Hampshire County Council

Improvement and Advisory Service

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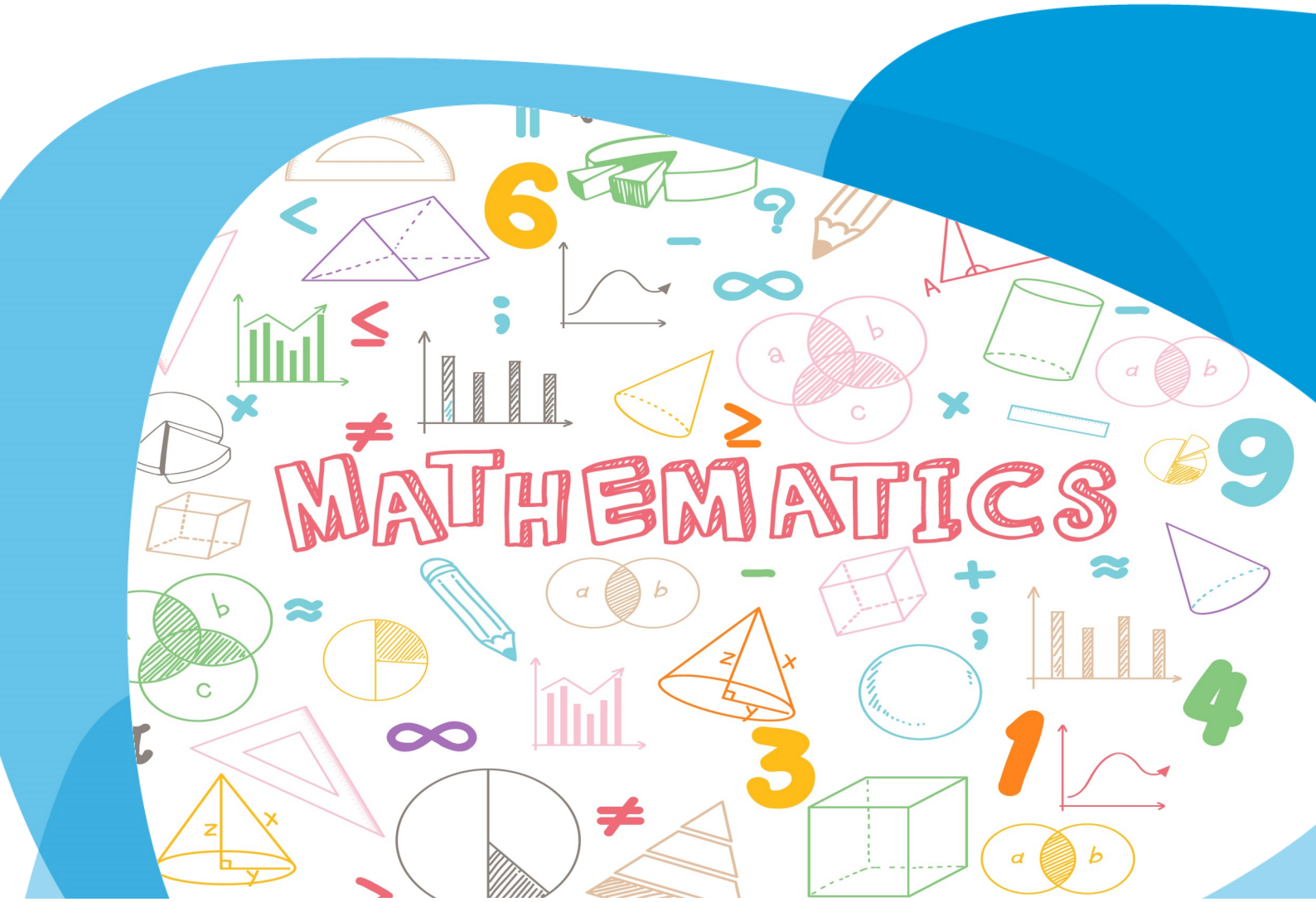
Hantsmaths

In this issue:



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Editorial

Welcome to the autumn edition of *Hantsmaths*. We hope the start of the academic year is going well and that all pupils, teachers and leaders are feeling motivated and excited about the year ahead.

In this issue, we want to support mathematics leaders by sharing some key areas to focus upon during the autumn term. It is in the autumn term that mathematics leaders should be setting routines, reviewing the mathematics action plan and beginning to develop a weekly plan as to how actions will be addressed. New teachers to our schools may require planning support to understand the way in which mathematics is taught and continuing professional development (CPD) requirements across the school will be identified. There is a lot to think about in the autumn term, especially for our new maths leaders, so hopefully this article helps to guide your steps this term.

I would like to take this opportunity to thank Richard Bailey from Castle Primary School for his fantastic article focusing upon developing problem solving. Within the article, Richard shares with us the importance of pupils understanding the *why* in maths and the ways in which a *big problem* can provide the context, therefore providing the *why*. Understanding the link between reasoning and problem solving and careful teacher modelling has been a clear focus for the school and it is great to see pupil work and the impact of the work from teachers and leaders so far. This article provides great inspiration for us all, on how all pupils can be taught problem solving through a range of strategies including pupil talk.

Supporting teacher assessment in mathematics to ensure data is accurate for all year groups is essential for schools. Accurate data helps us to target pupils appropriately and plan for the next term. Moderating in maths however can prove tricky as the National Curriculum is full of objectives and a vast range of pupil work would need to be discussed and reviewed if we were to assess the full National Curriculum. Provided within this edition are top tips for how to hold a successful moderation session to support teacher assessment throughout the year.

Olivia from the maths team has been working closely with Victoria Flynn (HIAS Tackling Educational Disadvantage Inspector/Adviser) on a collaborative project in which a select group of schools have been visited and we have asked our maths leaders for feedback during Core Provision sessions. Olivia shares with us some of the initial findings from the summer term. This is an ongoing project in which I look forward to seeing how it develops throughout the academic year.

Questioning in mathematics is key to provoking enquiry and developing reasoning. It also provides teachers with the opportunity to assess pupils' understanding and adapt lessons. Hinge questions are a way in which to gather formative assessment and helps teachers know whether to move on within the lesson or provide the opportunity for further explanation or practice. We spend some time within this edition, thinking carefully about hinge questions, how we can develop them and why they work.

I hope that you enjoy this edition of *Hantmaths* and we look forward to visiting schools this year and seeing maths in action.

Kate Spencer

Primary Lead Inspector/Adviser for Mathematics, HIAS

The role of a maths leader: autumn term focus

As the new academic year begins, primary maths leaders play a crucial role in setting the tone for a successful year of mathematics education. The autumn term is an ideal time to establish routines, review curriculum content, and plan for the year ahead. In this article, we will outline the key tasks a primary maths leader should be focusing on during the autumn term.

Review and refresh

Take time to review the previous year's maths curriculum coverage, identifying areas of strength and weakness. Consider pupil progress, attainment, and any gaps in learning. Refresh your knowledge of the National Curriculum expectations and make any necessary adjustments to your school's maths strategy.

Set clear priorities and a maths action plan

Establish clear priorities and objectives for the upcoming year, ensuring they are measurable, achievable, and relevant to your school's context – these will create your maths action plan. These priorities should align with your school improvement plan (SIP). Set termly milestones setting out what you will do to achieve these goals. Do not forget to share your maths action plan with teachers and learning support assistants (LSAs) to ensure everyone is working towards the same objectives.

Plan your leadership time

As a maths leader, effective time management is crucial to ensure that goals are met and priorities are addressed. To plan your leadership time, begin by setting clear objectives for the week or term, aligning them with the maths action plan. Then allocate specific times for tasks, such as reviewing pupil progress data, planning staff training sessions, and meeting with teachers to support planning or discuss maths related issues.

When possible, plan regular drop-ins to observe maths lessons and book reviews and provide feedback and guidance to teachers. Additionally, prioritise time for reflection and planning, allowing time to adjust your approach as needed and stay up to date with the best practices. By managing your time effectively, you can ensure you are making a positive impact on maths teaching and learning, and that your leadership is focused on supporting teachers and improving pupils' outcomes.

Using your scheme of work as a curriculum resource

To ensure your chosen maths scheme meets the needs of all pupils, it is essential to adapt it and take ownership. Spend time thinking and planning how teachers can be supported in doing this.

Assessment for learning and being diagnostic

Develop an assessment strategy that allows you and your teachers to monitor pupil progress throughout the year. This could include low stake quizzes (eg exit tasks/tickets), or formative assessments that inform teaching and learning. Teachers should be diagnostic in the autumn term identifying any areas where pupils may need additional support or more time to embed objectives from the previous year. Assessment for learning should always drive the teaching of mathematics.

Provide professional development opportunities

Plan for professional development opportunities for staff across the year.

- Do you need to plan/book in staff meetings to share key messages, support moderation or provide further CPD?
- Do you have any new teachers to the school or early career teachers (ECTs) who may need planning support?
- Does anybody need to be booked on any courses?
- In any courses attended, have the key messages and pedagogy been shared with staff?

Review resources and materials

Review existing maths resources and materials, considering whether they align with your scheme of work and curriculum goals. Identify gaps or outdated materials that may need updating or replacing.

Review school policies

Review your school's maths policies, ensuring they are up-to-date and aligned with national expectations. Update policies as necessary to reflect changes in curriculum requirements or best practices.

By focusing on these key tasks during the autumn term, primary maths leaders can set their schools up for a successful year of maths education, ensuring pupils receive a high quality education that prepares them for future challenges.

Remember to stay flexible and adapt your approach as needed throughout the year, prioritising pupil needs and celebrating successes along the way!

Nikki Barber

Mathematics Teaching and Learning Adviser, HIAS

A big problem!

My school's journey to building a rich problem solving curriculum

When I joined Castle Primary School in 2021, the school had transitioned from Inspire Maths over to using the White Rose Maths hub scheme. As a new Maths Subject Leader, the priority was about ensuring the blocked approach was consistently being followed throughout the school. Our three-year journey had begun developing our curriculum and the notion of learning journeys was about to be born. White Rose Maths provides guidance on using a small steps approach which provided us with a framework for our learning journeys. Each component built upon prior knowledge and was leading to secure knowledge and skills being learnt.

However, as the children often ask us, *why? "Why are we learning to multiply fractions?" "Why are we learning to round to the nearest 100,000?" "Why are we learning to describe the properties of a 3D shape?"* In our English curriculum, we regularly speak about audience, form and purpose for our writing journeys so why not do the same in maths? The concept of a big problem was born, and our learning journeys now had a purpose. Children could articulate why they were learning new methods, skills and strategies. It was so that they could produce a magic number poster showing off their place value knowledge. It was also so that they could defuse a bomb that had been encoded with fractions. The purpose was also so that they could calculate the answer to a worded problem story hidden in an envelope. Year 3 particularly enjoyed trying to solve the murder mystery of Rodney rectangle by identifying the culprit based on their shape properties. They enjoyed this big problem so much that they created their own shape murder mystery problems. It was Patricia the triangular prism if you wanted to know who did it…

Just like any school, implementing a new way of planning and monitoring the impact of the learning journeys came up against its challenges but as mentioned earlier this has been and still is a journey. Through work sampling, lesson visits and monitoring of planning, big problem task designs needed further support so as a school we looked to the work of Gareth Metcalfe with I See Reasoning, the task designs available on NRich, the problems provided by White Rose Maths and now the real world maths problems from TTS. After three years, our school now has a maths curriculum that is clear, builds on prior knowledge, leads the children on a journey with purpose and they are exposed to a variety of problem solving experiences. During Hampshire Maths Core Provision meetings, the guidance and resources for problem solving has supported our school with ensuring all children have regular opportunities to problem solve and this has only enhanced our big problem outcomes further. Our curriculum and model of learning journeys leading up to rich problem solving outcomes was positively recognised in our recent Ofsted inspection.

At Castle Primary School, we know the importance of mathematical reasoning, particularly alongside problem solving as this helps form a deeper understanding of the procedural and substantive knowledge used. Reasoning opportunities should be interwoven into lessons, learning journeys and most certainly those composite outcomes. As a school, we adopted the because… I know… therefore… example (BITE) model as a clear, consistent approach to modelling and teaching reasoning across our school. As our curriculum developed over the past three years, we ensured different reasoning task designs were being incorporated for all learners. Adaptations were made so that every child in the school had not only the opportunity but also access to reasoning. Reasoning at Castle Primary School opened many more exciting projects and approaches adding to the exciting journey we are already on.

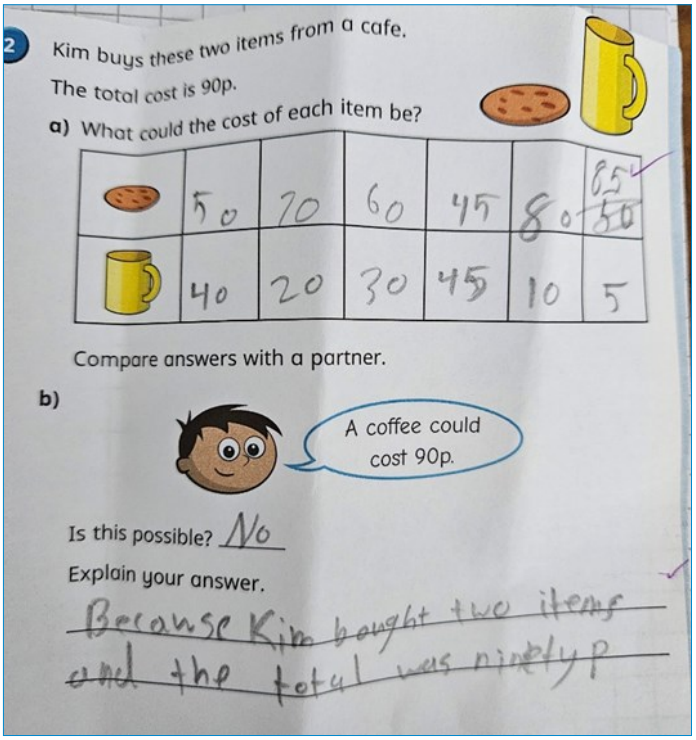
Modelling reasoning statements across the school

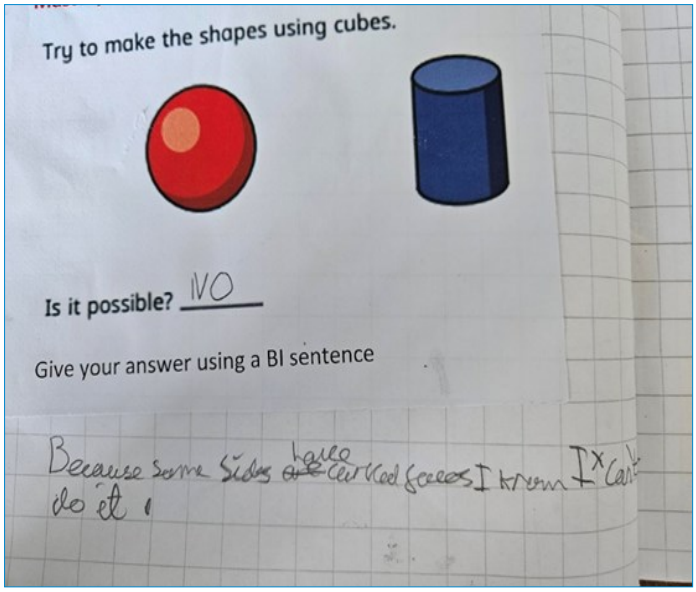
B.I.T.E

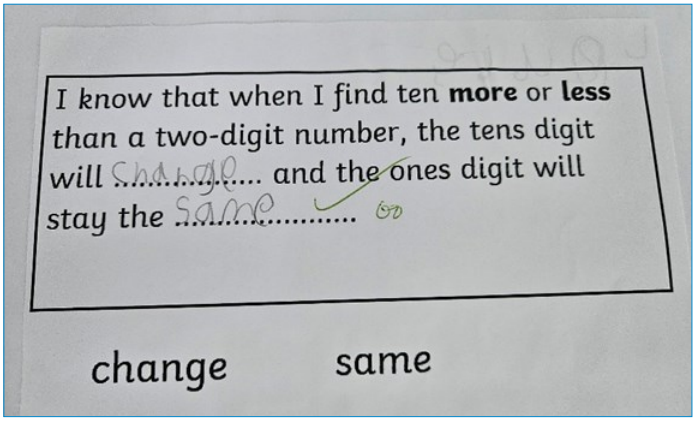
Let's get our teeth stuck into a good problem!

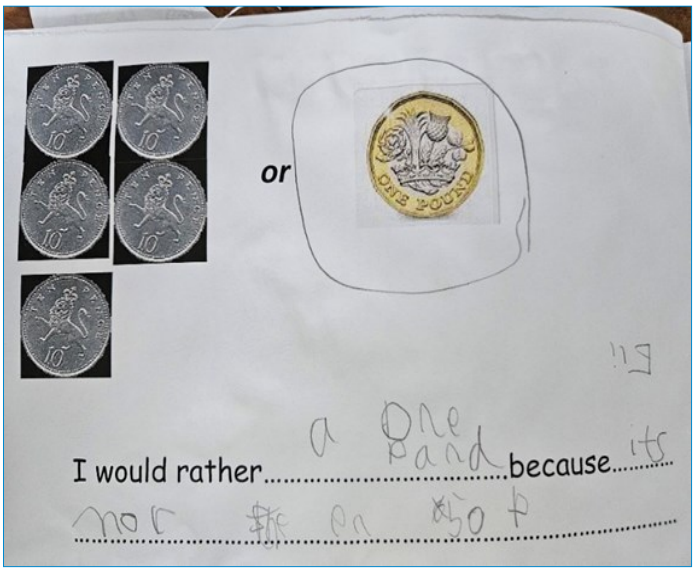
Because… I know… Therefore… Example

Examples of children's reasoning:









Our next steps as a school involves building the use of mathematical vocabulary into our reasoning. Like any school, the expected maths vocabulary of the National Curriculum is taught and modelled where appropriate. However, like vocabulary in English, how many of those words are understood, retained and used by the children? Some children thrive on using new words therefore these words *stick* and for others the words do not enter their regular vocabulary so slide off. At the Hampshire Maths Conference in 2022, a concept called peculiar, ordinary, non-example, gesture (PONG) was shared which enables children to deepen their understanding of a new maths concept. As a school, we felt the gesture approach might support a lot of our learners who struggle to stay focused. In the book *Why gesture?: How the hands function in speaking, thinking and communicating* (chapter 6), Cook and Fenn say:

"Hand gestures facilitate memory processes, both for newly learned material and for material that is already understood. Gestures facilitate working memory in the moment in which they are produced, and they facilitate recall over time. Information encoded with gesture appears particularly likely to be consolidated in memory, and is particularly likely to transfer to novel contexts. Thus, gesture not only improves initial encoding of material, but also improves the quality of the memory representation that is retained."

Cook, S. W., and Fenn, K. M. (2017). The function of gesture in learning and memory. In R. B. Church, M. W. Alibali, & S. D. Kelly (Eds.), *Why gesture?: How the hands function in speaking, thinking and communicating* (pp. 129–153). John Benjamins Publishing Company. https://doi.org/10.1075/gs.7.07coo.

The difference this approach to teaching has already begun to make with reasoning at our school has been really positive and rewarding. What started as experimental led to agreed gestures, some of which are based upon British Sign Language, to be used by staff and pupils alike. This part of our journey has only just begun and we cannot wait to see the full impact of this being used alongside our curriculum.

Our school is fortunate to have maths ambassadors: representatives from across the school with varying attainment and including children from disadvantaged groups. The ambassadors meet regularly to discuss the journey of maths in our school and engage in meetings with visitors such as our governors and our lead learning partner from HIAS. They trial new maths equipment and are given training on how best to use the equipment so that they can be an ambassador for helping others across the school. The children decided they would like to invent their own big problems and offer prizes for children completing them. When our new school initiative on gesturing began, one of the ambassadors suggested creating videos of the gestures and a display board for others to see. Before we knew it, another meeting was called to record and photograph gestures they had learned in class or ones they had created to help explain a new maths concept.

In any school, no journey is the same nor should it be travelled in exactly the same way each time. However, for Castle Primary School, we are on a very exciting and rewarding journey that involves so many positive initiatives both for the children and staff. If you would like to know more about our maths curriculum, the big problems, our maths ambassadors or our use of gesturing, please get in touch. Equally, if your school is gesturing or doing something similar with composite outcomes in maths, our school would love to share ideas.

Richard Bailey

Maths Manager, Castle Primary School

Tackling educational disadvantage – collaborative maths project

An analysis of 2023/24 maths outcomes has highlighted a critical need to improve maths outcomes, particularly for those facing socio-economic disadvantage. In response to these findings, Victoria Flynn (HIAS Tackling Educational Disadvantage Inspector/Adviser) and I (Olivia Goodburn, HIAS Maths Adviser) initiated a collaborative project to identify and disseminate best practice. Our work is focused on identifying evidence-based strategies to support disadvantaged pupils, aiming to close the achievement gap and promote equity in maths lessons.

In the summer term, Victoria and I visited schools that had strong outcomes for all pupils, as well as those with strong outcomes for non-disadvantaged pupils. As an initial step, Victoria and I observed maths teaching in all year groups and discussed provision with senior leaders to support challenges faced by disadvantaged pupils.

We have organised our key findings into five core categories and have reflected on best practice within those.

Curriculum knowledge and ownership

- In schools with stronger maths outcomes for disadvantaged pupils, leaders and teachers demonstrate deep curriculum knowledge, personalise the curriculum to suit the needs of pupils, ensure consistent teaching methods, and integrate maths learning throughout the school day.

Data, assessment and intervention

- In schools with stronger maths outcomes for disadvantaged pupils, leaders focus on attainment, use pupil progress meetings to address barriers, tailor tasks based on assessment, allocate expert staff to those with significant gaps, provide timely and effective interventions, and ensure interventions are integrated with classroom work.

Checking for understanding

- In schools with stronger maths outcomes for disadvantaged pupils, teachers and teaching assistants actively monitor learning, ensure engagement, involve all pupils in demonstrating knowledge, value misconceptions, create opportunity for collaborative learning, and encourage independent completion of tasks to ensure understanding.

Oracy

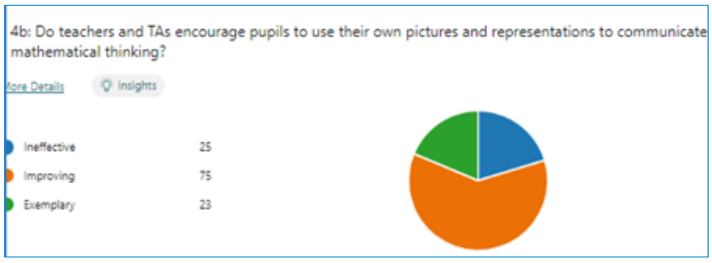
- In schools with stronger maths outcomes for disadvantaged pupils, teachers and teaching assistants emphasize precise mathematical vocabulary, engage all pupils in discussions, use sentence stems for clarity, and encourage pupils to use their own visual representations to express mathematical concepts and explain mathematical thinking.

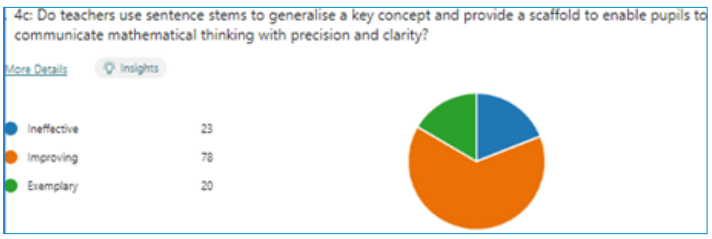
Independence and motivation

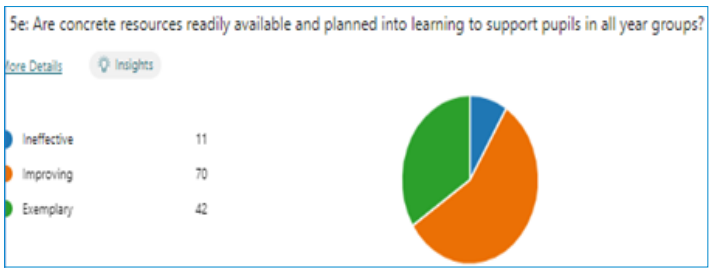
- In schools with stronger maths outcomes for disadvantaged pupils, learning is scaffolded to foster independence, supported by knowledgeable adults, flexible grouping, concrete resources, open questions, peer collaboration, and high expectations for all pupils.

Following this, self evaluation form (SEF) questions were created and shared with maths leaders during subject leader meetings in the summer term. Using the Education Endowment Foundation (EEF) maths guidance red amber green (RAG) documents, leaders were able to audit maths provision within their schools.

Pupils having access to concrete resources was one of the strongest green rated areas in the audit. Interestingly, the questions linked to how these resources support understanding of mathematical structure and oracy had some of the largest red (or blue as shown in the pie charts) sections. As a result, we will prioritise CPD and guidance materials with evidence-based strategies around developing curriculum knowledge and oracy.







https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/early-maths.

https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/maths-ks-2-3.

Victoria and I greatly valued the opportunity to learn from each of the schools we have visited so far and are looking forward to continuing our work with schools and leaders over the coming year.

Olivia Goodburn

Mathematics Teaching and Learning Adviser, HIAS

Teacher assessment and mathematics – a successful moderation

Throughout the year, teachers are challenged to make accurate teacher assessments regarding their pupils and mathematics. The importance of getting this right is fundamental to knowing the areas of the curriculum that the cohort needs to work on next and identifying target pupils for further interventions. Many schools use testing to support their teacher assessment, however sometimes this does not always prove to be accurate depending on how well the chosen test marries up with the school's curriculum. It is therefore necessary for mathematics leaders to support teachers to make accurate teacher assessment and moderate pupils' work. In this article, I would like to look at the different ways in which we can support our teachers to successfully moderate work to ensure that teacher assessment in mathematics is accurate.

Identify a few objectives to moderate

Completing a whole school moderation allows for a professional conversation to take place and provides teachers the opportunity to talk about their pupils. To be forensic regarding the pupil work and ask questions, it is important to select a few objectives to focus upon. It is not possible to look at all objectives across the National Curriculum and show evidence as this would mean looking at a lot of pieces of work and would dilute the professional conversations. Select a small amount of objectives from across the curriculum to allow for different domains to be discussed which will help to inform areas including further interventions that may be required as well as particular strengths to celebrate. If completing a whole school moderation, leaders could select objectives that build upon one another, across the year groups, to show the steps of progression across the school.

What does *on track* look like?

Part of the moderation session should ask teachers to consider what evidence would look like to show a pupil was on track to meet age related expectations by the end of the year. These discussions are particularly important for schools that follow a reciprocal curriculum. Agree this from the start of the conversation so that teachers know what they are looking for. This can be established from the scheme of work that a school follows or from teachers' planning of progression across the year.

Look at the tasks as well as the pupil responses

When moderating pupil work look carefully at the tasks. Think about whether the task has enabled the pupil to demonstrate a good understanding of the standard. Sometimes it is not the pupils' response but instead the task that has not allowed the children to show a good enough understanding of the given objective. This will help to inform future planning and support teachers to select tasks carefully when planning a learning journey.

Look for all three aims

Fluency, reasoning, and problem solving. The three aims from the National Curriculum that all pupils should experience and be taught objectives through. When moderating, ensure that you look for each of the aims. Evidence of fluency, reasoning, and problem solving do not need to be shared for each individual objective but across the body of work shared, there should be evidence of all three. Use moderation as an opportunity to look out for this and then inform planning for the next half term.

Moderation is an opportunity to be diagnostic

Support teachers to see moderation of mathematics as a useful experience and an opportunity to learn. Being provided with the opportunity to share pupil work and discuss individual pupils also provides us with the opportunity to be diagnostic and identify individual and cohort next steps. Take some time after a moderation session to make some notes. What do you need to do next to secure age related expectations/the greater depth standard? What domains need more time? What adaptations need to be made to long-term planning? What interventions would benefit individual/groups of pupils? Knowing exactly what to do next can make the whole experience worthwhile and informative.

Holding a professional conversation

When moderating with our colleagues, it is sometimes difficult to know the types of questions to ask. Below I have included a list of possible questions to provide a starting point:

- can you provide me with a further context to this lesson?
- what was the child saying/doing that makes you think they are secure with this objective?
- how can you be sure the objective is mastered?
- is the child able to apply the knowledge to reasoning and problem solving questions?
- how much support was provided to complete the task?
- at what point was the support/scaffold removed?
- where are the opportunities for independent practice?
- are you able to evidence that the child is still secure with the objective?

See the moderation of mathematics as an opportunity for further planning and the chance to celebrate our pupils. Discussing work helps teachers to understand the curriculum and progression of skills across the primary phase, helps them to feel secure with their judgments, and helps them to identify what can be done next. It also helps leaders to know that the data they are presented with is accurate. Regular moderation of mathematics is essential and allows teachers to share with others the individual successes of pupils. Our recommendation is that schools should try to moderate maths work at least two times within the academic year. As a maths team we are always happy to support moderation sessions within schools or with a cluster of schools. Ultimately, we want teachers to enjoy the experience and leave the session feeling knowledgeable about their pupils and secure with the judgments they have made.

Kate Spencer

Primary Lead Inspector/Adviser for Mathematics, HIAS

Using hinge questions to support responsive and adaptive teaching

Professor Dylan Wiliam states that there are only two valid reasons for asking a question in class: either to provide information to the teacher about what to do next, or to cause students to think. In this article we look at the former point around providing information to the teacher.

"When assessment is formative, the aim is to reveal pupils' weaknesses so the teacher can act on them. When assessment is summative, the aim is to give pupils a final grade […]. Indeed, formative assessment is so different from summative assessment that Wiliam has said that he wished he had called AfL 'responsive teaching', rather than using the word assessment."

Christodoulou, D. (2017). *Making good progress?: The future of assessment for learning*. Oxford University Press.

The following commentary draws on a range of thinking across the mathematics education community and also builds on the excellent article recently published in *Powerful science* (spring 2024), our sister publication from the HIAS science team. Many of the points made and strategies shared are equally applicable across mathematics, indicating the strong curriculum, conceptual and pedagogical links between the two subjects.

What do we mean by a *hinge* in this context?

A hinge is a point in a lesson when a teacher needs to check whether or not students have grasped a key concept and are ready to move on to study another.

A hinge question is a diagnostic tool which a teacher employs when their students reach the *hinge* point.

What is a hinge question?

Education Scotland (https://education.gov.scot/) states that:

"A hinge question is planned within a lesson to gauge the level of understanding, the depth of thinking and hence to determine the next stage of the lesson. The planning of the question prior to the lesson is essential. The question should be asked about midway in the lesson to allow time to address the issues."

Harry Fletcher-Wood in his blog (link below) suggests that a hinge question is:

"A check for understanding at a 'hinge-point' in a lesson, so-called because of two inter-linked meanings:
1) it is the point where you move from one key idea/activity/point on to another
2) understanding the content before the hinge is a prerequisite for the next chunk of learning."

Fletcher-Wood, H. (2013) *Do they understand this well enough to move on? Introducing hinge questions* https://improvingteaching.co.uk/2013/08/17/do-they-understand-this-well-enough-to-move-on-introducing-hinge-questions/.

A hinge question can be thought of as a brief item of formative assessment which enables the teacher to know whether it is appropriate to move on, to briefly recap, or completely reteach, a concept before moving on – what Dylan Wiliam calls the most important decision a teacher has to make on a regular basis. If you get this wrong and some students have not understood, then the next task or idea may well be unachievable because the concepts build one on another.

Designing a hinge question

Good hinge questions should:

- be quick and easy to ask
- be quick for students to respond to (multiple choice questions are popular) – within about a minute or two
- be constructed in such a way that a correct answer will only be achieved if you really understand the point
- be constructed in such a way that wrong answers signal which sort of misconceptions may be pervading the room.

Designing a good hinge question can be quite an art and is dependent on the teacher understanding the concept in a deep and structural way and appreciating how students are learning and thinking.

Matt Bromley (www.sec-ed.co.uk/content/best-practice/teaching-practice-hinge-questions/) looks at how to make multiple choice hinge questions work in your classroom and your teaching. He comments:

Why do teachers ask questions?

It is important to acknowledge that there is a balance to be had in a good lesson between open and closed questions. Open questions should encourage dialogue and mathematical thinking, whilst closed questions should be seen as another assessment tool to use in the classroom. *"They can provide valuable assessment information to the teacher about their students' learning and progress, about who has 'got it' and who has not, and about what needs reteaching, recapping or developing further. Closed questions used as a form of assessment may also reduce the marking load on teachers and make assessment "live" and responsive.*

One of the most effective forms of closed questions is the 'hinge question'."

The hinge question is often presented in multiple-choice form.

"The trick to making multiple-choice questions effective is to create several wrong options which are nevertheless plausible and closely related to the right answer. The best 'wrong' options also uncover common misconceptions or false assumptions. As such, the best way to create the wrong options in a way which makes them plausible is to… review your *"students' common misconceptions, misunderstandings and mistakes*." The *"act of mining students' work for misconceptions and then applying the findings in a way that helps anticipate students' difficulties and questions, is the difference between… knowing your subject and knowing how to teach your subject in a way which makes sense to students."*

How do hinge questions work?

A hinge question is often, but not exclusively, *"a multiple-choice question which provides an immediate check of students' understanding. Crucially, a hinge question provides a check of understanding for every student in a class. A hinge question informs the teacher if students have understood what they have taught and, if not, what they have misunderstood."* It should be asked at the end of a learning task *"as the teacher moves from teaching one key concept to another, when the teaching and learning of the second concept is reliant on understanding the first.*

Every student must respond within a set timeframe, ideally one to two minutes. A hinge question is a quick assessment – a line in the sand – and, therefore, responses should be instinctive and almost immediate.

All students must participate in the process. As such, it is best to avoid a 'hands up' approach and instead employ a tactic that ensures every student shows the teacher their answer at the same time. This enables the teacher to assess every student and prevents students from being unduly influenced by their peers.

Simultaneous, all-class responses can be achieved by using mini-whiteboards on which students write their answers then hold them up when instructed. Alternatively, voting buttons could be used, perhaps on iPads. Equally, students could hold up lettered, numbered or coloured cards to indicate their answer. A set of four cards could be kept on desks or given to students to retain in their books or planners in order to reduce the logistical strain and permit hinge questions to become a quick, simple, everyday feature of lessons.

The teacher must be able to interpret students' responses quickly, ideally within a minute, so that the flow of the lesson isn't" interrupted. The teacher must decide the acceptable 'pass rate', say 80% correct responses, before moving on.

"They will then need to consider what to do to support the 20% who got the question wrong."

This can be scaffolding into the next task or recapping the previous learning before the part that has not been understood, whilst other more secure students engage in a task to deepen their learning at that point.

These ideas are taken from the *Best practice* series of articles by Matt Bromley, first published in 2017 in SecEd www.sec-ed.co.uk/content/best-practice/teaching-practice-hinge-questions/. The full collection of articles www.sec-ed.co.uk/authors/matt-bromley/.

Some examples of hinge questions in mathematics are shown below, taken from Education Scotland (https://education.gov.scot/) with thanks. 7hingequestions.doc (live.com).

These examples could be used as CPD for staff to introduce them to this strategy or by the pupils themselves to assist them in understanding the strategy.

Hinge Questions: example 1

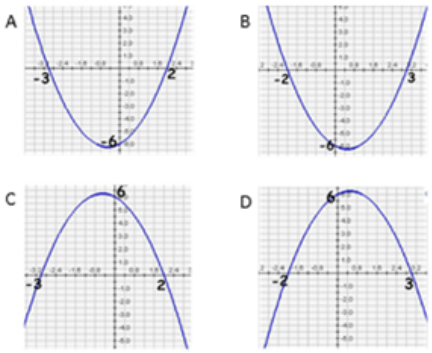
The gradient of the line joining the points (2,3) and (5,-7) is? A $^{3}/_{-10}$ B $^{-10}/_{3}$ C $^{-4}/_{7}$ D $^{7}/_{-4}$			I have discussed ways to describe the slope of a line, **can interpret the definition of gradient and can use it to make relevant calculations,** interpreting my answer for the context of the problem. **MTH 4-13b**
Correct Answer	B: $m = \frac{y_2 - y_1}{x_2 - x_1}$		
Thinking for wrong answers	A: x's on top and y's on bottom	C: added instead of subtracting	D: **added** x's on top and y's on bottom
How do you deal with the incorrect answers?	Go back to diagram and look at definition of gradient		

Hinge Questions: example 2

The distance between the two points (3, 5) and (8, 7) is? A √29 B √21 C √265 D 7	I have explored the **relationships that exist between the sides**, or sides and angles, **in right-angled triangles and can select and use an appropriate strategy to solve related problems**, interpreting my answer for the context. **MTH 4-16a**

Correct Answer	A: $\text{distance}^2 = (8-3)^2 + (7-5)^2$ $= 5^2 + 2^2$ $= 25 + 4$ $= 29$ $\text{distance} = \sqrt{29}$		
Thinking for wrong answers	B: subtracting the squares	C: adding the coordinates then squaring	D: distance = (8 – 3) + (7 – 5) = 5 + 2 = 7 Not squaring anything
How do you deal with the incorrect answers?	Explanation ????		

Hinge Questions: example 3

f(x) = (x - 3)(x + 2). Which diagram shows the graph of this function? 	Reference to CfE

Correct Answer	B: *Working for correct solution*		
Thinking for wrong answers	*A: Explanation*	*C: explanation*	*D: explanation*
How do you deal with the incorrect answers?	*Explanation*		

Hinge Questions: blank			
Insert question			*Reference to CfE*
Correct Answer	*Working for correct solution*		
Thinking for wrong answers	*Explanation*	*explanation*	*explanation*
How do you deal with the incorrect answers?	*Explanation*		

7hingequestions.doc (live.com)
www.nationalarchives.gov.uk/doc/open-government-licence/version/3/.

Final thoughts

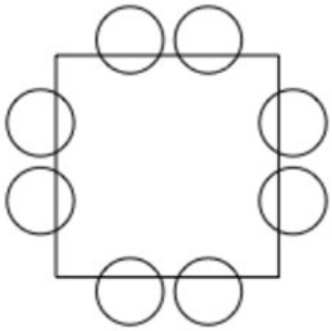
Well constructed hinge questions can offer the teacher a significant insight into what their students understand, what they do not understand, and why. They are a useful way to improve the teacher's appreciation of what students are thinking in lessons. The more time spent using and constructing hinge questions, the more time is spent thinking about student understanding and the pedagogical implications of this. Additionally, they allow a teacher to discuss and correct student misconceptions alongside the learner. Appropriate use of good quality, relevant hinge questions not only benefits students as lessons become more tailored to their individual needs, but also develops and enhances the teacher's ability to teach in an adaptive and responsive way.

Jo Lees

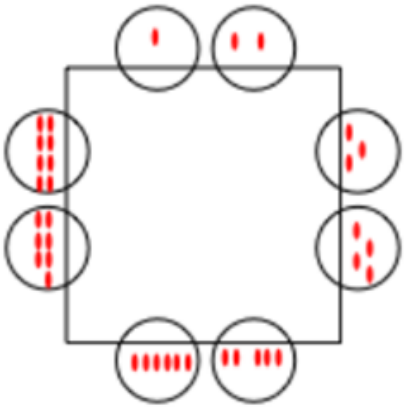
Secondary Inspector/Adviser for Mathematics, HIAS

Primary puzzle

Some children are at a party. They are sitting around a square table like this:



In the top left-hand corner is the person who is giving the party. They have a bag of sweets and they start giving them out in a clockwise direction: one for themselves, two for the next person, three for the next and so on.



What do you notice?

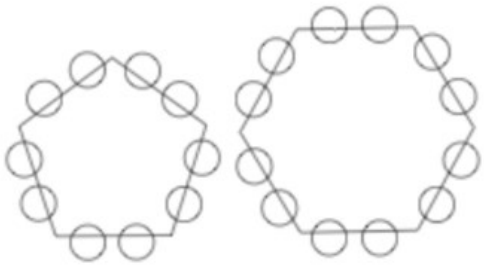
You might like to focus on:

- The number of sweets that are given out altogether
- The total number of sweets that children sitting opposite each other are given
- The total number of sweets that children sitting diagonally opposite each other are given
- Or something else!

There are other similar parties happening at the same time. They have bigger square tables with more children sitting around them - perhaps 3 children on each side, or maybe more.

Draw some of these tables. What do you notice? You can choose one of the areas above to focus on, or you might have your own ideas about what to investigate.

Once you've thought about that, you might like to explore what happens with five- and six-sided tables like these:



What do you notice?

https://nrich.maths.org/problems/sitting-round-party-tables

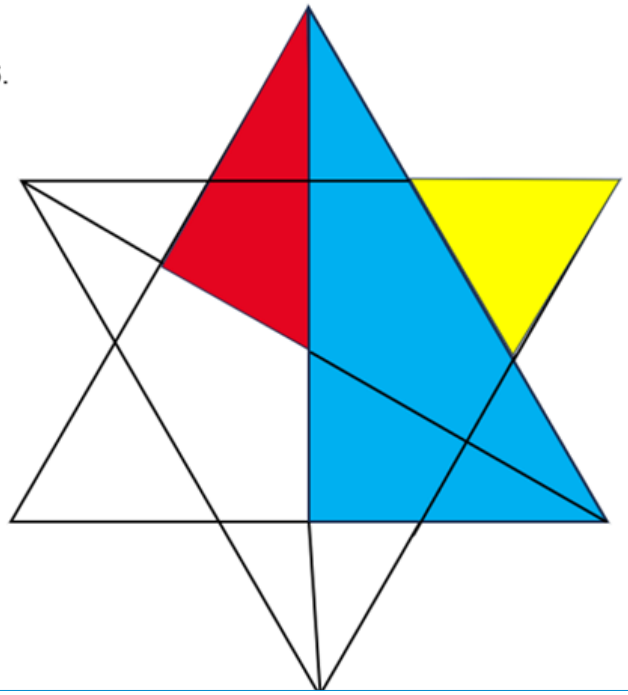
Secondary puzzle

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?



www.m-a.org.uk

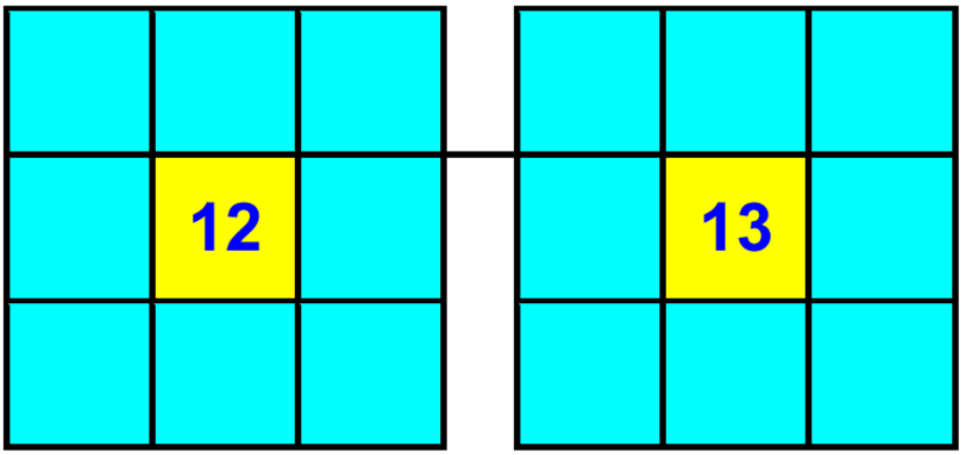
Primary puzzle – solution from summer 2024 edition

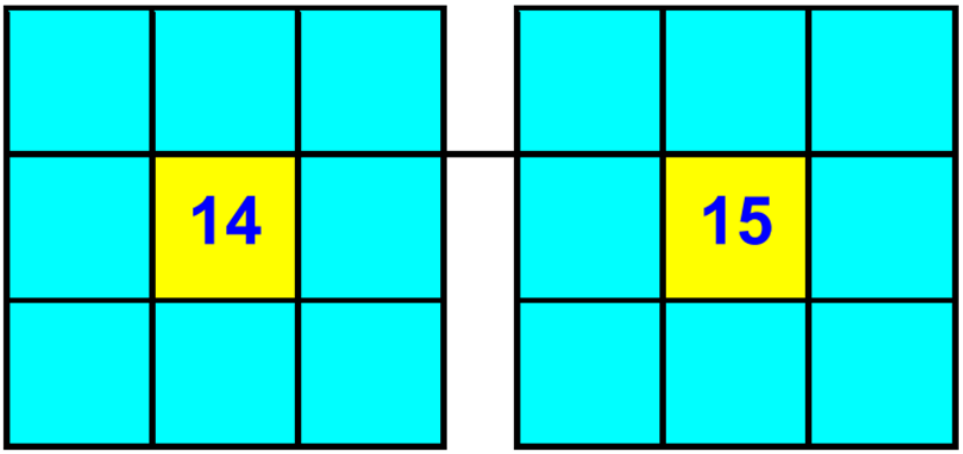
Puzzle time

12 to 15

Can you put the numbers 1 to 8 in each of the squares so that each side adds up to the middle number?

Find the answer on the next page





Puzzle time

12 to 15 - answers

Four questions in one for this puzzle. There are lots of ways of doing this but here is one answer for each square.

1	8	3
5	12	7
6	4	2

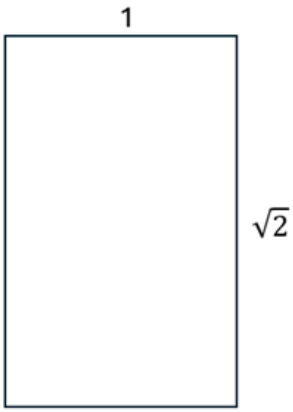
8	4	1
3	13	7
2	6	5

7	3	4
6	14	2
1	5	8

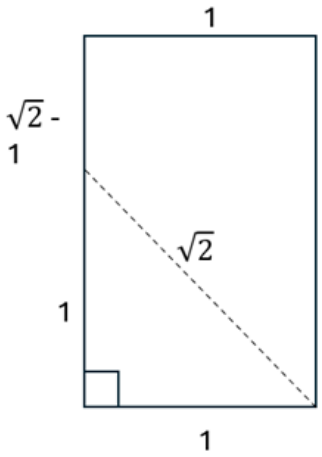
6	1	8
2	15	4
7	5	3

https://mathsphere.co.uk/downloads/maths-puzzles/maths-puzzle-01-12-to-15.pdf.

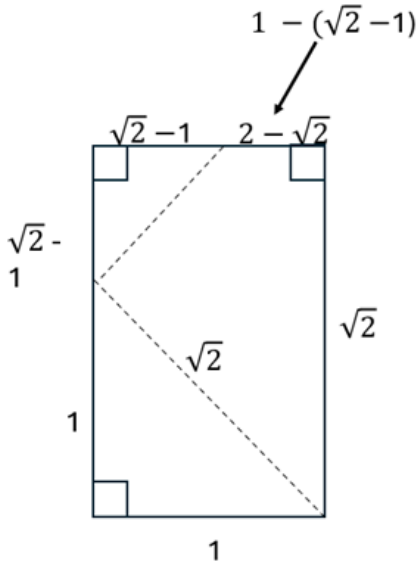
Secondary puzzle – solution from summer 2024 edition



Take a piece of A4 paper
Length: Width = $\sqrt{2}$: 1



Fold a right-angled isosceles triangle.
By Pythagoras: (1 , 1 , $\sqrt{2}$)



Fold a second right-angled isosceles triangle .
By Pythagoras: ($\sqrt{2}$-1 , $\sqrt{2}$-1 , hypotenuse ?)

By Trigonometry $\sin 45^0 = \frac{1}{\sqrt{2}} = \frac{opposite}{hypotenuse\ (a)}$

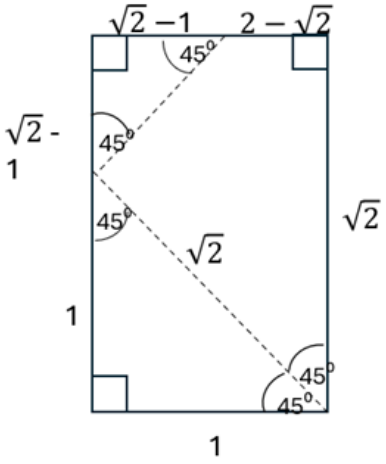
$a = \frac{\sqrt{2}-1}{1/\sqrt{2}} = \sqrt{2}(\sqrt{2}-1)$

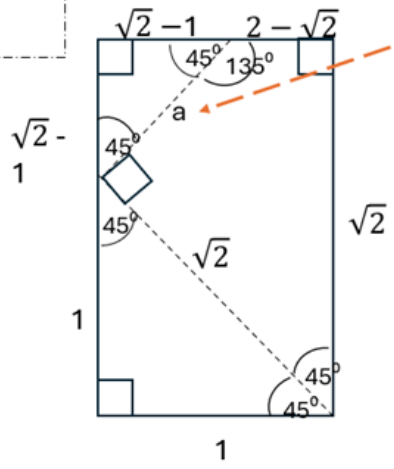
$a = 2 - \sqrt{2}$

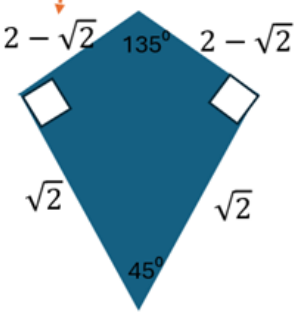
By Pythagoras $a^2 = (\sqrt{2}-1)^2 + (\sqrt{2}-1)^2$

$a^2 = 6 - 4\sqrt{2}$

$a = 2 - \sqrt{2}$







Perimeter = $2(2-\sqrt{2}) + 2\sqrt{2}$
= 4 units

Area = $2 \times 0.5(\sqrt{2})(2-\sqrt{2})$
= $(2\sqrt{2} - 2)$ units^2

Courses 2024/25

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

'Pathway to Progress' – A Mathematics Intervention Programme

A half-day training session 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 Key Stage 2.

11 November 2024

Pathway Mathematics

Sub £125 / SLA £85 / Full £150

Inclusive Classroom – Adapting Planning in Mathematics for Pupils with SEND

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.

11 November 2024 and 5 February 2025

Inclusive Classroom

Sub £220 / SLA £135 / Full £264

Primary Mathematics: New Mathematics Managers 2024/25

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.

22 November 2024, 17 January and 14 March 2025

New Mathematics Managers

Sub £495 / SLA £260 / Full £594

SEND Planning Tool: Using the Pre-Year 1 to Year 3 Mathematics Planning Tools 24-25 (Webinar)

This course will explore the effective use of the Pre Year 1-Year 3 SEND planning tools in mathematics. The documents have been written to outline the knowledge, concepts and strategies needed to progress from the Early Years Foundation Stage to the Year 3 curriculum. The planning tool is specifically for pupils with SEN.

The course will consider:

- effective pedagogy in mathematics
- diagnostic assessment
- developing pupil independence.

Delegates will have time to reflect on the needs of a child they are teaching and create a bespoke plan for the child.

9 January and 26 February 2025

SEND Planning Tool

Sub £175 / SLA £135 / Full £210

Unlocking Potential: Tackling Education Disadvantage in Maths – Part 1

This course aims to be thought provoking and practical. It is designed specifically for leaders who want to make a positive impact on the maths achievement of pupils who face educational disadvantage. This course will help develop a deeper understanding of the barriers within maths and provide you with the skills and confidence to develop and implement an action research project that addresses the specific needs of your own school.

22 January 2025
(Part 2 – 23 April 2025)

Unlocking Potential

Sub £220 / SLA £135 / Full £264
Part 1: Sub £110 / SLA £70 / Full £132
Part 2: Sub £110 / SLA £65 / Full £132

Making Accelerated Progress in Year 3/4 Mathematics for Pupils Assessed as 'Working Towards'

This course, aimed at Year 3/4 class teachers and maths leaders, over two face-to-face half-day sessions will provide practical ideas to implement within classroom practice to ensure accelerated progress in mathematics, for pupils assessed as 'working towards'.

23 January and 13 March 2025

Accelerated Progress

Sub £250 / SLA £160 / Full £300

Primary Mathematics: Working at Greater Depth in Mathematics 24-25

This course aims to develop teachers' ability to vary tasks to meet the needs of greater depth pupils within their class. Teachers will explore strategies, task design and questioning to enable pupils to deepen their knowledge and understanding.

6 February 2025

Mathematics Greater 24-25

Sub £120 / SLA £75 / Full £144

Problem Solving in Key Stage 2 Mathematics 24-25

This course aims to develop teachers' pedagogy on the various approaches to teaching the skills needed for effective problem solving – one of the main aims of the National Curriculum. Teachers will have the opportunity to explore the different styles of problems which enable children to develop and embed their mathematical skills.

6 February 2025

Problem Solving

Sub £110 / SLA £75 / Full £132

Secondary

Secondary Mathematics Network 24-25

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.

Autumn 1 – 16 October 2024
Autumn 2 – 3 December 2024
Spring 1 – 6 February 2025
Spring 2 – 25 March 2025

Autumn 1 Maths
Autumn 2 Maths
Spring 1 Maths
Spring 2 Maths

Sub £75 / SLA £40 / Full £90 per network

Contact details

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Email: kathryn.spencer@hants.gov.uk

Website: www.hants.gov.uk/educationandlearning/hias

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.