications: hias.publications@hants.gov.uk.