Maths

at

Firs Primary School

Updated September 2021

Firs Primary School

Contents

Firs Primary School

Our Vision for Maths at Firs

At Firs we want our children to:

- ✓ Show enjoyment and feel excited whilst being immersed in their learning of mathematics.
- ✓ Have a positive attitude towards maths lessons and solving problems by acknowledging our FIRSY values: Fascinated, Independence, Respectful, Sociable and You Can Do It!
- ✓ Acquire a deep, long-term, secure and adaptable understanding of mathematics.
    - This will be done by providing all children with the same curriculum and opportunities and giving all children the chance to do fluency, problem solving and reasoning for every objective. Children who require additional help will be given speedy interventions to prevent long term gaps in their learning and to enable them to keep up with their peers.
    - All children will be given the same opportunities by completing the same task which will be differentiated by support and resources where applicable rather than by task.
- ✓ Be continually challenged in their thinking and acknowledging the need for some to gain a greater depth of proficiency and understanding.
    - This is done by assessing children at the start of the lesson (pre-task) to ensure they are given the correct task and moved on from fluency, to problem solving and reasoning (mastery glasses) before moving on to the further challenge. The further challenge will provide rich and sophisticated problems within the topic.
- ✓ Become confident mathematicians, which allows them to, upon leaving Firs, apply their learning in everyday life, contribute to being a positive member of society, and continue to be successful in secondary school.

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As a school we have decided to follow White Rose Maths for children in Key Stage One and Key Stage 2. The White Rose schemes of learning are designed to support a mastery approach to teaching and learning, as well as to support the aims and objectives of the National Curriculum.

The White Rose schemes have number at the heart and a lot of time is spent reinforcing number to build competency. It also provides opportunities to build reasoning and problem solving into each lesson.

White Rose believes that **all** children, who are introduced to a concept, should have the opportunity to build on their abilities by following a concrete-pictorial-abstract approach.

Concrete – children should have the opportunity to use concrete objects to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

Firs Progression Statement

Although we follow the White Rose Maths progressive curriculum and use the 'Small Steps' to plan and support the sequencing of our own lessons, we recognise that due to the diverse needs of our pupils including SEND, disadvantaged, EAL, New to English or gaps in their schooling, we may need to adjust the order of our curriculum within one National Curriculum year to ensure learning in maths can be successful. As our transience and needs of the pupils adjusts dramatically each year, adjustments also alter year on year. As maths co-ordinators we record, track and monitor and curriculum adjustments to ensure coverage of the whole curriculum.

For our pupils who have gaps in their learning and/or pupils who need to make rapid progress, interventions (see Number Stacks link at the bottom of the page) may be given in addition to every day maths lessons. These interventions prioritise initially the concepts of Place Value and the Four Operations as these areas are vital in ensuring the entirety of the maths curriculum can be accessed and the skills and knowledge applied to other learning objectives.

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Maths in EYFS

In EYFS maths is taught through "White Rose".

White Rose Maths overview for EYFS has been split into number and shape, space and measure. Each section starts with the Early Learning Goal. The development matters statements are used to break the ELGs down into smaller steps. This is to support our ethos of spending longer on some topics to ensure children have a deep understanding before moving on to the next topic. Each development matters statement has activity ideas that can be modelled in whole class sessions or placed in provision areas for children to access independently.

Children are given the opportunity to meet maths obejctives through objective led planning. A series of progressive maths objectives are planned into the children's continuous provision. Throughout the week children are then observed by the EYFS team and moved on to the next objective. The objective led planning ensures that all children are given the opportunity to meet the same end goal, regardless of their starting point.

Evidence of children's learning will be photographed for their digital learning journeys and annotated on to the objective led planning sheet which is used as a working document for the EYFS team.

As children prepare to transition into year 1 in the summer term, reception children are introduced to the "Mastery Glasses."

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SEND and High Attaining Pupils

SEND

For all pupils who are on the SEND register at Firs they will have an personalised plan. This will either be a IPM (Individual Provision Map) or MEP (Multi Element Plan). Within the plan the children will have personalised targets are provisions that are put in place to support the child in meeting targets. If the target links to maths, the provisions maybe techniques that are put in place to include children in whole class learning or interventions that support the children's learning outside of maths lesson time.

In maths most SEND children will follow the same lesson structure as others by completing the pre-task and using this to assess their needs. Where written work may not be appropriate for that child, practical learning may take place and images or a description placed in their child's book for evidence. Cognitive overload is also taken to into account, so the child can take focus on that specific learning objective such as in long multiplication giving the child a timestable grid. All SEND children will be exposed to age-related objectives but how they attempt those objectives will differ as the class teacher scaffolds the learning for their needs.

High Attaining Pupils

Due to how the maths lesosn structure is designed, it allows for every child to be challenged appropriately in every lesson. All pupils are assessed at the beginning of each LO, as we understand that even high attaining pupils may struggle more with one area of maths that others. The 'Further Challenge' is planned into every lesson to give the opportunity for greater depth pupils to apply their learning in an unknown and different context. This is usually in the form of a "low ceiling high threshold task" where high quality questioning can continue to challenge the pupil even when the answer is "solved." These tasks often come from the Nrich website. https://nrich.maths.org/

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Interventions

Children can be assessed for maths interventions for a variety of reasons, it may be to consolidate current learning, improve mental maths skills, build confidence for lower attainers prior to the lesson or as part of their IPM/MEP.

- Same day/follow up interventions
    - These will be used for children who have been identified by the teacher as unable to meet the LO or are not yet secure in the area of learning. By following up the lesson with an intervention, it ensures no child is left behind and all children can continue on the learning journey together.
- Pre-teach
    - This may be used for low attaining pupils or child who show little confidence in maths. It allows for new vocabulary and methods to be introduced prior to the lesson so that they can access the maths lesson with more confidence and are more likely to be successful in the lesson. Pre-teaching should also be used to assess and fill in the gaps of prior learning (using previous year groups objectives). It is also an opportunity for any misconceptions to be addressed in a smaller group.
- Precision Teaching
    - Precision teaching is an intervention that can be used across many subjects and focuses on speed and accuracy. This can be used for improving children's number recognition, number bonds or timestables.
- Tackling Add & Subtract/ Tables
    - Tackling Add & Subtract/Tables is used throughout the school as a way of improving children's mental maths skills. This can also be used as a more controlled intervention with an adult to target specific pupils.

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Calculation Policy

The following policy identifies different methods for concrete, pictoral and abstract across all of the foupr operations. It outlines how these should progress with ability/age.

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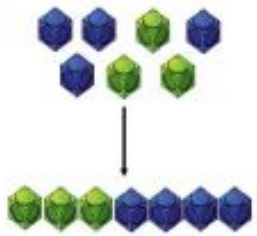
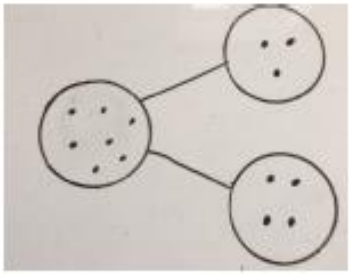
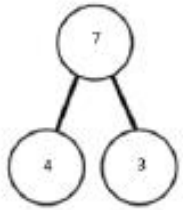
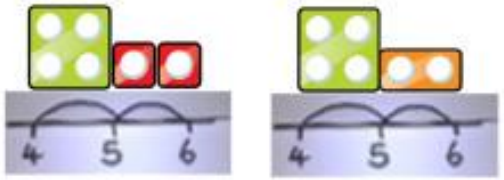
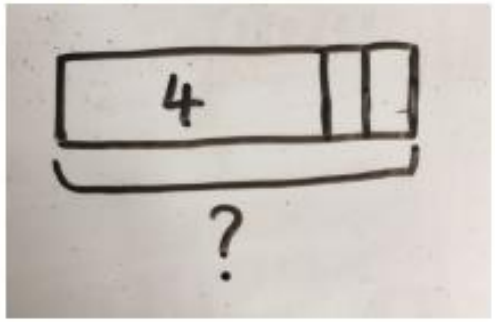
Calculation policy: Addition

Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars). 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 
Counting on using number lines using cubes or Numicon.  	A bar model which encourages the children to count on, rather than count all. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 

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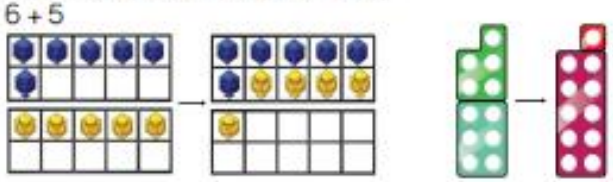
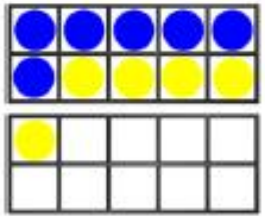
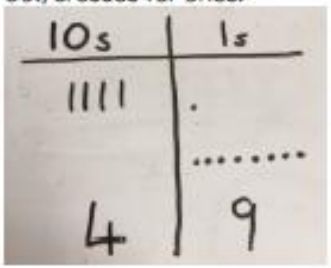
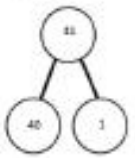
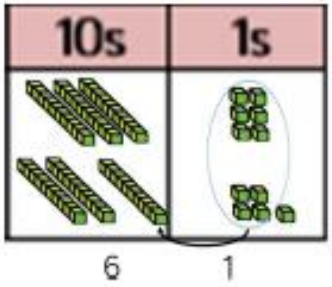
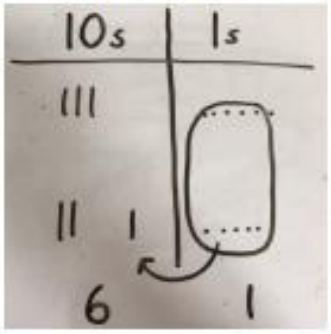
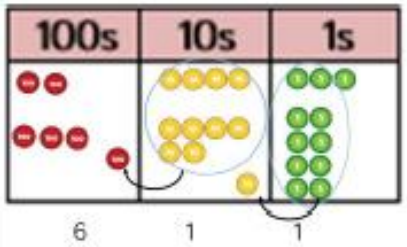
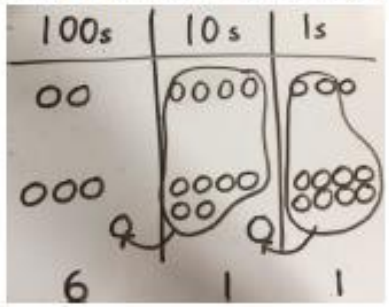
Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$
TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8  1 + 8 = 9 40 + 9 = 49 4 1 + 8 4 9
TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Chidlren to represent the base 10 in a place value chart. 	Looking for ways to make 10. 36 + 25 = 1 5 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 36 Formal method: +25 61 1

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.

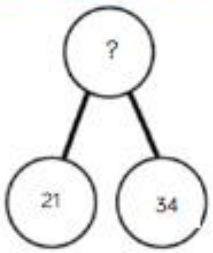


Chidren to represent the counters in a place value chart, circling when they make an exchange.



$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 1\ 1 \end{array}$$

Conceptual variation; different ways to ask children to solve 21 + 34



?	
21	34

Word problems:
In year 3, there are 21 children and in year 4, there are 34 children.
How many children in total?

21 + 34 = 55. Prove it

$$\begin{array}{r} 21 \\ +34 \\ \hline \\ \hline \end{array}$$

21 + 34 =

$\square$ = 21 + 34

Calculate the sum of twenty-one and thirty-four.

Missing digit problems:

10s	1s
	?
?	5

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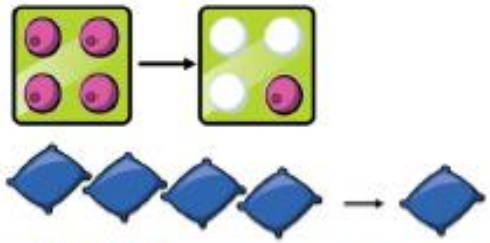
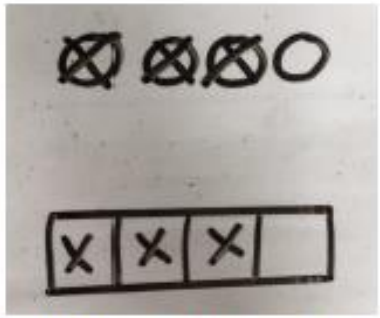
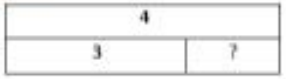
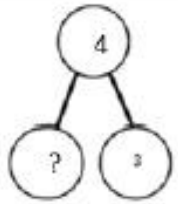
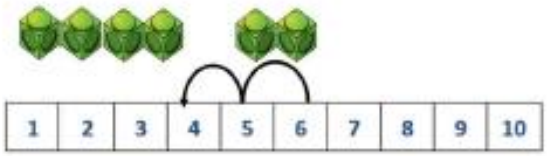
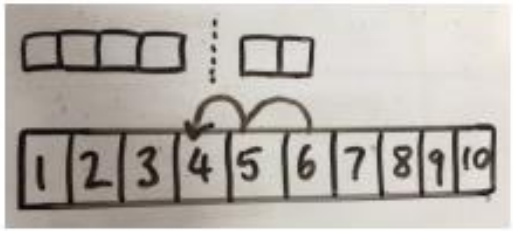
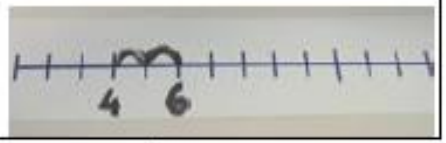
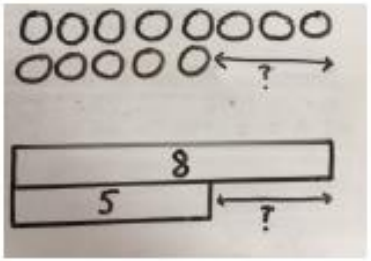
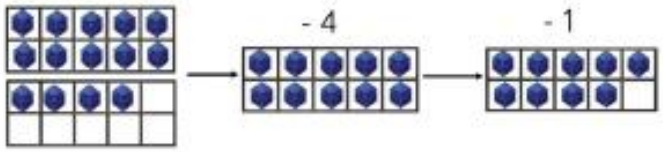
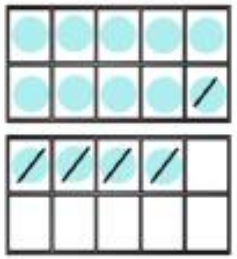
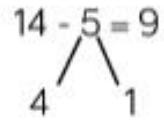
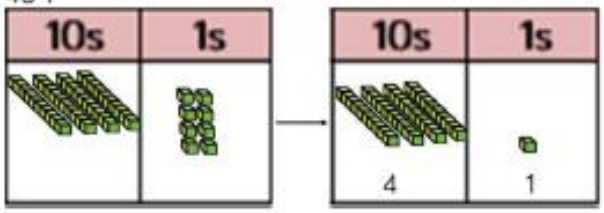
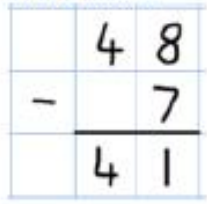
Calculation policy: Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease. exchange

Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 – 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4- 3 = □ = 4 – 3  
Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 – 2 = 4  	Children to represent what they see pictorially e.g.  	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line  

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5.  	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.  	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 - 5 = 7 - 4 have the same difference.
Making 10 using ten frames. 14 – 5  	Children to present the ten frame pictorially and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9
Column method using base 10. 48-7  	Children to represent the base 10 pictorially.  	Column method or children could count back 7. 

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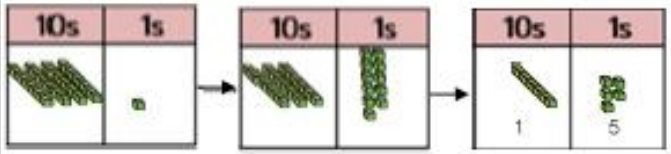
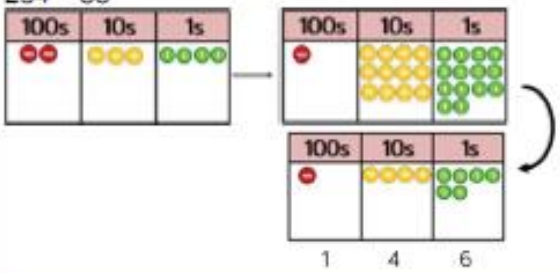
Column method using base 10 and having to exchange.
41 – 26



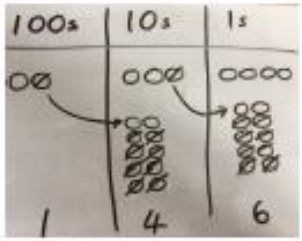
Represent the base 10 pictorially, remembering to show the exchange.

Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.

Column method using place value counters.
234 – 88



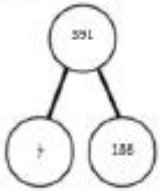
Represent the place value counters pictorially; remembering to show what has been exchanged.



Formal colum method. Children must understand what has happened when they have crossed out digits.

$$\begin{array}{r} {}^{2}\not{2}\,{}^{1}\not{3}4 \\ -\ 88 \\ \hline 6 \end{array}$$

Conceptual variation; different ways to ask children to solve 391 - 186



391	
186	?

Raj spent £391, Timmy spent £186.
How much more did Raj spend?

Calculate the difference between 391 and 186.

□ = 391 – 186

391
-186
———

What is 186 less than 391?

Missing digit calculations

$$\begin{array}{r} 3\ 9\ \square \\ -\ \square\square\ 6 \\ \hline \square\ 0\ 5 \end{array}$$

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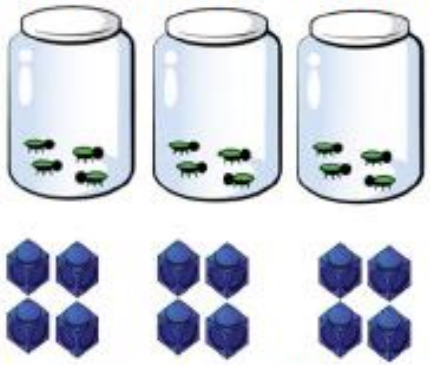
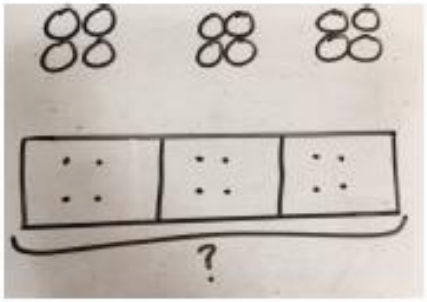
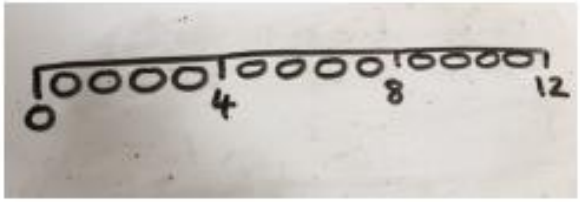
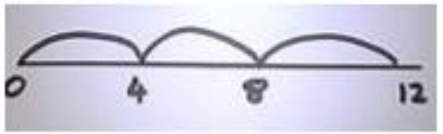
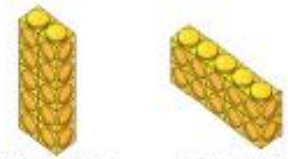
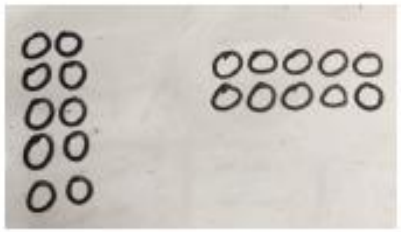
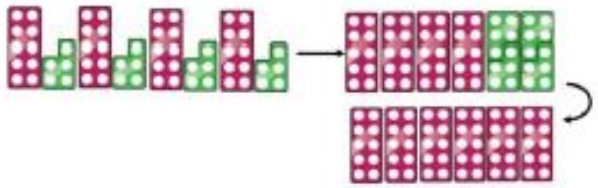
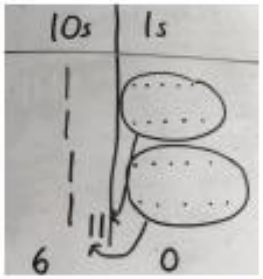
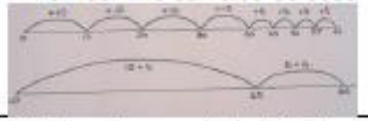
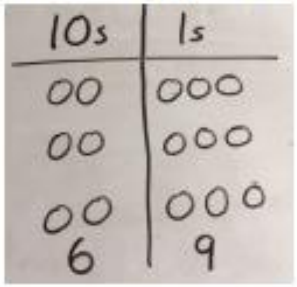
Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
Number lines to show repeated groups- 3 × 4   Cuisenaire rods can be used too.	Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jumps of four. 3 × 4 = 12 

Use arrays to illustrate commutativity counters and other objects can also be used. $2 \times 5 = 5 \times 2$  2 lots of 5 5 lots of 2	Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$
Partition to multiply using Numicon, base 10 or Cuisenaire rods. 4×15 	Children to represent the concrete manipulatives pictorially. 	Children to be encouraged to show the steps they have taken. 4 × 15 10 5 10 × 4 = 40 5 × 4 = 20 40 + 20 = 60 A number line can also be used 
Formal column method with place value counters (base 10 can also be used.) 3×23 	Children to represent the counters pictorially. 	Children to record what it is they are doing to show understanding. 3×23 20 3 $3 \times 20 = 60$ $3 \times 3 = 9$ $60 + 9 = 69$ 23 × 3 69

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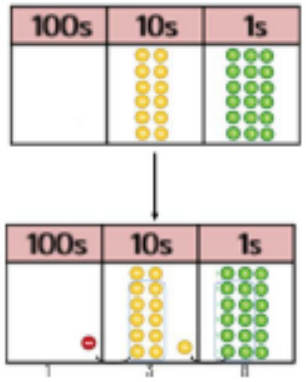
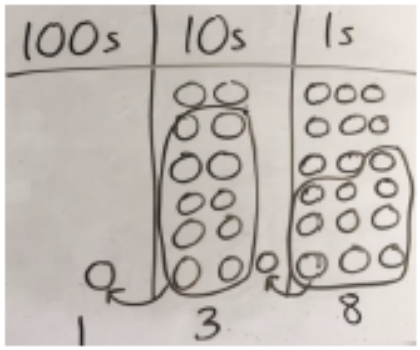
– School –

Formal column method with place value counters.
6 x 23



Children to represent the counters/base 10, pictorially e.g. the image below.



Formal written method

$$6 \times 23 =$$

$$\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \hline 1\ 1 \end{array}$$

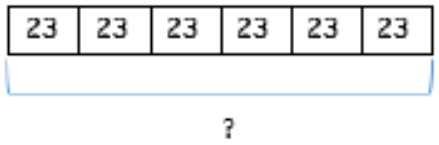
When children start to multiply 3d × 3d and 4d × 2d etc., they should be confident with the abstract:

To get 744 children have solved 6 × 124.
To get 2480 they have solved 20 × 124.

$$\begin{array}{r} {\scriptstyle 1\ 2\ 4} \\ \times\ \ 2\ 6 \\ \hline 7\ 4\ 4 \\ 2\ 4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ \hline {\scriptstyle 1\ 1} \end{array}$$

Answer: 3224

Conceptual variation; different ways to ask children to solve 6 × 23



Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?

With the counters, prove that 6 x 23 = 138

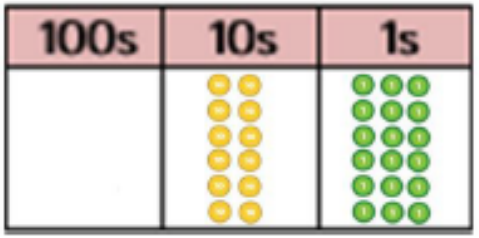
Find the product of 6 and 23

6 × 23 =

□ = 6 × 23

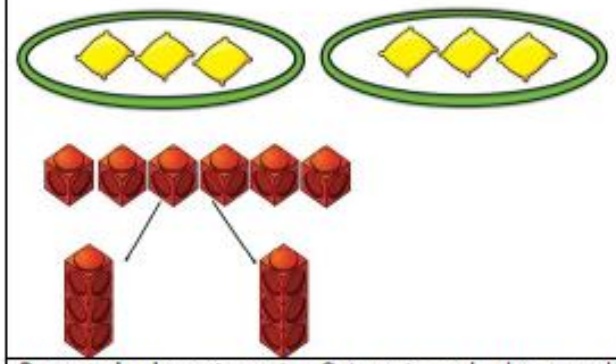
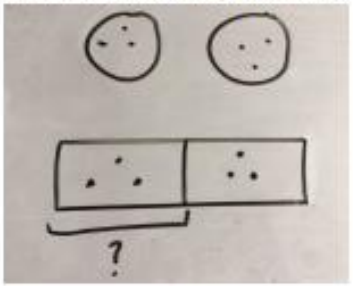
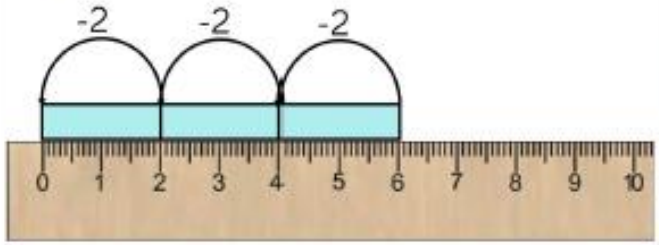
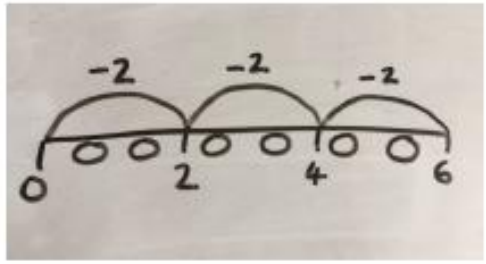
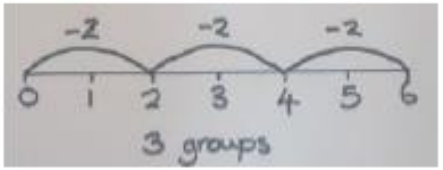
$$\begin{array}{r} 6 \\ \times\ 23 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ \times\ 6 \\ \hline \\ \hline \end{array}$$

What is the calculation?
What is the product?



Calculation policy: Division

Key language: share, group, divide, divided by, half. exchange

Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3  Children should also be encouraged to use their 2 times tables facts.
Repeated subtraction using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Children to represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted. 

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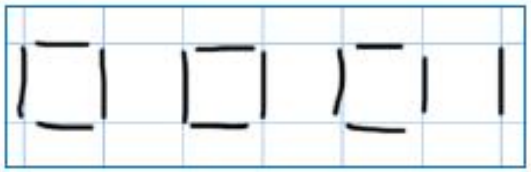
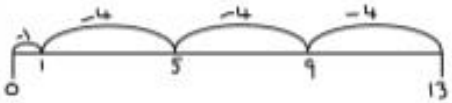
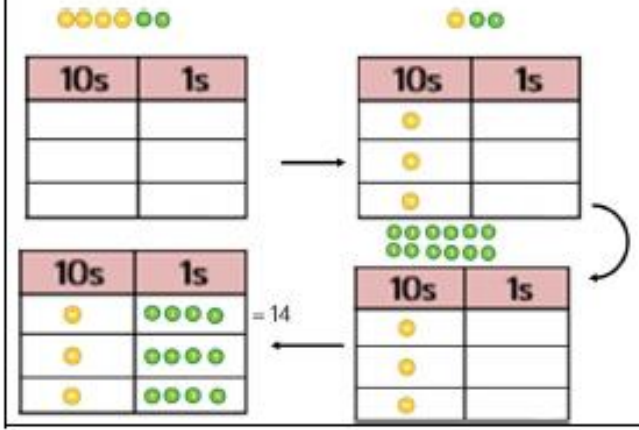
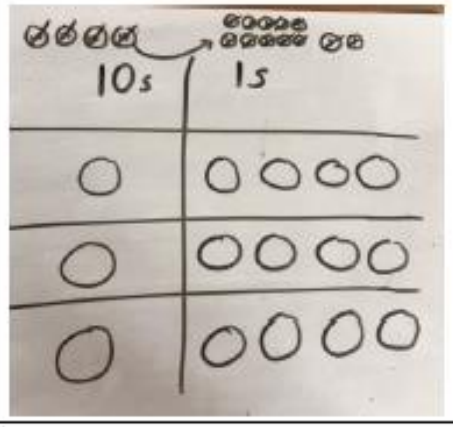
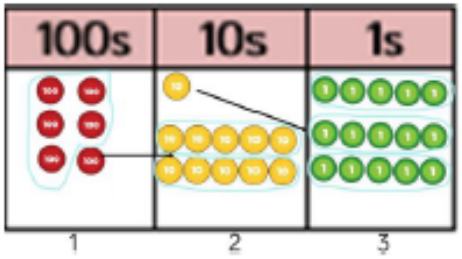
2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.  There are 3 whole squares, with 1 left over.	Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over.	13 ÷ 4 = 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '3 groups of 4, with 1 left over' 
Sharing using place value counters. 42 ÷ 3 = 14 	Children to represent the place value counters pictorially. 	Children to be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14

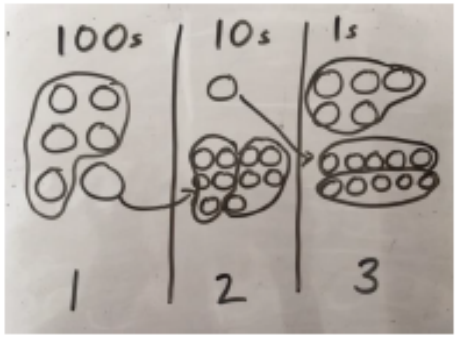
Firs Primary School

Short division using place value counters to group.
615 ÷ 5



1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Represent the place value counters pictorially.

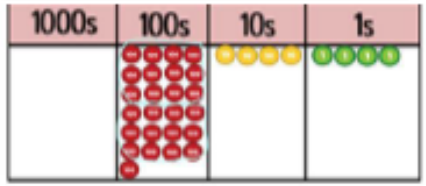


Children to the calculation using the short division scaffold.

$$5\overline{)615}^{\,123}$$

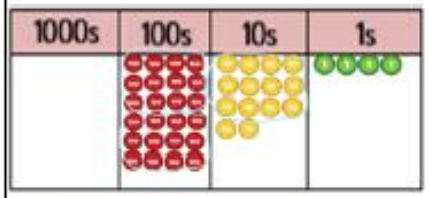
Long division using place value counters
2544 ÷ 12

We can't group 2 thousands into groups of 12 so will exchange them.



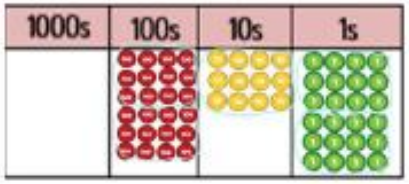
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$12\overline{)2544}^{\,212}$$
$$\underline{24}$$
$$14$$
$$\underline{12}$$
$$2$$



After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.

$$\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$$

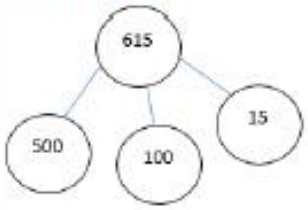


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

$$\begin{array}{r} 0212 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$$

Conceptual variation; different ways to ask children to solve 615 ÷ 5

Using the part whole model below, how can you divide 615 by 5 without using short division?



I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

$5\overline{)615}$

615 ÷ 5 =

□ = 615 ÷ 5

What is the calculation?
What is the answer?

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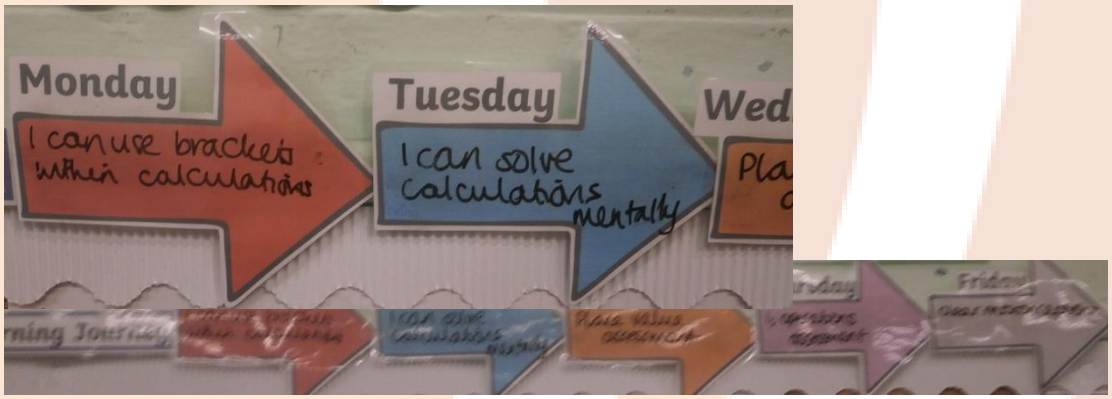
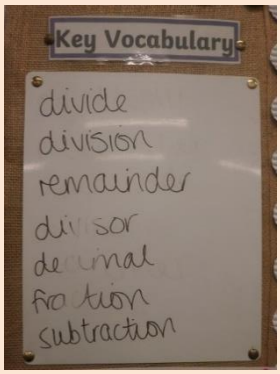
Classroom Environment

Every classroom must have a "Maths Working Wall" which reflects the current learning. Displayed on the working wall must be learning journey arrows so children can see how their learning will progress over the week and how they are going to transfer and develop the skills they have learnt. This is to be used in all classrooms from EYFS to KS2. Teachers may choose to have communication in print or pictures on the arrows if appropriate for their children.



To support the children's understanding of what they are learning, current key vocabulary must also be shown. This identifies what the children must be able to define and use in their discussions in that week's maths lessons.



All working walls must also have modelled examples of the current learning so children are aware of how to set out their work in books and can use it when using the 5Bs to support them in the lesson.

On each working wall must also be a display of the mastery glasses so when children are given problem solving and reasoning questions using these, they can use the working wall to understand what they have to do and what their answer should look like such as including an explanation or their working out. All children should be able to say what the glasses are used for and mean if asked. In each hall there must be an up-to-date display of the mastery glasses to show how they are used across the key stage.

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Equipment

During the summer of 2020, the NCETM worked with the DfE to provide a guidance for teaching maths. This outlines the essential objectives for each year group, known as the ready to progress criteria. It explains what they should have already learnt and also some ideas of how you should teach it using concrete and pictorial representatives. They also provide ideas of questions you may use to assess children's understanding.

https://www.gov.uk/government/publications/teaching-mathematics-in-primary-schools

Below is a list of maths resources that we expect all classrooms to have at **all times.** Classrooms may have other maths resources too, these are just the minimum. These are resources that can be used for a range of objectives and should be accessible for the children to support their learning every lesson (not stored elsewhere). It is important that we make sure we are also modelling using the equipment.

Year 1

- Counters
- Numicon
- Part Part Whole models
- 100 square
- Number lines

Year 2

- 100 square
- Base 10
- Place value counters
- Bead strings
- Part Part Whole models

Year 3

- Ten Frame
- Place Value Counters
- Place value grid (showing the relationship between each column p87 of guidance)
- Double sided counters
- Dienes
- 100 Square
- Blank number line

Year 4

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- Place value counters
- Ten frame
- Place value grid (showing the relationship between each column p147 of guidance)
- Timestable grid (p160 of guidance)
- 100 square
- Blank number line

Year 5

- Place value grid that shows the relationship between each column (P212 of guidance)
- Dienes blocks
- Ten frame
- Place value counters
- Gattegno chart
- Timestable grid (P235 guidance)
- 100 Square

Year 6

- Place Value Grids (Hundredths to 10 million)
- Ten frame
- Place Value Counters
- Gattegno Chart
- Double sided counters
- 100 square
- Timestable grid

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Planning and Lesson Structure KS1 and KS2

Maths Plan	Class: W/C: Area:	Vocabulary –	White Rose Block/ Small Steps

Children's books should be set out with the subheadings as below so that the learning journey can be seen from before/at the start of the lesson to the end. The subheadings maybe printed (e.g. Pre-Task under the learning objective and Problem Solving and Reasoning above the challenges). Teacher Led does not need to be inlcuded in KS1 books.
The aim should be to get all children on to problem solving and reasoning questions, not just the higher ability – this may take more than 1 lesson! Children only need to be doing as much fluency to show they understand the method, pages of calculations aren't necessary.
This lesson plan may be rough ideas or a full plan, depending on if a planned SMART board is used to accompany it. The important part is that the books reflect this lesson structure clearly without having to look in more than one place.

Date	Learning Objective and Success Criteria	Pre-Task	Teacher Led	Independent Practise			At the end of the lesson	Interventions
				Fluency Task	Problem Solving and Reasoning Task	Further Challenge (for Greater Depth Children)		

Guidance		This task may be a word problem for them to solve in pairs or simple fluency questions to check their understanding. This needs to be used for AFL and should be recorded in books where necessary under the heading Pre-Task.	This should teach the method to the children. Questions should be planned to address any misconceptions that may happen before children begin the task. Such as when teaching column addition do a 2 digit + 3 digit and line up the columns wrong. Children should have the opportunity to "have a go" on their whiteboard.	This should give them the opportunity to practise the skill/method you have taught them. Children should be given supporting tools where necessary to ensure their focus is only on achieving the LO. For example if you are teaching children the short multiplication method, the focus is on using the method so children should be allowed to use a timestable grid if needed. Differentiation should be through resources and support where possible instead of by task.	These should relate to the mastery glasses where children should apply their learning. Tasks should be planned so all children can access them. All children should have the opportunity to move on to these in the lesson. On the learning platform, see 'reasoning questions' and 'pitch and expectations' for ideas for each topic.	This should challenge children to apply their learning to a different context. NRICH challenges are good for this. This may be a low threshold high ceiling task.	Have most children got onto the problem solving and reasoning? Yes Give the children who haven't mastery glasses for purple pen If there are children who haven't got it, they need an intervention No Another lesson is needed to give all children a chance for problem solving and reasoning	Children who need additional same day intervention to keep up with age related expectations. The work doesn't have to be recorded in their book as a whiteboard may be more appropriate but note of this happening needs to be recorded to show the learning journey.

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Supporting the White Rose Scheme

An exemplification for each National Curriculum objectives can be found on the NCETM website under "National Curriculum Resource Tool." This also provides examples of activities that can be used to support the White Rose resources. https://www.ncetm.org.uk/resources/41211

For fluency questions, the Target Your Maths for KS2 provide a range of questions for each objective. Within each Target Your Maths book the activites are differentiated 3 ways, with "B" being age related questions. Practise Maths can also be used for flunecy questions (KS1 and KS2).

Mastery Glasses

Mastery glasses can be used throughout all key stages including EYFS. How this is evidenced in books may differ depending on the year group. For example year 2 children may be able to write their answer whereas year 1 may do this verbally or with equipment. The evaluate it glasses are more appropriate for key stage 2 children as they are aware of multiple methods, however this could be used in whole class teaching across the school.

In EYFS the mastery glasses may not be embedded into their learning until the summer term. This is done verbally and recorded though videos or photographs to go in their learning journey. Children may be encouraged to use the language of the mastery glasses in their continuous provision with prompting from the adult.

Explain it

Children need to describe what they have done in his/her own words and then explain it to someone else.

- Become the teacher
- Can you explain the problem to me?
- What method have you chosen to use, and why have you chosen to use it?
- How did you reach your answer?

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Convince me

Children must identify misconceptions and reasons why the answer is correct.

- How do you know that you are correct?
- Can you convince me that it is not this answer?

Prove it

Children are challenged to prove that they reached the correct answer using alternative methods or representations. They may be asked to prove whether a given answer is correct or incorrect.

- Can you prove that you are correct using a different method?
- Can you check your answer using the inverse operation?
- Can you represent the same problem in a different way?

Use it

Children are challenged to apply their learning and use it in different contexts. They should recognise it in new situations and contexts as well as see connections between it and other facts and ideas.

- Can you use the same method to solve a different problem?
- What prior knowledge can you use to help you solve this problem?

Evaulate it

Children must evaluate their choice of method, explaining which is the most efficient method and why.

- Why have you chosen to do it like that?
- Is there a quicker way?
- Do you think x has done it in the most efficient way? Why?

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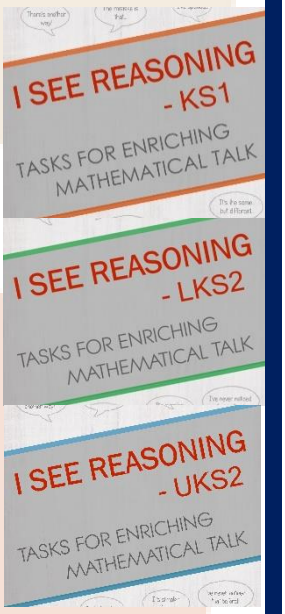
Sources of questions:

- NCETM assessment materials
https://www.ncetm.org.uk/resources/46689
- I See Reasoning
- NCETM Progression Materials
https://www.ncetm.org.uk/resources/44672



Children who are greater depth will need moving on from the mastery glasses and will need the opportunity to apply their learning in usual and unfamiliar contexts. Problems for this can be found on NRICH.
https://nrich.maths.org/content/id/9445/KS2FrameworkLinkedtoNRICHNov13.pdf
https://nrich.maths.org/content/id/9445/EYFSKS1CurriculumLinkedToNRICHJan16.pdf

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The difference between problem solving and reasoning

Aims

The national curriculum for mathematics aims to ensure that all pupils:

- 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.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- 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.

Types of reasoning

Write the missing numbers to make this **multiplication** grid correct.

×	□	□
9	63	54
□	56	48

Reason about a mathematical relationship or calculation

20 Adam says,

Explain why he is correct.

Perform or analyse a calculation and then offer an opinion

Reasoning can be the why, the proving and the explaining.

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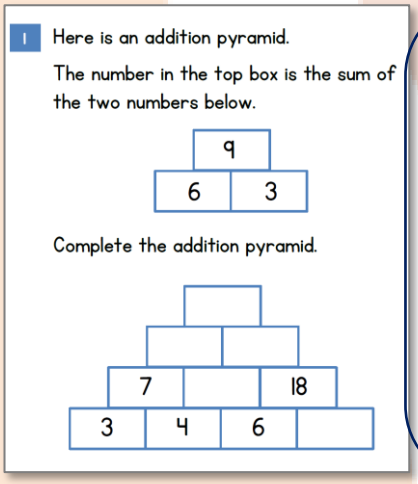
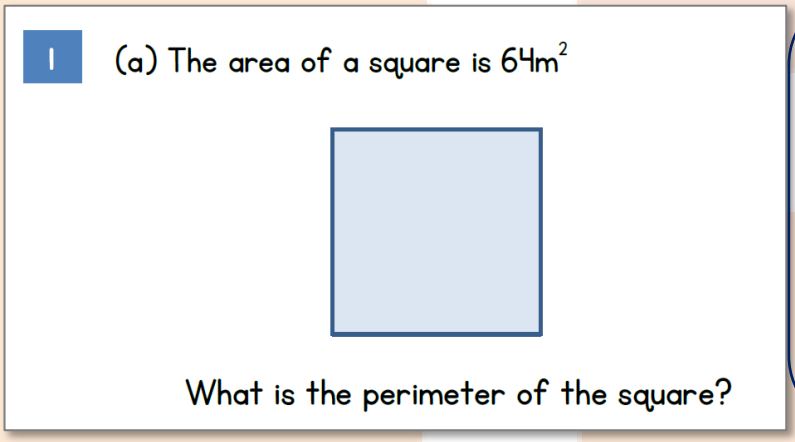


1 Here is an addition pyramid.

The number in the top box is the sum of the two numbers below.

Complete the addition pyramid.

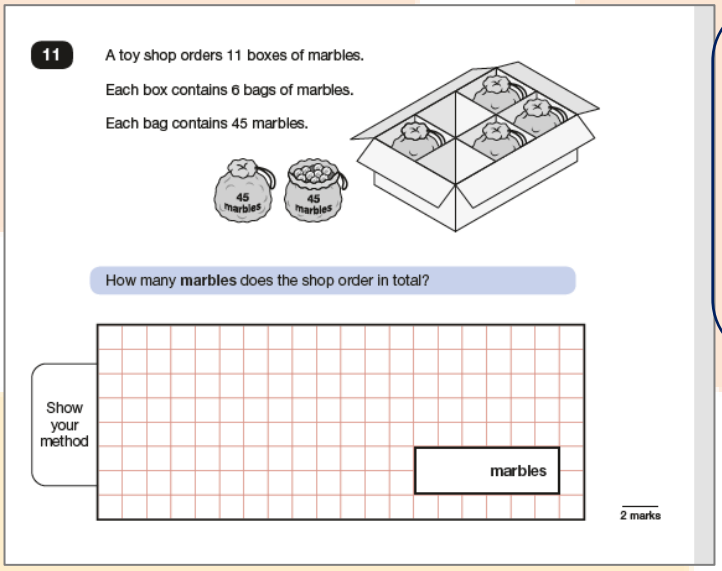
Reasoning can 'look' like fluency, in this question children are being asked to apply their knowledge of addition and subtraction but must reason with the relationships and where to start to find the answer and know why.



1 (a) The area of a square is 64m^2

What is the perimeter of the square?

Reasoning can 'look' like fluency. In this question children need to know what area and perimeter are and how to work them out (fluency) but must reason how to get from the area to the perimeter.



11 A toy shop orders 11 boxes of marbles.

Each box contains 6 bags of marbles.

Each bag contains 45 marbles.

45 marbles 45 marbles

How many **marbles** does the shop order in total?

Show your method

marbles

2 marks

Problem solving is where children need to identify what method to do and carry it out. There is a context to the question (real life) and can be multi-step.

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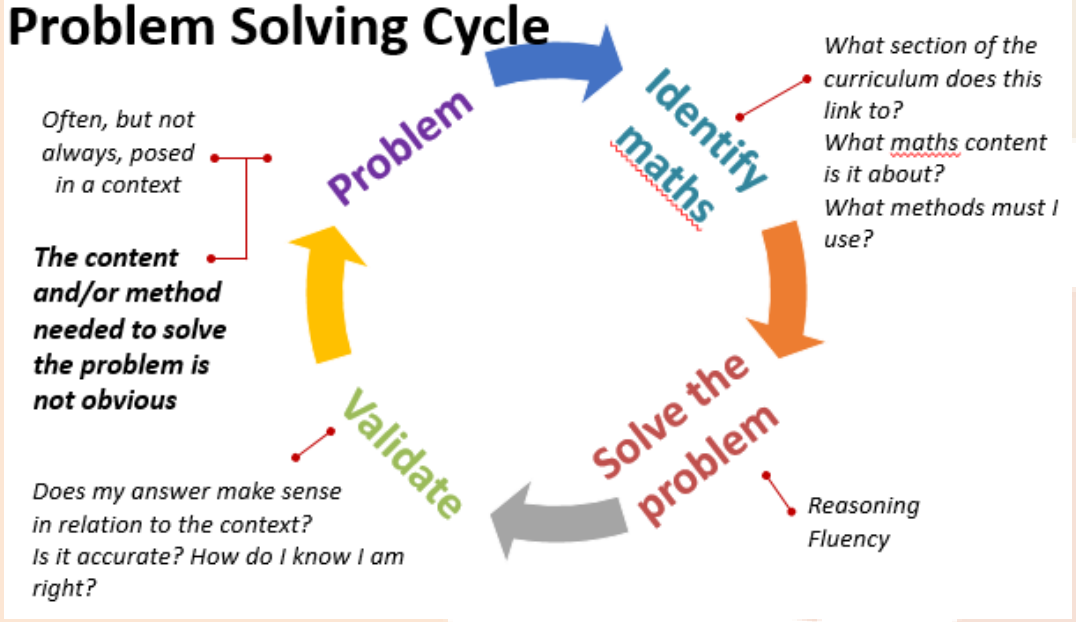
Problem Solving Cycle



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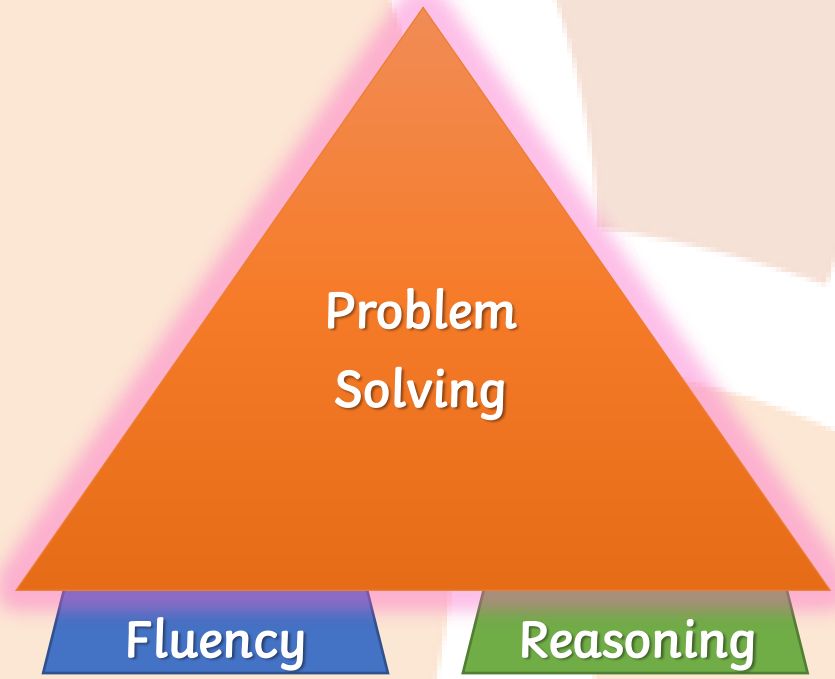
We need to teach children how to solve reasoning and problem-solving questions by modelling practice for them.

Problem Solving is impossible without fluency.

We need to give children a selection of strategies for solving problems – this is why we use multiple representations.



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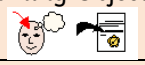
Assessment

Steps to Success

The 'Steps to Success' should be a guide to help a child to succeed every lesson. The success criteria may include communciation in print as well as examples of how to do the method.This can be used to show formative assessment at the end of the lesson by using the self and teacher assessment boxes. This should then reflect on how the next lesson is taught and any interventions that take place.
If the LO is carried across to the next day, a new steps to success isn't needed, instead a short date can just be put where the work has continued.

Steps to Success

Date			
Subject/s	Maths		
Learning Objective 			
		SA 	TA 
Success Criteria 			
Support	Independent	Adult Support ( )	Group Work
Pre-task			

Steps to Success

Date	
Subject/s	**Maths**
	Follow Up Intervention
Carried out by:	
Focus:	
Notes:	

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Intervention: Number Stacks

Number Stacks
- Making sense of Numbers -

- It takes 60 key skills from the National Curriculum separates them into 5 key categories, this is aligned by year group.
- Each key skill has its own video tutorial designed to be watched by an adult and child together.
- The videos break down the skills into simple manageable steps and allow opportunities to practice each step before assessing the child's understanding with a final fluency activity.

https://www.numberstacks.co.uk/wp-content/uploads/2019/02/Key-skills-pathways-edited-and-reduced-V4.pdf

Assessment

- The assessments are carried out on a 1:1 basis (like RWInc)
- All children who aren't doing the NTS tests should be assessed as they are not accessing close to their year group. Others can do them also if the class teacher identifies the assessment as applicable.
- Always start with the Number and Place Value initial assessment. Go through each key skill. If children get both wrong stop the assessment and this is the year group that they are working within (see answer sheet for matching year groups)
- If they get all correct up to their current year group move to addition and subtraction then multiplication and division then percentages and decimals.
- It is important that the children are not told the answers to the assessments as they will repeat the assessments at the end of the interventions.
- Once the assessment has been completed, this can be used as a summative assessment and a stage/level of learning can be determined for the child. *See FFT conversion grid.*

Intervention

- Use the assessment to know which key skill to start the interventions on.
- https://www.numberstacks.co.uk/number-place-value/
- Guidance of videos, using equipment, 1:1 interventions
    - "There is no expected time for how long this will take and it is better to spend a number of sessions on the same skill rather than rushing through too quickly." TAs may have to add additional examples in the same structure as the ones in the video.
- Interventions should take around 15 minutes max. No more than 2 children at a time.

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- These should be done 2 times a week minimum.
- Follow up with activity sheet.
- Continue working through the objectives. When they come to the end/the child's year group. Redo the initial assessment. If they achieve up to their year group move on to the next area, otherwise repeat steps where necessary (TAs/teachers can use judgement to edit activities if they are having to repeat with the same child)

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	Numberstacks Initial Assessments					FFT Assessment Key					
	Number and Place Value	Addition and Subtraction	Multiplication and Division	Fractions	Decimals and Percentages	If child in Year 1	If child in Year 2	If child in Year 3	If child in Year 4	If child in Year 5	If child in Year 6
Reception Level Skills	NPV1					5 skills = W+, 3-4 skills = W, 1-2 skills = W-	5 skills = B+, 3-4 skills = B, 1-2 skills = B-	4-5 skills = PK4, else check PK levels and P level descriptors	4-5 skills = PK4, else check PK levels and P level descriptors	4-5 skills = PK4, else check PK levels and P level descriptors	4-5 skills = PK4, else check PK levels and P level descriptors
	NPV2										
	NPV3										
	NPV4										
	NPV5										
Year 1 Level Skills	NPV6	AS1	MD1	F1		N-/N/N+	11-12 skills = W+, 7-10 skills = W, 1-6 skills = W-	11-12 skills = B+, 7-10 skills = B, 1-6 skills = B-	11-12 skills = PK5, else check PK level and P level descriptors	11-12 skills = PK5, else check PK level and P level descriptors	11-12 skills = PK5, else check PK level and P level descriptors
	NPV7	AS2	MD2								
	NPV8	AS3									
	NPV9	AS4									
		AS5									
Year 2 Level Skills	NPV10	AS6	MD3	F2		A-/A/A+	N-/N/N+	11-12 skills = W+, 7-10 skills = W, 1-6 skills = W-	11-12 skills = B+, 7-10 skills = B, 1-6 skills = B-	11-12 skills = PK6, else check PK level and P level descriptors	11-12 skills = PK6, else check PK level and P level descriptors
	NPV11	AS7	MD4								
		AS8									
		AS9									
		AS10									
		AS11									
		AS12									
Year 3 Level Skills	NPV12	AS13	MD5	F3	DP1	A+	A-/A/A+	N-/N/N+	12-13 skills = W+, 8-11	12-13 skills = B+, 8-11	12-13 skills = B-, else
	NPV13	AS14	MD6		DP2						

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	NPV14	AS15			DP3				skills = W, 1-7 skills = W-	skills = B, 1-7 skills = B-	check PK level and P level descriptors
		AS16									
Year 4 Level Skills	NPV15		MD7	F4	DP4	A+	A+	A-/A/A+	N-/N/N+	9-10 skills =W+, 6-8 skills = W, 1-5 skills = W-	9-10 skills =B+, 6-8 skills = B, 1-5 skills = B-
			MD8	F5	DP5						
					DP6						
					DP7						
					DP8						
Year 5 Level Skills			MD9	F6	DP9	A+	A+	A+	A-/A/A+	N-/N/N+	7-8 skills =W+, 5-6 skills = W, 1-4 skills = W-
			MD10	F7	DP10						
			MD11	F8							
Year 6 Level Skills			MD12	F9	DP11	A+	A+	A+	A+	A-/A/A+	N-/N/N+
				F10							
				F11							

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Presentation

Children in EYFS will have access to maths jotters to begin to practise mark making an being exposed to writing in books

Children in KS1 will start with 10mm square book, in year 1 children may use guided sheets initially to support their presentation. By the spring term, the majority of children in year 1 will be introduced to writing in the squares on a regularly basis. Towards the end of KS1 children may use towards using a 7mm square book.

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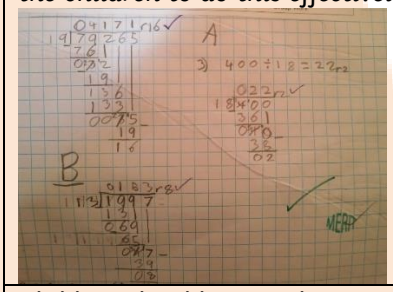
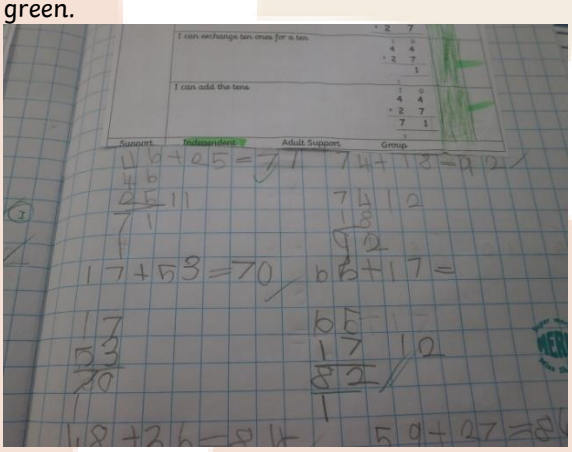
Marking

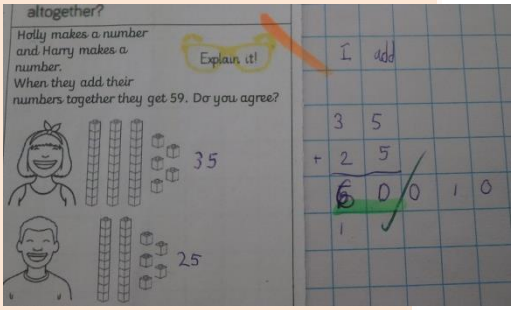
Children may be given the opportunity to mark their own learning to help them have a better understanding of their learning in the lesson. This must then be checked over by the teacher and acknowledged.
The use of peer or self marking should be assessed by the teacher and their knowledge of the age and capability of the children to do this effectively and accurately.



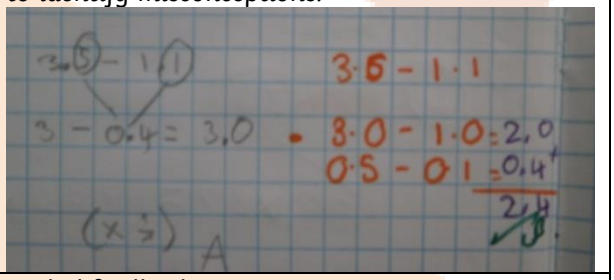
Children's correct answers should be ticked in green.



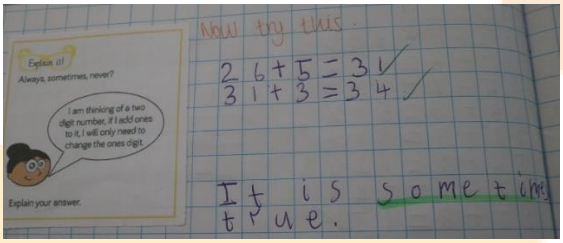
Children should respond to any comments that are written in orange by the teacher in purple. This response should be marked an acknowledged by the teacher with the teacher's initials.



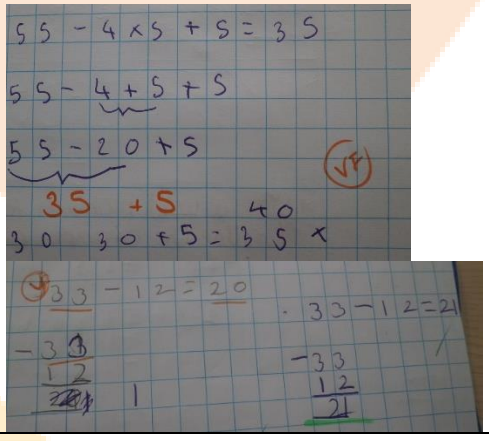
Children's incorrect answers should be dotted in orange. Children should be encouraged to correct any mistakes either independently or with the support of the children. Any children with lots of mistakes should be picked up as an intervention to identify misconceptions.



Further challenge
Children who are succeeding in the lesson need to moved on to a further challenge. This conversation with the children may be shown through writing "Move on to…." or "Try this." After the lesson, if the child still needs to be challenged these can be given in orange pen or printed challenges with a orange highlight.



Verbal feedback
In lessons anything discussed with children such as identifying errors should be recorded as VF along with either a comment to what has been discussed or highlighting the corresponding area. The impact of the VF should be evident in their books.

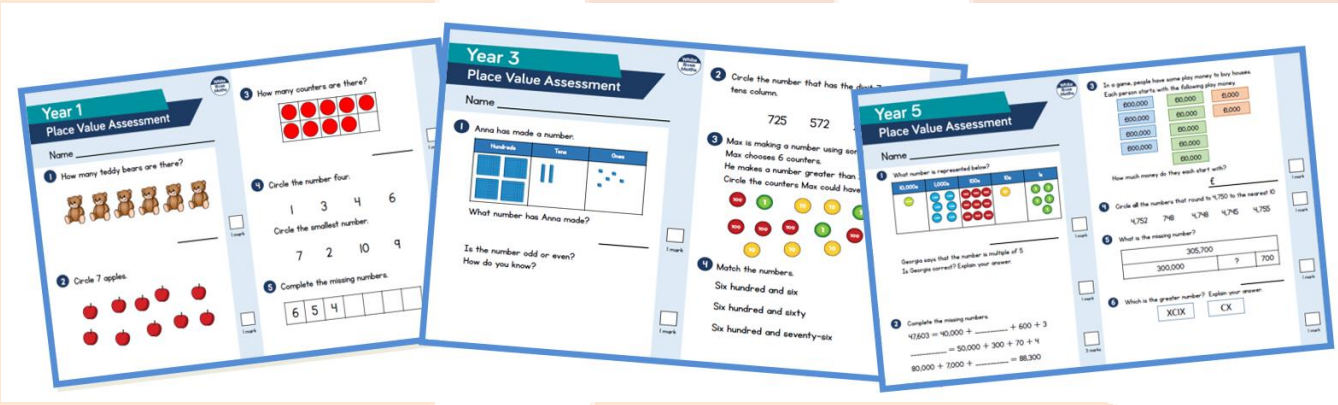


End of Block Assessment

At the end of each White Rose block, teachers may choose to carry out the end of block assessment. All children should complete the assessment for their year group however for children who are significantly behind (or SEN) this could be done with support and the adult making their own judgement about the child's understanding. This does not apply for children still working within the development matters statements. This then needs to be used to either plan "recap lessons" or interventions.

The end of block assessments can all be found on the learning platform under "maths" and "White Rose Assessments."

EYFS are not required to complete end of block assessments as children are constantly assessed against the development matters grid and are put into target groups to meet specific objectives.



End of Term Assessment

At the end of every full term children need to complete the NTS tests relating to their year group.

You may also wish to complete the White Rose assessments. The chosen year group needs to be relevant to their needs as they need to do this independently. This should then provide the teacher with an understanding of whether they are achieving above their last assessment.

All of the White Rose assessment materials can be found on the One Drive.

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Continual Professional Development

- Triads
  - Teachers will be put into groups of 3. With each teacher being from a different key stage. Teachers will have the opportunity to share ideas, planning and observe each other teaching to gain ideas to implement into their own class.
  - Teaching assistants will also be put into pairs and have the opportunity to go into each others classes to experience lessons within a different key stage and develop their own subject knowledge as well as expertise.
- External Training
  - Any external training that members of the maths team attend will be reported back to staff where necessary and staff meetings arranged if there is a whole school initiative.
- Staff Voice
  - A staff voice question is distributed to the staff to identify any need for specific CPD this can then be planned for in whole school staff meeting or support from the maths lead.

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Monitoring

Maths is monitored throughout the year using learning walks, pupils voice, observations and book scrutinies. Books and learning journeys are monitored using the RAG rating below.

EYFS	
Child Led	Adult Led
Pictures relates to the notes written	Pictures relates to the learning objective
Picture links to development matter statement	The success criteria helps the children reach the learning objective
The observations show progress through the development matters ages and stages	The observations show progress through the development matters ages and stages
Shows a range of different aspects of Maths	Shows a range of different aspects of Maths
	Next steps are clearly shown
	Evidence of next steps being met further in the learning journey
	Next step is appropriate for the learning objective
	Evidence of child's work

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KS1	KS2
Learning objectives are used with the short date and consistent font (Twinkl or Sassoon)	Learning objectives are used with the short date and consistent font (Twinkl or Sassoon)
Success criteria is child friend and shows the child how to achieve the learning objective	Success criteria is child friend and shows the child how to achieve the learning objective
Evidence of pre-task for each new LO	Evidence of pre-task for each new LO
Pre-task is matched to the LO	Pre-task is matched to the LO
The pre-task has been used as AFL	The pre-task has been used as AFL
Teacher's input can be seen through "Teacher Led"	Teacher's input can be seen through "Teacher Led"
Progression is seen in the lesson: Pre-task, Fluency, Problem Solving and Reasoning, Further Challenge	Progression is seen in the lesson: Pre-task, Teacher Led, Fluency, Problem Solving and Reasoning, Further Challenge
All children have the opportunity to do Problem Solving and Reasoning (in the lesson or as Purple Pen)	All children have the opportunity to do Problem Solving and Reasoning (in the lesson or as Purple Pen)
Mastery glasses are used to challenge children.	Mastery glasses are used to challenge children.
Children have been moved on when a challenge is needed (not constant fluency)	Children have been moved on when a challenge is needed (not constant fluency)
VF is used to support children and enable progress	VF is used to support children and enable progress
Children have had the opportunity to respond to their marking.	Children have had the opportunity to respond to their marking.
Misconceptions have been picked up.	Misconceptions have been picked up.
All work is marked in line with the school policy.	All work is marked in line with the school policy.
Work is well matched to the ability of the children.	Work is well matched to the ability of the children.
White Rose is being followed. There is evidence of coverage	White Rose is being followed. There is evidence of coverage

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