Built on botheredness . . .

the enquire learning trust



- Culture
- Curriculum
- Pedagogy
- Assessment

Enquire Learning Trust Maths Strategy 2026-30

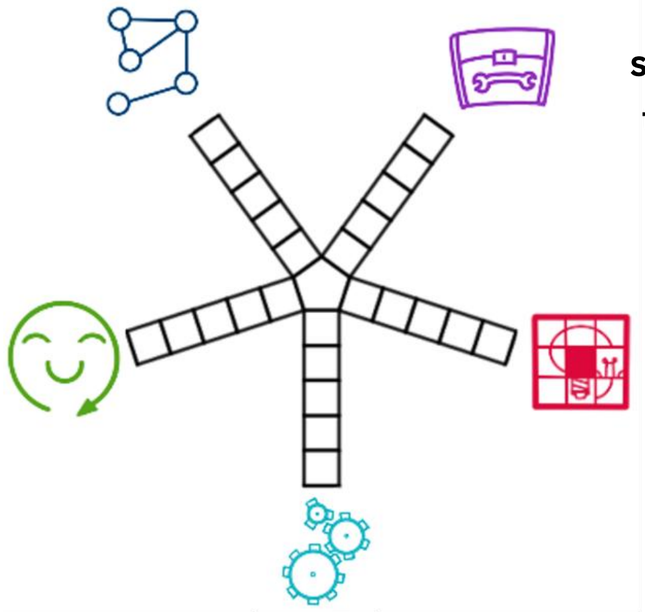
Our ELT Maths Culture

At Enquire Learning Trust our maths culture, that underpins and informs all that we do, is based around our shared belief that all our children can be mathematicians – and enjoy the journey of getting there! Our culture is one of all staff members being the best prepared possible to ensure all children can master all of maths. At ELT, mastery means every stakeholder moving together to improve their maths – not just children.

This culture informs the intent of our maths curriculum: for children to develop proficiency in the five key ingredients that characterise successful mathematicians

Understanding **- Maths is a network of linked ideas. I can connect new mathematical thinking to what I already know and understand.**

Attitude **- Maths makes sense and is worth spending time on. I can enjoy Maths and become better at it by persevering.**



Tools **- I have a toolkit that I can choose tools from to help me solve problems. Practising using these tools helps me become a better mathematician.**

Problem solving **- Problem solving is an important part of Maths. I can use my understanding, skills and reasoning to help me work towards solutions.**

Reasoning **- Maths is logical. I can convince myself that my thinking is correct and I can explain my reasoning to others.**

Our ELT Maths Culture

We believe that learning maths is about much more than just learning topics and routines. Successful mathematicians understand the curriculum content and are fluent in mathematical skills and procedures, but they can also solve problems, explain their thinking and have a positive attitude about themselves as learners of mathematics.

- **Understanding - Maths is a network of linked ideas. I can connect new mathematical thinking to what I already know and understand.**
- **Tools - I have a toolkit that I can choose tools from to help me solve problems. Practising using these tools helps me become a better mathematician**.
- **Problem solving - Problem solving is an important part of Maths. I can use my understanding, skills and reasoning to help me work towards solutions.**
- **Reasoning - Maths is logical. I can convince myself that my thinking is correct and I can explain my reasoning to others.**
- **Attitude - Maths makes sense and is worth spending time on. I can enjoy Maths and become better at it by persevering.**

Ref: Kilpatrick, J., Swafford, J. and Findell, F. (eds) (2001) Adding It Up: Helping Children Learn Mathematics. Mathematics Learning Study Committee: National Research Council.

To implement our curriculum, we base our pedagogy around a consistent lesson delivery model (LDM) that fuses together the best of cognitive science approaches and the mastery approach to maths. Our robust LDM has several benefits:

- It acts as daily CPD for our staff about the most effective way to help children learn mathematical content
- Allows predictability and consistency for children, especially those with SEND needs
- Acts as a daily induction model for new staff

Learning steps and units of learning last as long as they need for all children to have grasped a concept/area of maths – a true mastery approach.

To ensure that our curriculum has the desired impact, we have a robust assessment, monitoring and CPD model that encompasses both pre-unit/post-unit assessments, summative assessments, fluency checks along with ongoing checks for understanding in lessons. Running alongside this same day intervention is at the heart of our curriculum to ensure all children are ready for their new learning.

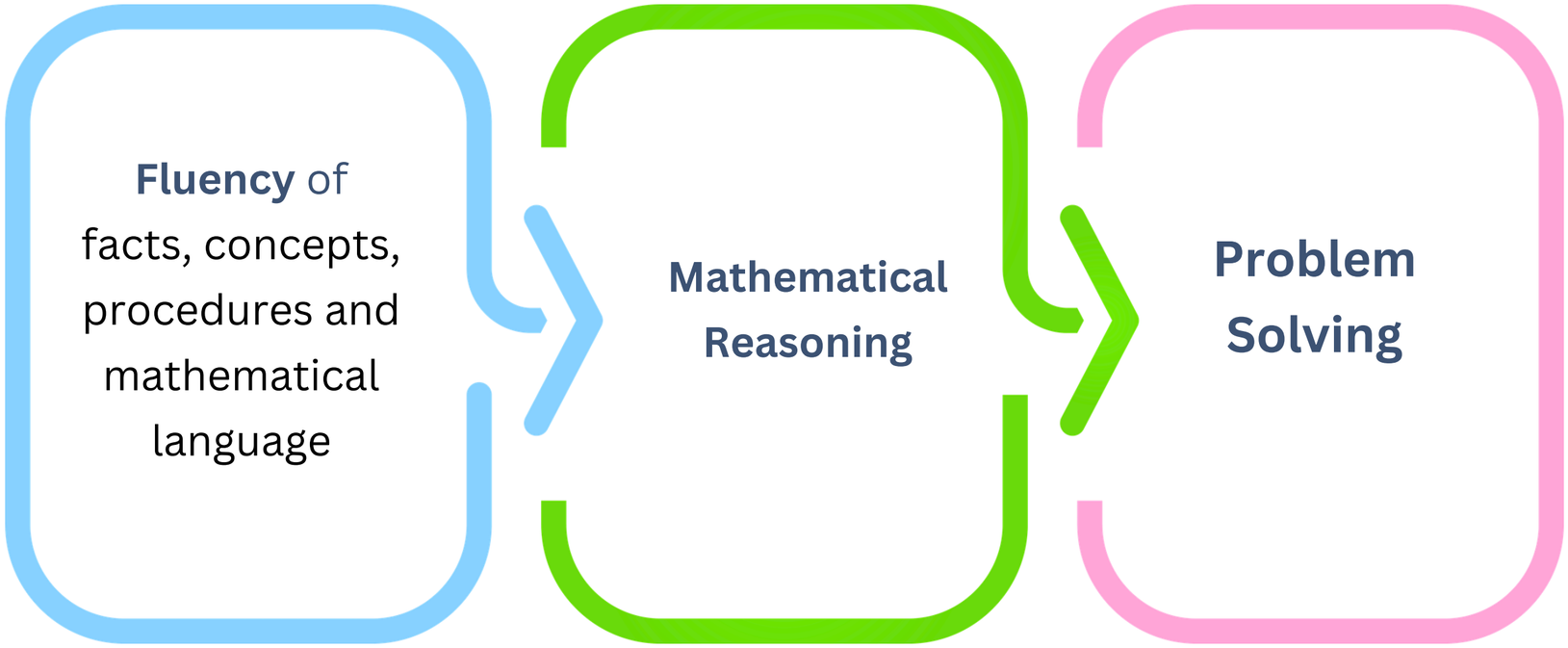
All our children can be mathematicians!

Curriculum Design

Our curriculum is one aimed at ensuring our shared belief, that all our children can be mathematicians, becomes a reality. We believe strongly that all children can learn their intended curriculum if it is sequenced correctly and affords children enough time to learn mathematical content.

Aims of our Mathematics Curriculum

Our maths curriculum is designed to develop pupils' proficiency through the interconnected strands of fluency, reasoning and problem solving.



Fluency - Pupils develop secure knowledge of key mathematical facts and procedures, with the ability to recall these accurately and efficiently. They apply their understanding flexibly across a range of contexts and choose appropriate methods to solve tasks, supported by varied representations and regular practice.

Reasoning - Pupils learn to think logically about mathematics, making connections, explaining their thinking and justifying their methods. Reasoning acts as the bridge between fluency and problem solving, enabling pupils to select strategies and communicate their understanding clearly.

Problem Solving -Pupils apply their mathematical knowledge to unfamiliar situations, using creativity and perseverance to find solutions. They learn to adapt prior knowledge and skills to new problems, rather than relying on memorised methods, developing confidence in tackling both routine and non-routine challenges.

Curriculum Design Principles

To achieve these aims, we have based our curriculum around the high-quality published materials. The key components are:

White Rose Maths

White Rose Maths – for small steps and fluency, reasoning and problem solving tasks

Fact Fluency

A conceptual fact fluency programme (either NCETM Mastering Number or Number Sense)

NCETM

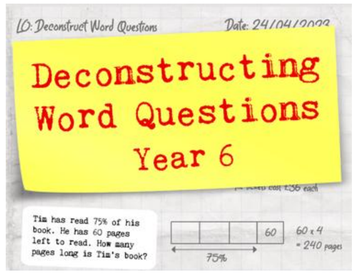
NCETM tasks to provide additional fluency, reasoning and problem solving tasks

I See Reasoning

I See Reasoning – to develop reasoning routines

Word Problems

Deconstructing Word Problems – for discrete teaching of word problems



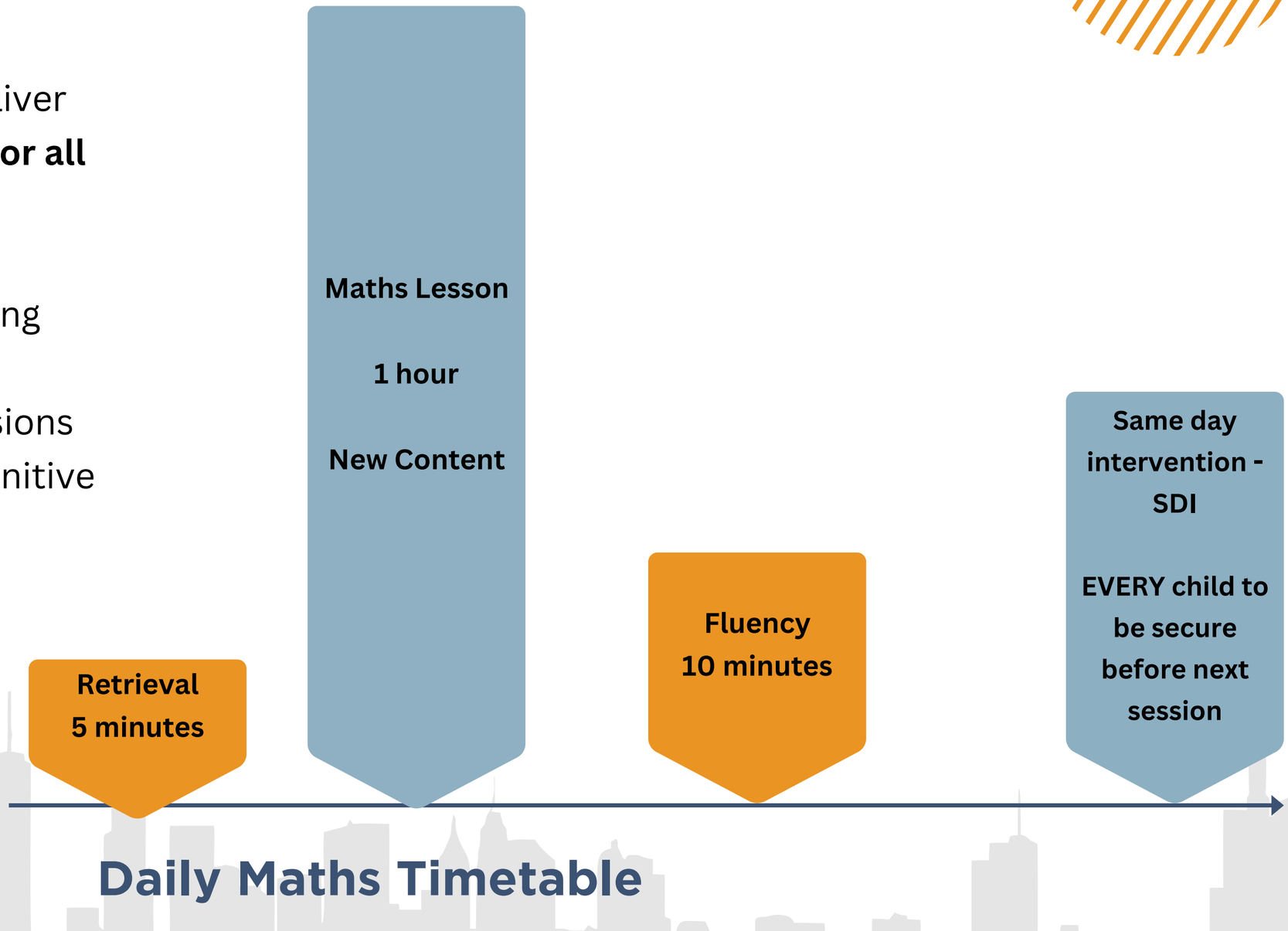
nrich

Nrich for discrete teaching of other types of mathematical problems

Daily Maths Timetable

This curriculum aims to deliver **mathematical excellence for all children**.

For this happen the following daily mathematical diet is followed. These sessions are be split to address cognitive load issues.



Built on botheredness . . .
the enquire learning trust

Daily Maths Timetable

Curriculum Design Principles

Built on botheredness . . .
the enquire learning trust

Academies are not bound by the exemplification set in this strategy document, but any curriculum must adhere to the following desig

Overall Curriculum Considerations

- Is the curriculum a mastery curriculum that allows all pupils to move together securing fluency, reasoning and problem-solving?

Early Years

- Does the EY curriculum have the same level of detail as KS1 and KS2?
- Does the EY curriculum plan for the teaching and practice of matching, sorting, ordering, comparing and patterning?
- Does the EY curriculum develop spatial awareness and spatial reasoning skills?
- Does the EY curriculum develop a secure understanding of subitising, counting and quantity?
- Does the EY curriculum develop a secure understanding of number composition to 10?
- Does the EY curriculum develop a secure understanding of pattern and patterns within the number system?
- Does the EY curriculum lead to automaticity in some add and take facts within 10?

Fact Fluency

- Does the curriculum plan for the systematic teaching of a conceptual understanding of KS1 addition and subtraction facts?
- Does the curriculum plan for the assessment of addition and subtraction facts automaticity?
- Is there a systematic approach to the retention of KS1 addition and subtraction facts in LKS2?
- Is there a systematic approach to the remediation of KS1 addition and subtraction facts in LKS2?
- Does the curriculum plan for the systematic teaching of a conceptual understanding of multiplication and division facts?
- Does the curriculum plan for the assessment of multiplication and division fact automaticity?
- Is there a systematic approach to the retention of multiplication and division facts in UKS2?
- Is there a systematic approach to the remediation of KS1 multiplication and division facts in UKS2?

Conditional Knowledge: reasoning and problem-solving

- Is there a systematic reasoning hierarchy based approach to teaching reasoning?
- Are all children taught to reason and given opportunities to reason?
- Is there a systematic approach to teaching all children to solve problems?
- Are all children taught to solve a wide range of problems?

Greater Depth

- Does the curriculum plan for exposing children, who have grasped content rapidly, to rich and sophisticated problems?

Mixed-Age (where required)

- Is there an effective, and fair to teachers, mixed-age curriculum with the same level of detail as non-mixed?

Retrieval

- Is there a systematic and documented approach to retrieving prior learning from across the full curriculum?
- Does the curriculum explicitly build in same day intervention so no child encounters new learning without prior learning secure?

Curriculum Documentation

- Is there a clear long term plan in place – which units are studied by which year groups in which term?
- Are units within the curriculum sequenced in an effective manner?
- Do medium term plans effectively sequence small steps of learning?
- Do unit designs act as sequences of learning that allow teachers to know when problem-solving and assessments should take place?
- Is there an effective calculation policy that is integrated into the curriculum?
- Is there an effective manipulative policy that is integrated into the curriculum?
- Does the curriculum plan to expose children to mathematical careers?
- Does the curriculum plan to expose children to historical mathematicians and their legacy?

Assessment

- Does the school have effective fact fluency checks for addition/subtraction and multiplication/division?
- Does the school have effective end of unit assessments that act as a diagnostic tool for determining what children have and have not learnt?
- Does the school have effective end of term summative assessments that find out if children can bring the different strands of the mathematics curriculum together?
- Are gaps identified from assessments addressed?

Curriculum Sequences (Long Term Plans)

The White Rose yearly overview provides suggested timings for each block of learning, which are then adapted by academies to suit different term dates or other requirements such as the assessment cycle. These should also be adapted in real time, if pupils need more time on specific content.

Mathematics Long Term Plan: Year 3

Built on botheredness . . .
the enquire learning trust

Term	Week													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Autumn	Place value			Addition & subtraction					Shape		MERIT Assessment	Mass & capacity		
Spring	Multiplication & division							MERIT Assessment	Length & perimeter					
Summer	Fractions					Time			MERIT Assessment	Money	Statistics			

Number & PV	Geometry	Measure	Statistics	Assessment

Learning Sequences (Small Steps)

Learning Sequence

Year 4: Block 2 – Addition & Subtraction (Autumn)

Step No	Small Step
EFA	**Prior Learning Assessment (White Rose Infinity +)**
EFA	**Remediation / Deepening of Prior Learning**
PS	Deconstructing Word Problems Y4 – More Than, Less Than
1	Add and subtract 1s, 10s, 100s and 1,000s
2	Add up to two 4-digit numbers - no exchange
3	Add two 4-digit numbers - one exchange
4	Add two 4-digit numbers - more than one exchange
5	Subtract two 4-digit numbers - no exchange
6	Subtract two 4-digit numbers - one exchange
7	Subtract two 4-digit numbers - more than one exchange
8	Efficient subtraction
9	Estimate answers
10	Checking strategies
PS	Deconstructing Word Problems Y4 – Multi-Step Additive
EFA	**End of block assessment (White Rose)**
EFA	**Remediation / Deepening of New Learning**

EFA = Embedding Formation Assessment PS = Problem Solving

- **White Rose precise small steps are used as the spine for the learning sequence**
- **Before Step 1, there is a prior learning check with remediation and deepening**
- **Teachers need to decide where to insert dedicated problem-solving lessons**
- **After the final small step, the sequence concludes with end of block assessment followed by remediation and deepening**

Systematic Retrieval Sessions

Retrieval is not the assessment of learning; it is learning!

To ensure the content learnt in maths lessons is retained, all learning is built into our systematic, spaced retrieval plans.

This ensures that all key knowledge is regularly retrieved and that nothing is left out.

This also means maths lessons can focus on that year
group's new content.

These sessions are daily.

Retrieval Sequence

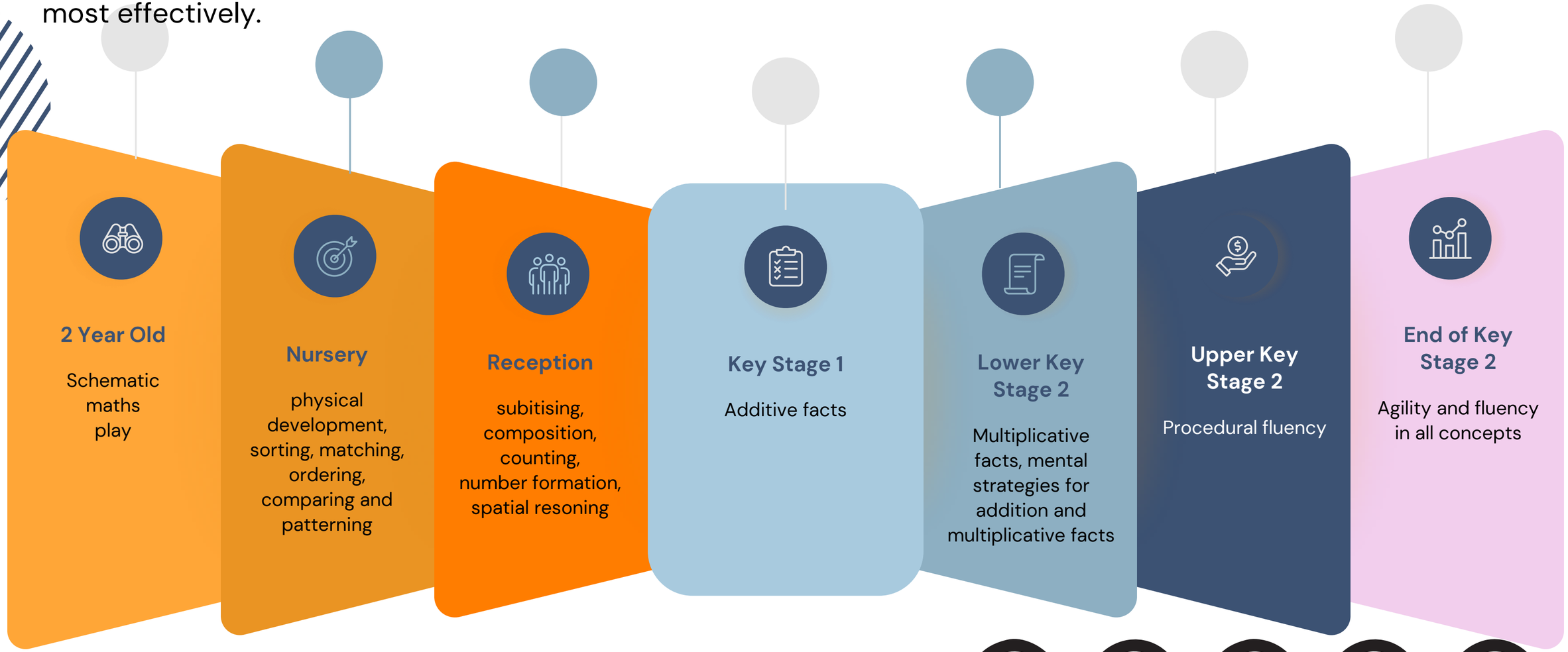
Year 3: Autumn

Built on botheredness . . .
the enquire learning trust

Week	Addition / PV	Subtraction / PV	Multiplication	Division	Fractions	GMS
1	PV - Value of Digits PV - Partitioning	PV - Comparing PV - Ordering	Equal Groups & Repeated +	Division by group & share	½ of shapes	KS1 Patterns
2	TO+O (no bridging)	TO-O (no bridging)	x2, 10, 5 Table Facts	x2, 10, 5 Table Facts	½ of amounts	KS1 2D Shape
3	Bridging 10	Bridging 10	x2, 10, 5 Table Facts	x2, 10, 5 Table Facts	¼ of shape	KS1 3D Shape
4	TO+O (bridging)	TO-O (bridging)	Equal Groups & Repeated +	Division by group & share	¼ of amount	KS1 Spatial Reasoning
5	Near Doubles	Near Halves	x2, 10, 5 Table Facts	x2, 10, 5 Table Facts	¾ of shapes	KS1 Length
6	Near Tens	Near Tens	x2, 10, 5 Table Facts	x2, 10, 5 Table Facts	¾ of amounts	KS1 Mass & Capacity
7	TO + TO	TO - TO	Equal Groups & Repeated +	Division by group & share	½ of shapes	KS1 Money
8	PV - Value of Digits PV - Partitioning	PV – Comparing PV - Ordering	x2, 10, 5 Table Facts	x2, 10, 5 Table Facts	½ of amounts	KS1 Time
9	TO+O (no bridging)	TO-O (no bridging)	x2, 10, 5 Table Facts	x2, 10, 5 Table Facts	¼ of shape	KS1 Statistics
10	Bridging 10	Bridging 10	Equal Groups & Repeated +	Division by group & share	¼ of amount	KS1 Pattern & 2D/3D Shape
11	TO+O (bridging)	TO-O (bridging)	x2, 10x 5 Table Facts	x2, 10x 5 Table Facts	¾ of shapes	KS1 Spatial Reasoning
12	Near Doubles	Near Halves	x2, 10x 5 Table Facts	x2, 10x 5 Table Facts	¾ of amounts	KS1 Length
13	HTO + HTO (written, no bridging)	HTO - HTO (written, no bridging)	Equal Groups & Repeated +	Division by group & share	½ and of ¼ shapes	KS1 Mass & Capacity
14	HTO + HTO (written, bridging)	HTO - HTO (written, no bridging)	x2, 10, 5 Table Facts	x2, 10, 5 Table Facts	½ of amounts	KS1 Time

Firm Foundations

Each phase of our maths curriculum has a strong focus on developing firm foundations for future mathematics. Each phases continues to build on the foundations from the previous phase in addition to their own foci. Foundational maths is developed through our three-part curriculum: **main curriculum, retrieval and fact fluency.** Key shape and measure foundational knowledge is developed within the main curriculum where children will learn it most effectively.



Fact Fluency Sessions

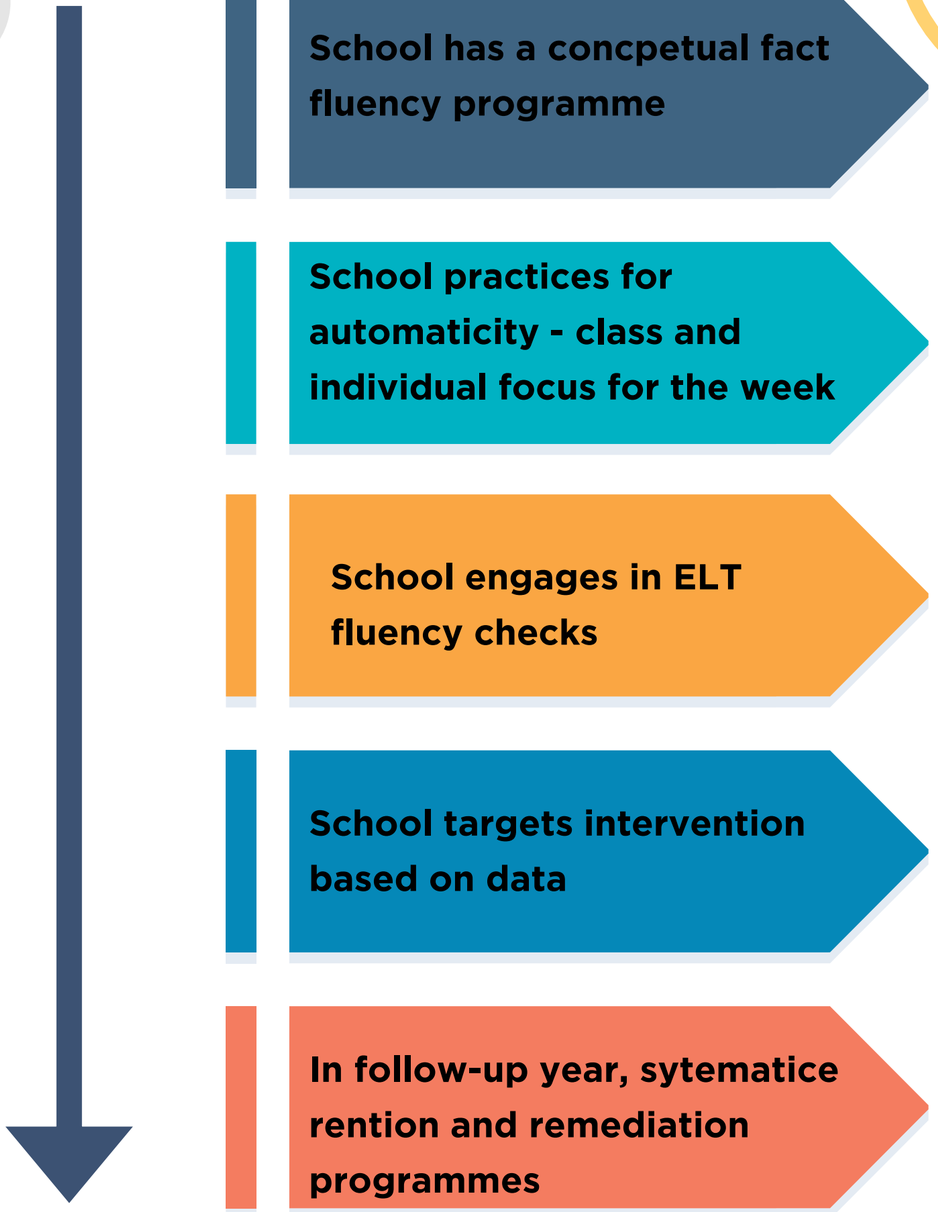
Fact fluency is what makes maths accessible for all. We know that without this children cannot access and enjoy the wider maths curriculum.

To ensure fact fluency is not a barrier for any child, we have dedicated daily fact fluency sessions that ensure children gain a deep conceptual understanding of these facts, which leads to automaticity.

These sessions are daily and last for 15 minutes in each year group.

KS1 focus on securing additive facts.
LKS2 focus on embedding additive facts before developing multiplicative facts. We use termly fluency checks (through Numbots and TTRS) to benchmark school attainment.

UKS2 focus on applying these facts to wider mental strategies, thus regularly retrieving the basic facts to working memory.



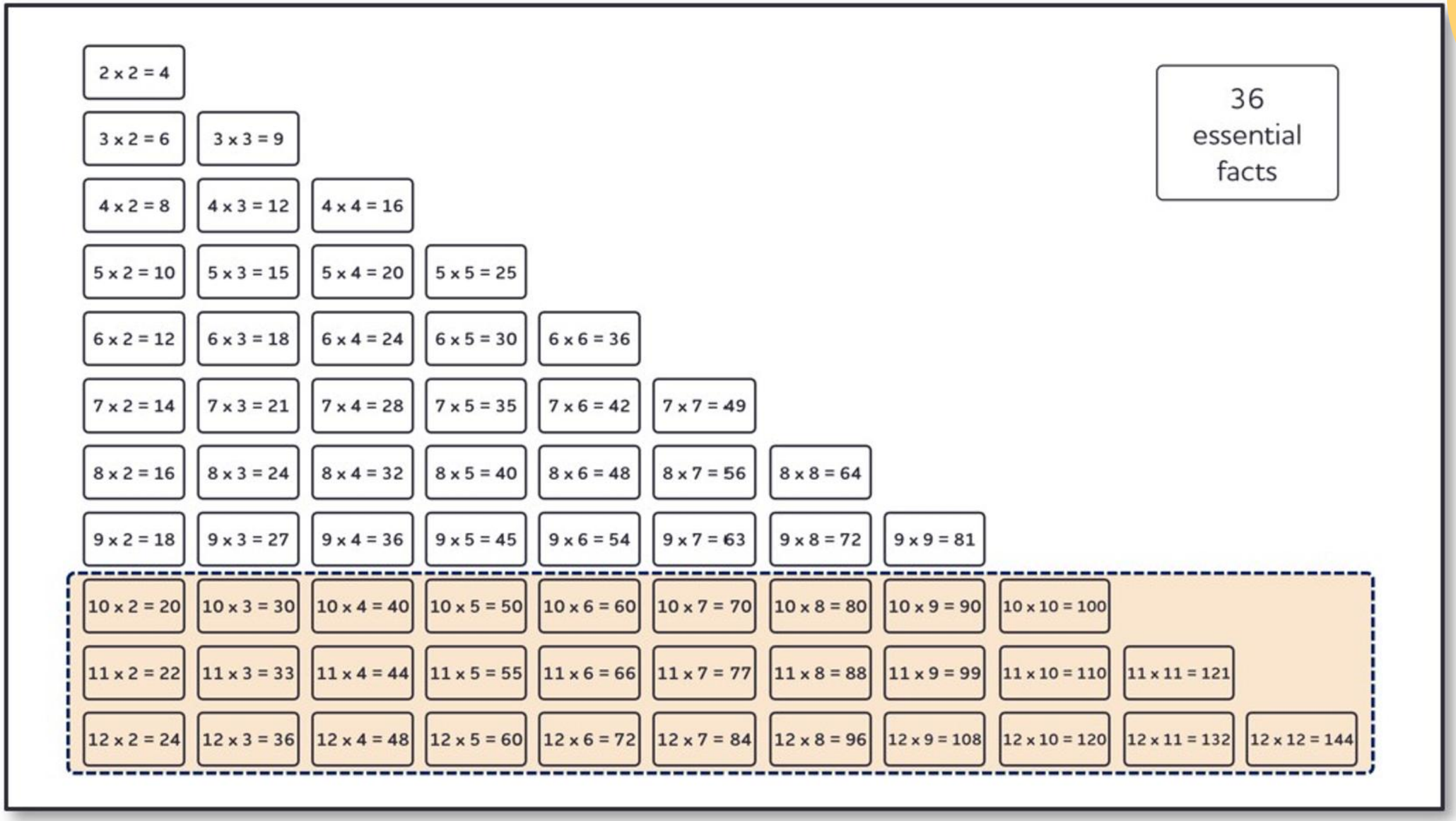
Number Facts (KS1) – Addition

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

Number Facts (KS1) – Subtraction

-	0	1	2	3	4	5	6	7	8	9	10
0	0 - 0										
1	1 - 0	1 - 1									
2	2 - 0	2 - 1	2 - 2								
3	3 - 0	3 - 1	3 - 2	3 - 3							
4	4 - 0	4 - 1	4 - 2	4 - 3	4 - 4						
5	5 - 0	5 - 1	5 - 2	5 - 3	5 - 4	5 - 5					
6	6 - 0	6 - 1	6 - 2	6 - 3	6 - 4	6 - 5	6 - 6				
7	7 - 0	7 - 1	7 - 2	7 - 3	7 - 4	7 - 5	7 - 6	7 - 7			
8	8 - 0	8 - 1	8 - 2	8 - 3	8 - 4	8 - 5	8 - 6	8 - 7	8 - 8		
9	9 - 0	9 - 1	9 - 2	9 - 3	9 - 4	9 - 5	9 - 6	9 - 7	9 - 8	9 - 9	
10	10 - 0	10 - 1	10 - 2	10 - 3	10 - 4	10 - 5	10 - 6	10 - 7	10 - 8	10 - 9	10 - 10
11		11 - 1	11 - 2	11 - 3	11 - 4	11 - 5	11 - 6	11 - 7	11 - 8	11 - 9	11 - 10
12			12 - 2	12 - 3	12 - 4	12 - 5	12 - 6	12 - 7	12 - 8	12 - 9	12 - 10
13				13 - 3	13 - 4	13 - 5	13 - 6	13 - 7	13 - 8	13 - 9	13 - 10
14					14 - 4	14 - 5	14 - 6	14 - 7	14 - 8	14 - 9	14 - 10
15						15 - 5	15 - 6	15 - 7	15 - 8	15 - 9	15 - 10
16							16 - 6	16- 7	16 - 8	16 - 9	16 - 10
17								17 - 7	17 - 8	17 - 9	17 - 10
18									18 - 8	18 - 9	18 - 10
19										19 - 9	19 - 10
20											20 - 10

Multiplication Facts (Year 3 and 4)



Fluency Practice – Numbots & Times Table Rock Stars

We use Times Table Rock Stars (TTRS) and NumBots as key tools to supplement and strengthen our teaching of mathematical fluency, particularly in number sense and recall of key facts. These platforms provide pupils with regular, structured opportunities to practise essential skills in an engaging and motivating way, helping to build automaticity alongside our taught curriculum.

NumBots is primarily used in Key Stage 1 and early Key Stage 2 to support the development of number sense. Through frequent, short bursts of practice, pupils build confidence in addition and subtraction facts, number bonds and the relationships between numbers. The programme reinforces conceptual understanding through carefully sequenced activities, allowing pupils to develop both accuracy and efficiency. This supports classroom teaching by ensuring that pupils have secure foundations, enabling them to access more complex mathematical concepts with confidence.

TTRS is used across Key Stage 2 to develop rapid recall of multiplication and division facts. Through consistent practice, pupils build speed and accuracy, reducing cognitive load when tackling more complex calculations and problem solving. The gamified nature of the platform increases engagement and encourages regular practice, both in school and at home, helping to embed key facts in long-term memory.

Both platforms are used purposefully alongside high-quality teaching, not as a replacement for it. Staff monitor pupil engagement and progress, using the data to identify gaps and inform targeted support where needed. By combining explicit teaching with regular, focused practice through TTRS and NumBots, we ensure that pupils develop strong fluency in number facts, which underpins their ability to reason and solve problems effectively.

Preparation for the Year 4 Multiplication Check

This preparation schedule outlines a structured, year-long approach to supporting pupils in developing secure multiplication fact recall in preparation for the Multiplication Tables Check (MTC). The programme gradually shifts from building fluency through regular practice to increasing intensity and test readiness. A key principle underpinning this approach is that approximately 21 minutes of focused times tables practice per week is highly effective in achieving strong MTC outcomes.

Autumn Term: Building Foundations	Spring Term: Increasing Fluency and Exposure	Summer Term: Test Readiness and Performance
<u>September, October, November and December</u> Garage Mode: 21 minutes per week During the autumn term, the focus is on consistent, low-stakes practice. Garage mode supports pupils in developing accuracy and fluency in multiplication and division facts at an appropriate level. This phase is about: • Embedding core number facts • Developing confidence and recall speed • Establishing strong practice routines **Autumn Officially Unofficial MTC**	<u>January and February</u> Garage Mode: 18 minutes per week Soundcheck: 3 games per week At this stage, pupils begin transitioning towards more time-sensitive recall. Soundcheck introduces a format similar to the MTC, encouraging pupils to recall facts under time pressure. Spring term 1 focus: • Maintaining fluency through Garage practice • Introducing test-style questioning • Developing speed alongside accuracy <u>March</u> Garage Mode: 16 minutes per week Soundcheck: 5 games per week As pupils become more confident, emphasis shifts further towards rapid recall and performance under timed conditions. **Spring Officially Unofficial MTC**	<u>April</u> Garage Mode: 15 minutes per week Soundcheck: 3 games per week Studio Mode: 3 games per week Studio mode introduces increased challenge and competition, supporting pupils in applying their knowledge flexibly and confidently. <u>May</u> Soundcheck: 6 games per week Studio Mode: 15 games per week At this point, the focus is on full preparation for the MTC: Frequent exposure to test-style questions Building stamina and confidence Strengthening rapid recall under pressure **Summer Officially Unofficial MTC** <u>June</u> Soundcheck: 21 games per week In the final phase, preparation is highly focused on test simulation. Regular Soundcheck sessions ensure pupils are fully familiar with the expectations and format of the MTC.

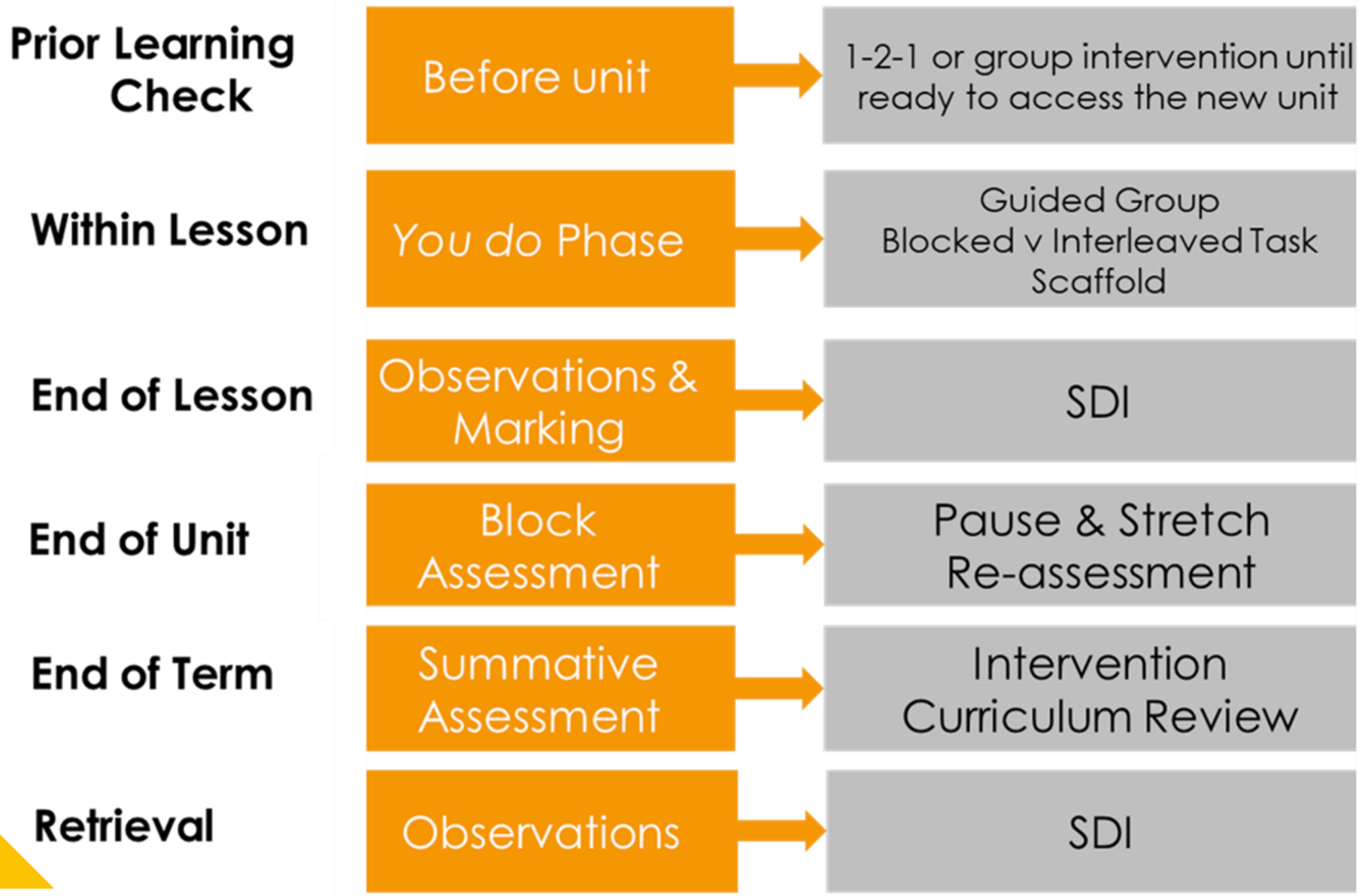
The MTC is designed to assess pupils' ability to recall multiplication facts quickly and accurately. To support this:

- Pupils benefit from experiencing multiple "checkpoint" assessments across the year
- Practice should be supplemented with high-quality teaching and reasoning around multiplication
- Retrieval practice and spaced repetition are key to long-term retention

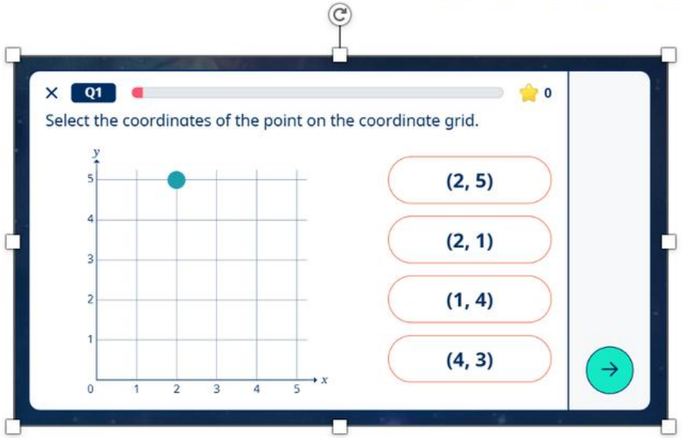
ELT Assessment Model

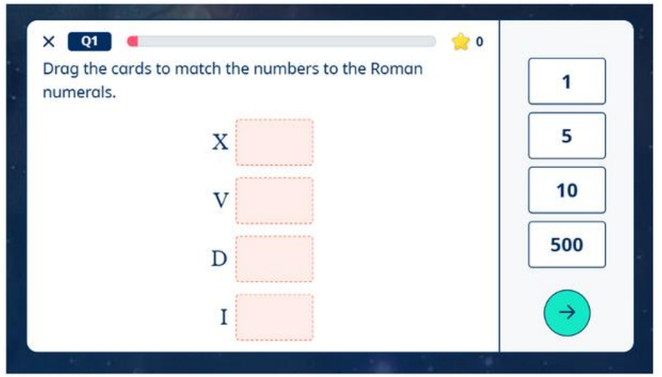


Layers of Assessment



Prior Learning Checks – White Rose Infinity+





- Teachers create Prior Learning Checks using White Rose Infinity+
- These checks are administered on Infinity+ before beginning a new unit. Teachers use the analysis from this to identify if children have the pre-requisite knowledge from the prior year group's learning to tackle the new content.
- Before starting the new unit, intervention is carried out so all children are ready to move on. This can be delivered using White Rose Infinity+ for maximum agility

Those with no gaps complete deepening activities, while other children complete remediation

End of Lesson Assessment

Marking informs same day intervention (SDI) meaning that no children start the next lesson confused.

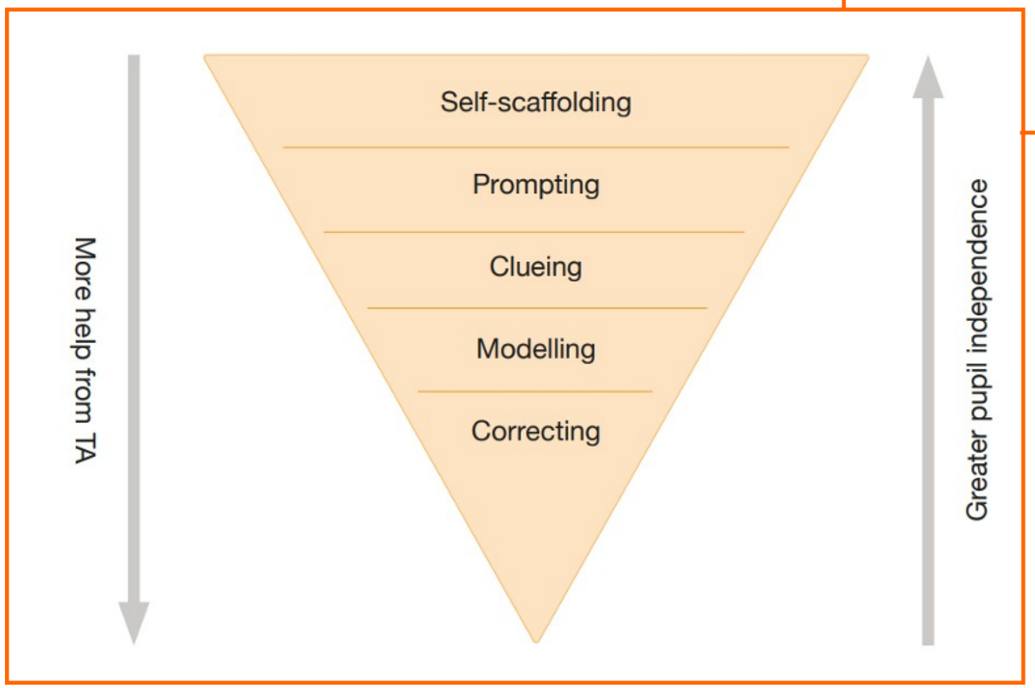
Misconceptions matter but don't signpost everything as a misconception!

$$\begin{array}{r} 4\ 2\ 5\ 7 \\ -\ 3\ 1\ 5\ 4 \\ \hline 7\ 1\ 0\ 3 \end{array}$$ ✗

You get maths all wrong!

Draw children's attention to ¾ correct and only ¼ not.

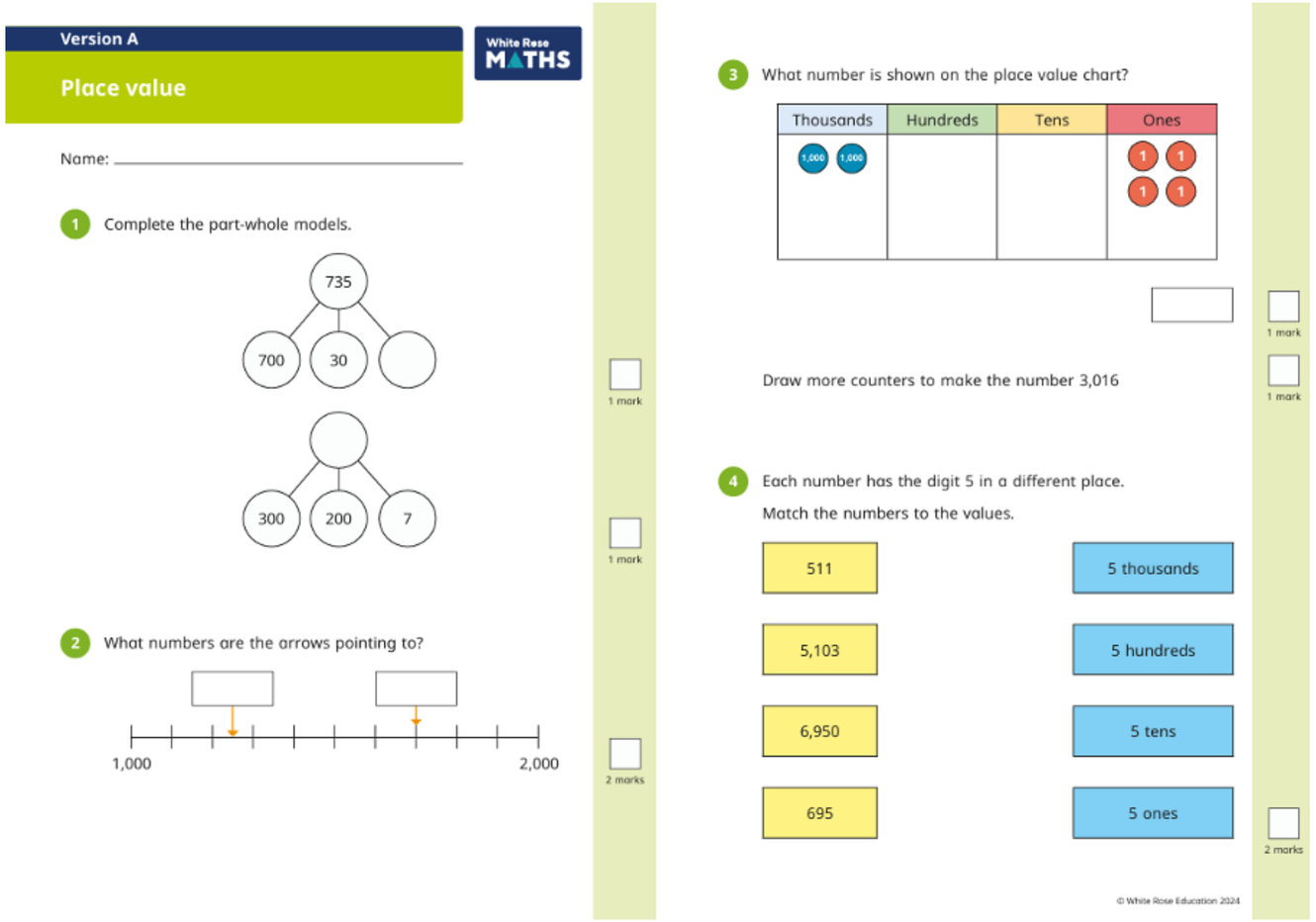
$$\begin{array}{r} 4\ 2\ 5\ 7 \\ -\ 3\ 1\ 5\ 4 \\ \hline (7)\ 1\ 0\ 3 \end{array}$$



- **SDI that fosters independence.**
- **Not just correcting but intervention to secure understanding before the next new learning.**

Use of White Rose Infinity+ to create agile opportunities for practice

End of Block Assessments



Version A

White Rose MATHS

Place value

Name: _____

1 Complete the part-whole models.

735 → 700, 30, ☐

☐ → 300, 200, 7

1 mark

1 mark

2 What numbers are the arrows pointing to?

1,000 ☐ ☐ 2,000

2 marks

3 What number is shown on the place value chart?

Thousands	Hundreds	Tens	Ones
1,000 1,000			1 1 1 1

☐

1 mark

Draw more counters to make the number 3,016

1 mark

4 Each number has the digit 5 in a different place.

Match the numbers to the values.

511	5 thousands
5,103	5 hundreds
6,950	5 tens
695	5 ones

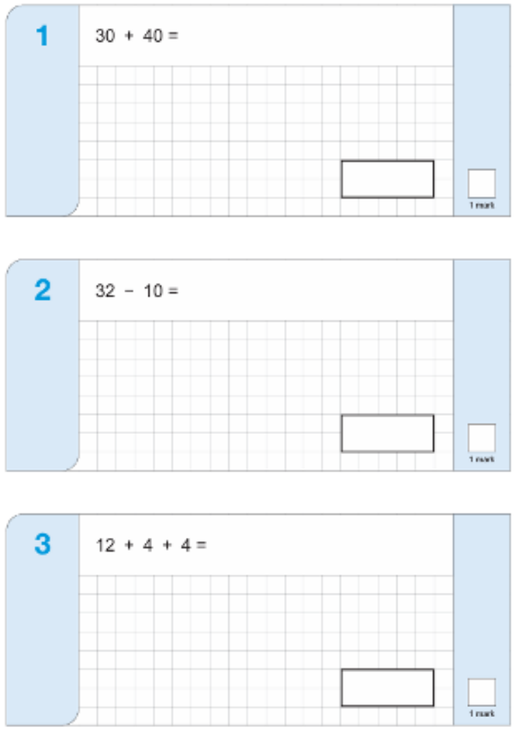
2 marks

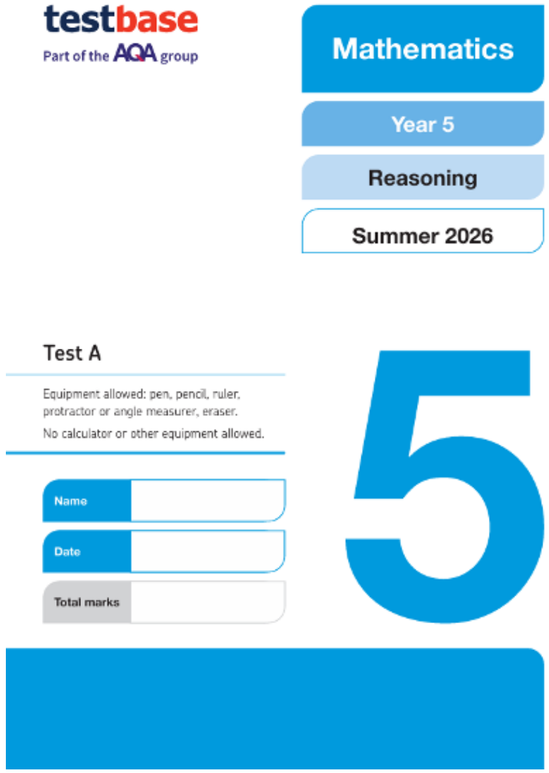
© White Rose Education 2024

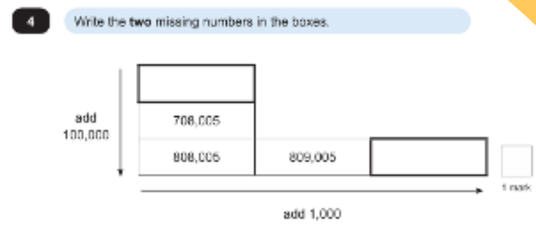
- Delivered at the end of each block.
- Allows teachers to identify what children have and have not learnt.
- Informs intervention and ‘pause’ lessons for those needing further consolidation.
- Includes two versions: version A for all children and version B to be given after remediation for those that required it
- Allows maths leads to evaluate the effectiveness of the curriculum.
- Includes reasoned response and problem-solving.

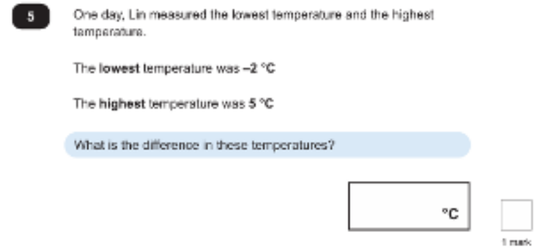
Summative Assessments – Testbase Standardised Tests











· Using the White Rose SoW as a guide, these tests have been constructed to:

o assess concepts that are likely to have been taught at the year group level and

o revise prior learning in topics that will be taught later in the year to help inform starting points in teaching.

· There is one test per term for Year 1. In Years 2 – 4, these are split into an arithmetic paper and a reasoning paper. In Years 5 and 6, there are two reasoning papers.

· The mathematical reasoning questions have been adapted from previous optional and KS1 / KS2 tests to ensure children build familiarity with national curriculum assessments at the end of KS2.

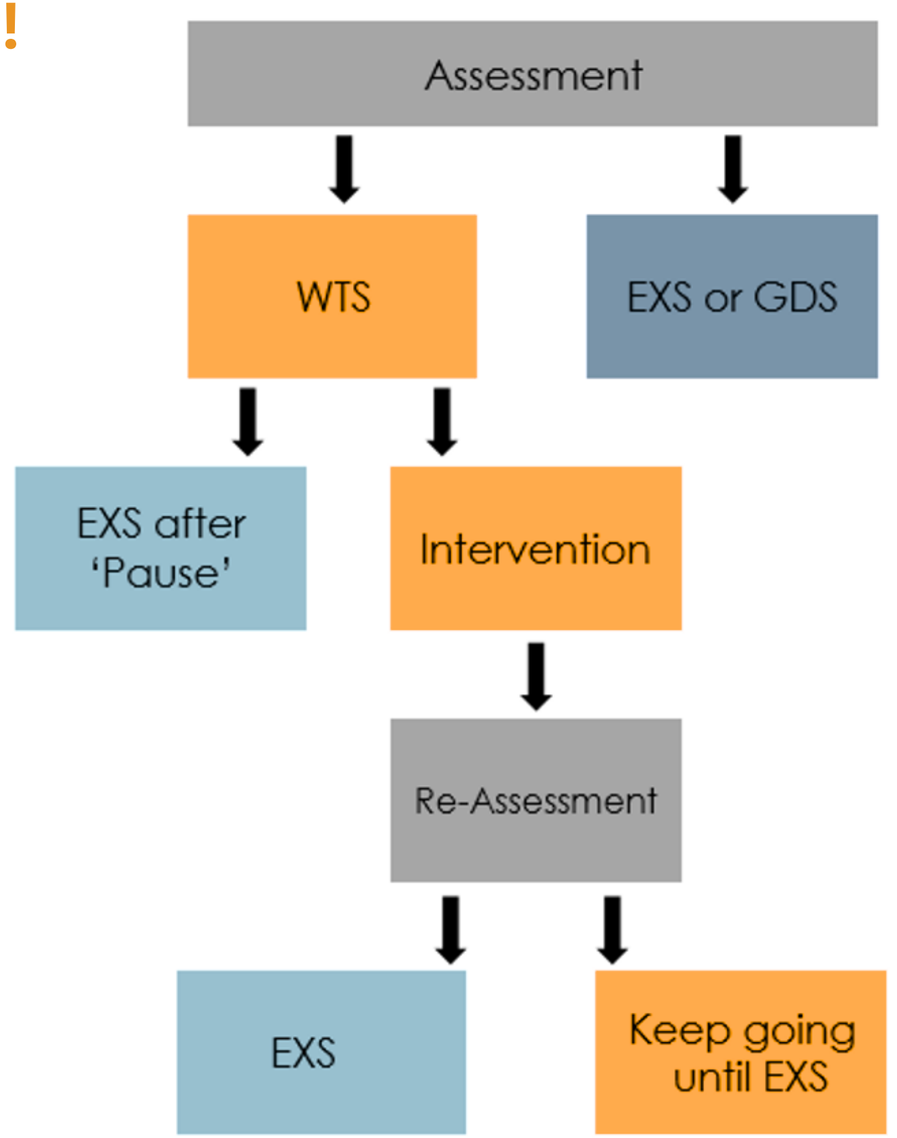
· Use of these tests will:

o Allow teachers to find out if children: can work on different maths concepts at the same time; can link their maths learning together and solve multi-step and multi-domain problems.

o Allow maths leads to evaluate the effectiveness of the curriculum by benchmarking against national performance (through MERiT analysis)

· Tests are taken during week 11 of the ELT assessment cycle to support teachers to make end of cycle judgments and provide the gap analysis

Achievement for all – WTS is not an end point!



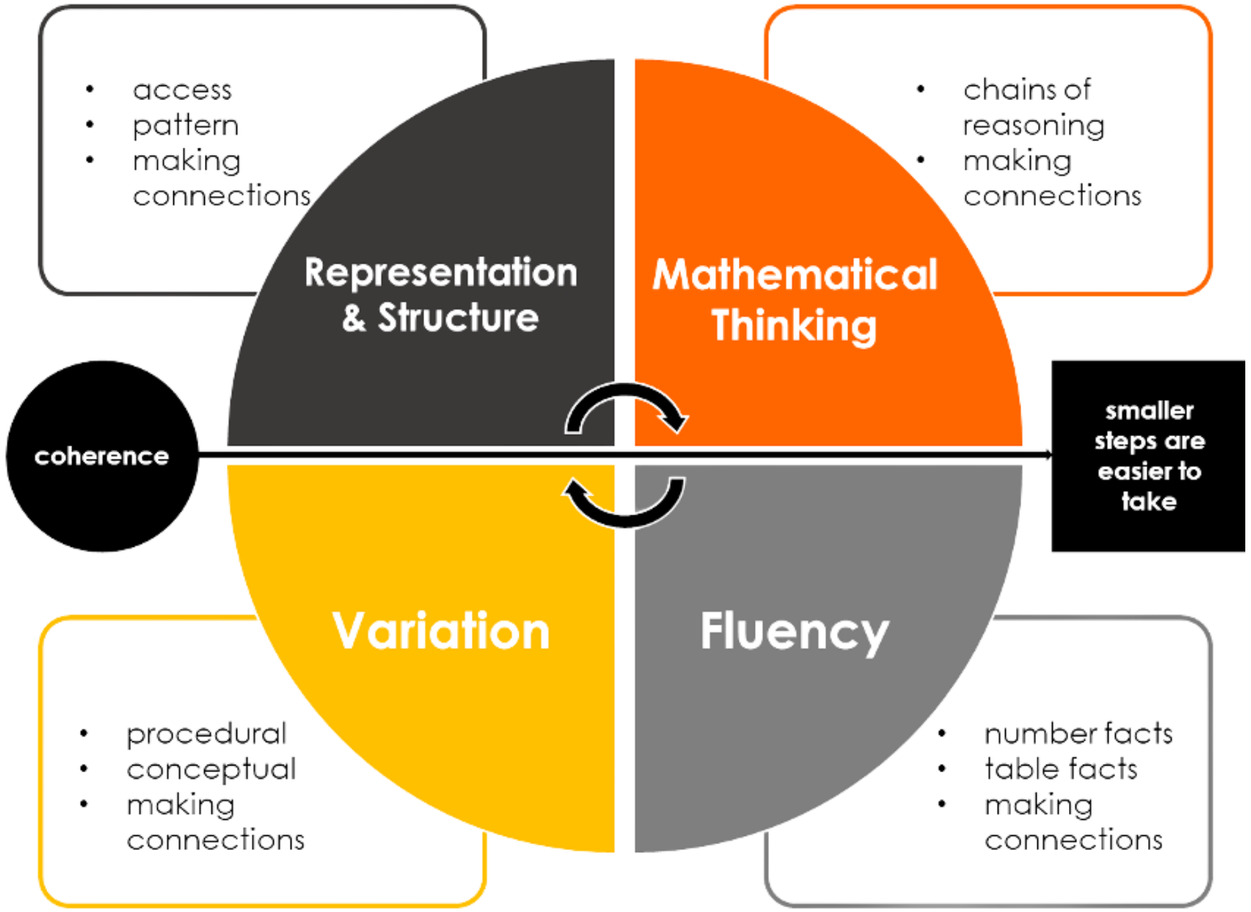
Pedagogy -Our lesson delivery model (LDM) that brings all the following pedagogies together...

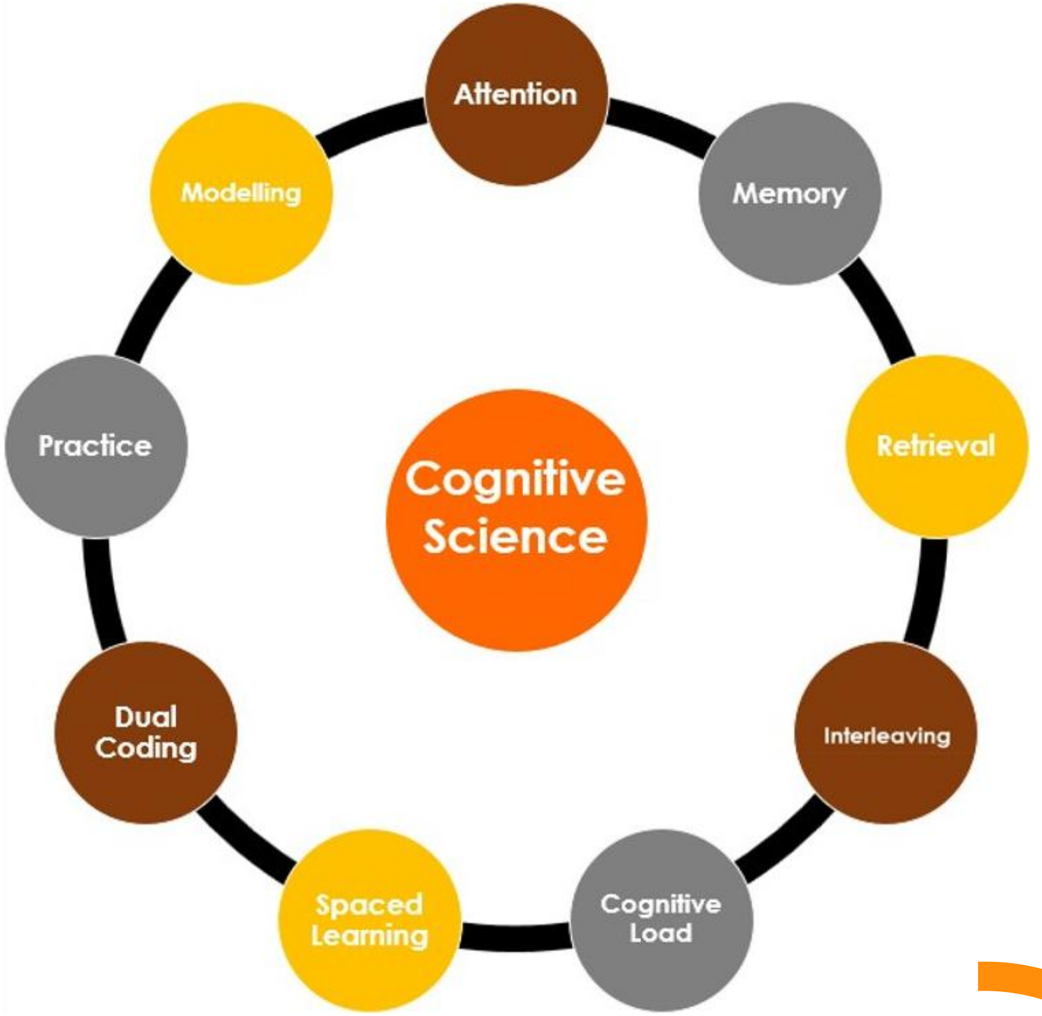


I do, we do, you do

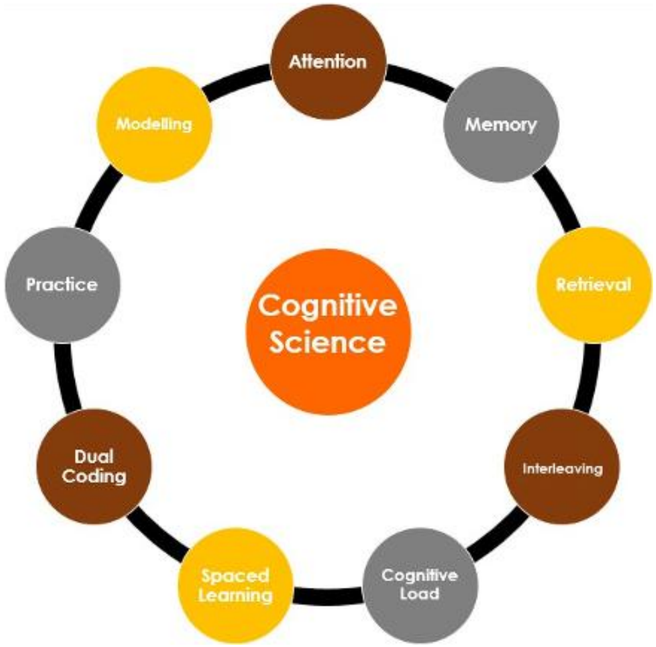


A fusion of the best of the mastery & cognitive science approaches





Cognitive Load Theory



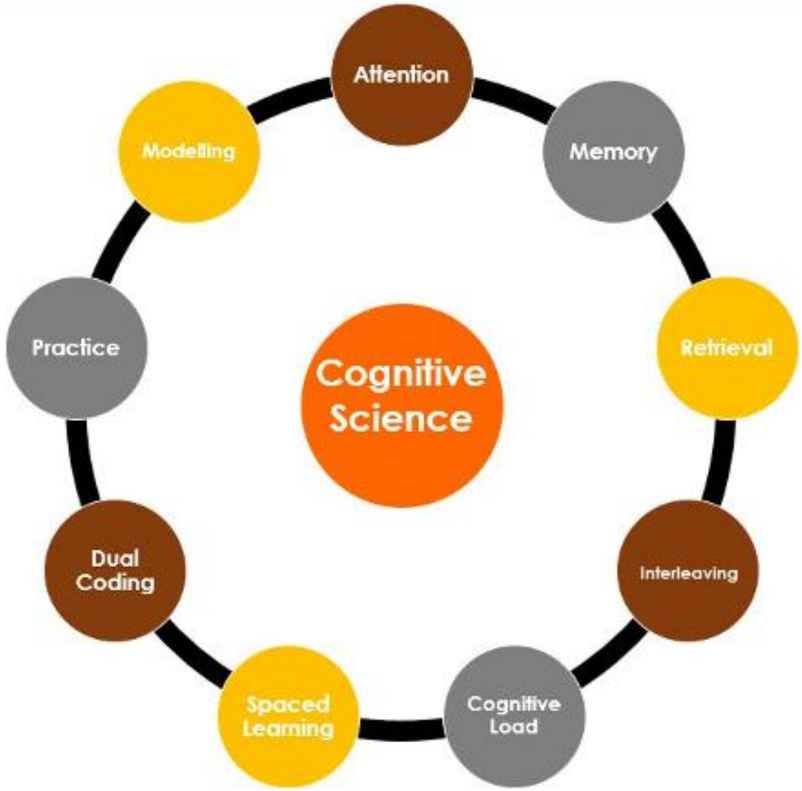
Cognitive Load Theory is central to our curriculum and lesson design: we know that for our cultural belief - all our children can be mathematicians - to be a lived reality requires that their working memory is not overloaded. Our approach to maths addresses this in several ways:

- Extraneous visual and auditory stimuli are removed where at all possible, for example lesson slides and tasks have only what is required on them and teachers say just what is needed.
- The curriculum is built around small steps.
- Our lesson delivery model (LDM) ensures children are taught key vocabulary and fact fluency before it becomes a barrier in the lesson.
- The LDM is built around a robust I do, We do, You do model so children are instructed in small steps.
- Varied fluency and variations are built in once the core concept has been secured using our chosen accessible representations and procedures.
- We never want fact fluency to be a barrier to wider maths competence and therefore we have daily, dedicated fluency sessions for all year groups.
- Likewise, we never want a lack of time to rush fluency or prevent problem-solving, therefore we have dedicated problem- solving lessons to ensure all children can be taught problem-solving, practise problem-solving and independently solve problems – once fluency in an area has been secured.

Spaced, Systematic Retrieval

Week	Addition / PV	Subtraction / PV	Multiplication	Division	Fractions, Decimals &	GMS
1	PV: value digits, partition, compare, order	PV: rounding	Multiplying with 1 and zero	Dividing by 1 and itself	Fraction Vocabulary	Pictograms & Bar Charts
2	PV: value digits, partition, compare, order	PV: rounding	x10, 100	÷10, 100	Compare & order fractions	Mass & Capacity
3	Mental Methods	Mental Methods	Scaled Facts	Scaled Facts	Unit fractions of amounts	Vertical, Horizontal,
4	Written Methods inc decimals	Written Methods inc decimals	Mental Methods	Mental Methods	Mixed into improper & vice-versa	Length
5	Inverse Checks	Approximation Checks	Written Methods	Written Methods	Add/subtract proper fractions	Units of time
6	PV: value digits, partition, compare, order	PV: rounding	Missing number & balance equations	Missing number & balance equations	Add/subtract mixed fractions	2D and 3D shape &
7	PV: value digits, partition, compare, order	Roman Numerals	Multiplying with 1 and zero	Dividing by 1 and itself	Decimal equivalents ½ ¼ and ¾	Reading Analogue Time
8	Mental Methods	Mental Methods	x10, 100	÷10, 100	Compare and round decimals	12-24 hour time
9	Written Methods inc decimals	Written Methods inc decimals	Scaled Facts	Scaled Facts	Compare & order fractions	Pictograms & Bar Charts
10	Inverse Checks	Approximation Checks	Mental Methods	Mental Methods	Unit fractions of amounts	Coordinates
11	PV: value digits, partition, compare, order	PV: rounding	Written Methods	Written Methods	Mixed into improper & vice-versa	Money
12	PV: value digits, partition, compare, order	Roman Numerals	Missing number & balance equations	Missing number & balance equations	Add/subtract proper fractions	Translations
13	Mental Methods	Mental Methods	Multiplying with 1 and zero	Dividing by 1 and itself	Add/subtract mixed fractions	Perimeter
14	Written Methods inc decimals	Written Methods inc decimals	x10, 100	÷10, 100	Decimal equivalents ½ ¼ and ¾	Area

Practice



Direct Instruction & Enquiry

Direct instruction using an **I do, We do, You do** model lies at the heart of our system of the transfer of expertise.

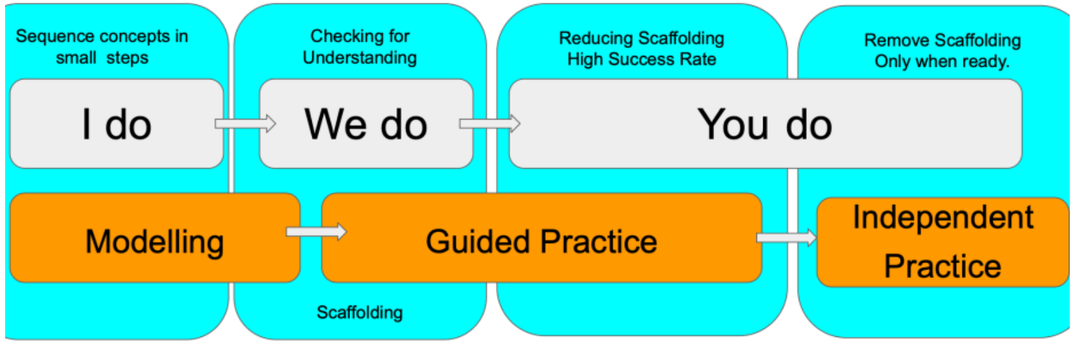
New content is delivered through direct modelling in the **I do** phase.

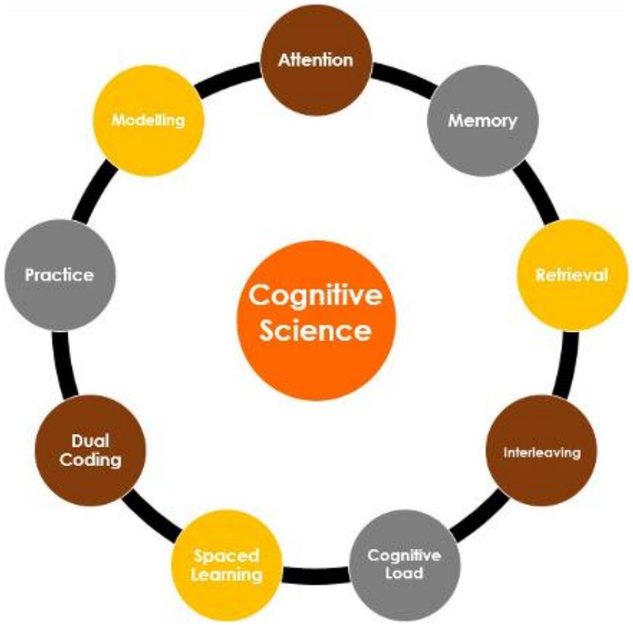
Further expertise is then transferred through the **We do** phase, where teachers and children work together in a **faded scaffolding** way on a concept or skills. Rich reasoning questions lie at the he of this teacher-child phase.

Following this children work collaboratively on the learning with guidelines and roles so that both participants are active learners.

To ensure that staff know whether their teaching has been received by all, or which children may need further support in a guided-group, the **You do** phase is completed before children work independently. We want them to practice and encode success not misconceptions. This is our check.





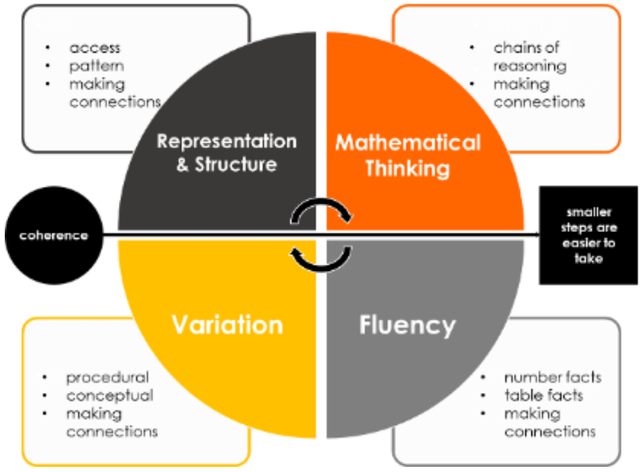


I do

We do

You do

Our Mastery Approach To Maths



Coherence

• The precise ordering of content in our curriculum, acts as scaffolding for our children in itself.

Fluency

• Fact fluency is developed within maths lessons but also within additional, daily fluency sessions. In these sessions, a deep conceptual understanding is developed using a range of manipulatives and visual representations. To ensure this leads to automaticity, daily automaticity practice is built into maths lessons and automatic recall is assessed every half-term.

• To ensure our children are truly fluent, our maths lessons are structured in a way that children have to apply their fluency to a range of variations and varied fluency prompts.

Variation

• To ensure too much variation early on does not lead to cognitive overload, our lessons are structured in a way that children work on what we decide is the most accessible representation/procedure to initially learn a concept/skill. Immediately after this, children work on a range of variations to strengthen their understanding. This initial ‘basic fluency’ phase tightly matches the direct instruction and working wall scaffold. The ‘varied fluency’ phase also allows us to pair this new learning with other areas of maths to build connections, for example comparison questions presented on a bar chart.

Representation & Structure

• Concrete resources are used to introduce new concepts in each year group of school, as they help children expose the structure of maths, for example our children use a tens frame to see how 7 + 4 can be represented as 7 + 3 to make a new ten leaving the 1 as a bit for ten and a bit as 11. When manipulatives are first introduced, specific lessons are planned to teach how to actually use the, before
they are paired with mathematical content. We also know that for each piece of learning ‘concreteness fading’ needs to be applied so children can ultimately work without scaffold.

Mathematical Thinking

• We view reasoning as ‘reasoning throughout’ not as an end of lesson task. Children are asked to reason throughout maths lessons, including how new learning links to old, reasoning with the precise mathematical vocabulary taught and about how to tackle problems. To ensure all children are taught how to be problem-solvers, practice being problem-solvers and acts as independent problem-solvers, we have dedicated problem-solving lessons when a concept/skill has been secured.

Systematic Teaching of Reasoning – Gareth Metcalfe's Reasoning Routines

To ensure that our children are proficient in reasoning about mathematics, we have a rigorous, systematic approach:

- Precise mathematical vocabulary is directly taught, practised and applied

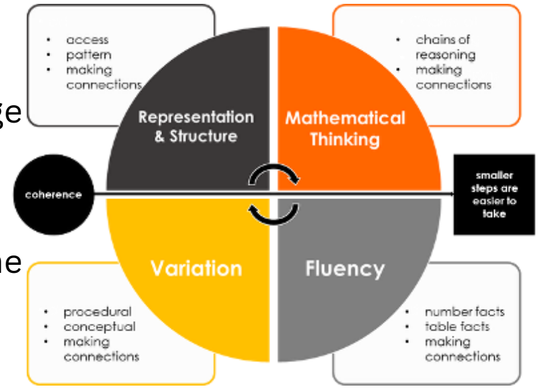
- Reasoning is used through lessons using 'think-pair-share' structures

- Every lesson includes a reasoning task based on the prompts below – taken from Gareth Metcalfe's Reasoning Routines. These help children to develop their problem-solving-thinking skills so they can apply them to a wide range of routine and non-routine problems.

Exploring and noticing	Working systematically	Conjecturing and generalising	Visualising and representing	Explaining, convincing and proving
• Contexts • Spot the difference • Odd one out • Spot the pattern	• Small Difference Questions • How Many Ways? • Different Ways • Sort	• I know … so… • Agree or Disagree? • Always, sometimes , never	• Read the pictures • Complete the diagram	• Explain the mistakes • Which answer? • Agree or Disagree? • Correct or Incorrect? • Estimate • Explain

Our key reasoning prompts are used to frame discussions in other subjects too. The rationale is that as our children develop comfort and competency with the reasoning sentence frames in other contexts, when they are asked them apply them to novel maths ideas, they only have to use working memory on the maths.

Direct Teaching of Problem-Solving



• All children are taught a full range of problem-solving skills; all are exposed to a range of problem-types; all practice a range of skills; and all independently apply learnt skills.

• Problem-solving is taught when underlying content is secure.

• Problem types are built into learning sequences to ensure children are systematically taught each skill, each year. The identified problem types are: finding all possibilities, logic, visual, rules & patterns and word problems.

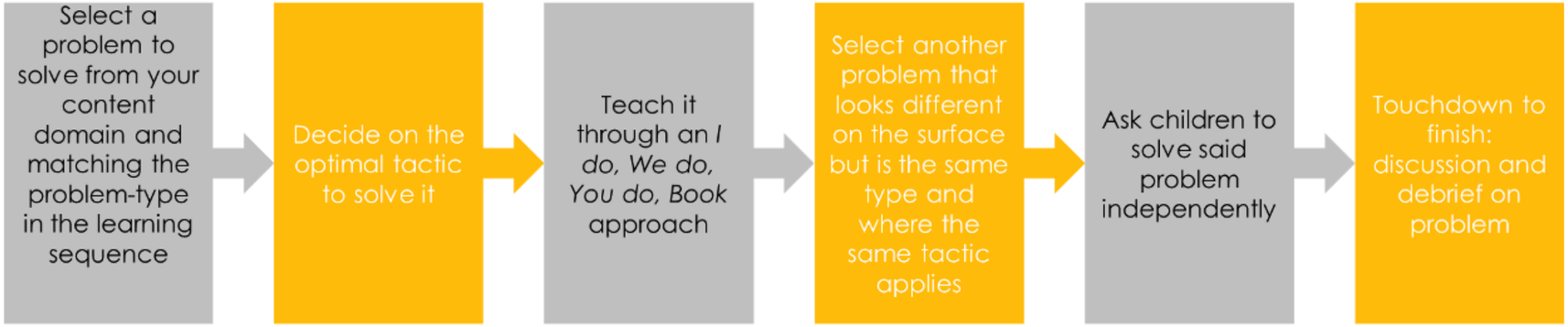
• Based on National Curriculum guidance, KS1 children do less problem-solving. Year 1 are introduced to it in Spring and then just one lesson per block is planned for in KS1 to ensure fluency takes precedent.

• As children progress through school, they are exposed to a wider range of problem types linked to units of work.

• Alongside this, each year group has one half-termly generic problem-solving skills lessons with the aim being that these skills can then be further applied in content-based problem-solving lessons

• We have a specific LDM for our dedicated problem-solving lessons that ensures it is a problem-solving approach for all:

Keep input minimal
Michaela Epstein



Choose one you enjoy yourself.
Michaela Epstein

Show content but not the question and ask what could the question be.
Gareth Metcalfe

Direct Teaching of Word Problem-Solving – Deconstructing Word Problems

The Approach:

From Year 2 onwards, we use a discrete teaching method for word problems - Deconstructing Word Problems designed by Gareth Metcalfe. These lessons are designed to be taught towards the end of a unit of work, allowing pupils to apply and deepen their understanding.

This approach focuses on developing pupils' understanding of word problems through careful scaffolding and structured discussion. By initially covering parts of a word problem and gradually revealing information, pupils are encouraged to focus on the key mathematical ideas before calculating an answer. Children are asked to predict what the missing information could be, considering multiple possibilities and reasoning about the structure of the problem.

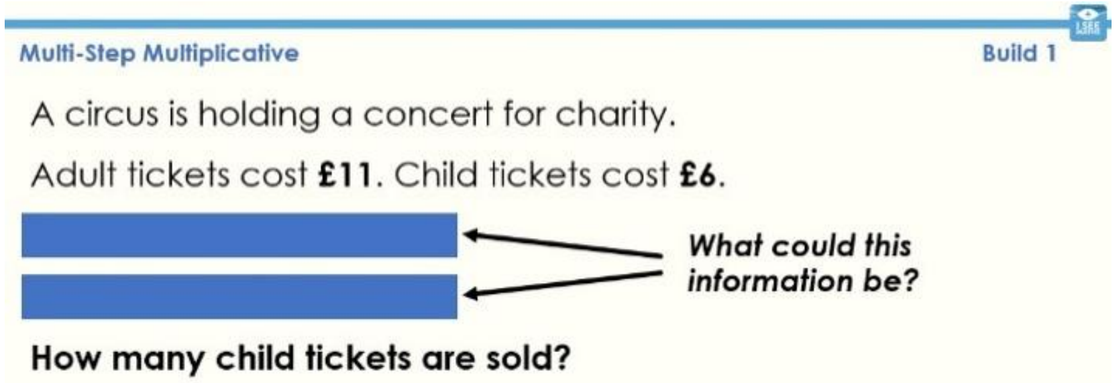
Modelling plays an important role. The use of equipment and images supports pupils in visualising the structure of problems. This process is active: pupils may be asked to choose which of two representations best matches a question, complete a partially constructed bar model, or explain a misconception. Occasionally, redundant information is included in questions so that pupils must think carefully about which details are relevant.

Connections between questions are explicitly developed. 'Minimally different' questions highlight how small changes in wording can alter meaning, while pairing questions with the same structure but different contexts helps pupils to see underlying similarities. Non-routine challenges further promote creativity and flexible thinking in problem solving.

Lesson Structure:

Lessons typically follow a consistent structure:

- Build 1 – Interactive teaching
- Task A – Paired discussion
- Build 2 – Further interactive teaching
- Task B (Version 1 or 2) – Independent practice
- Extend – Deeper challenge



Task Design and Progression

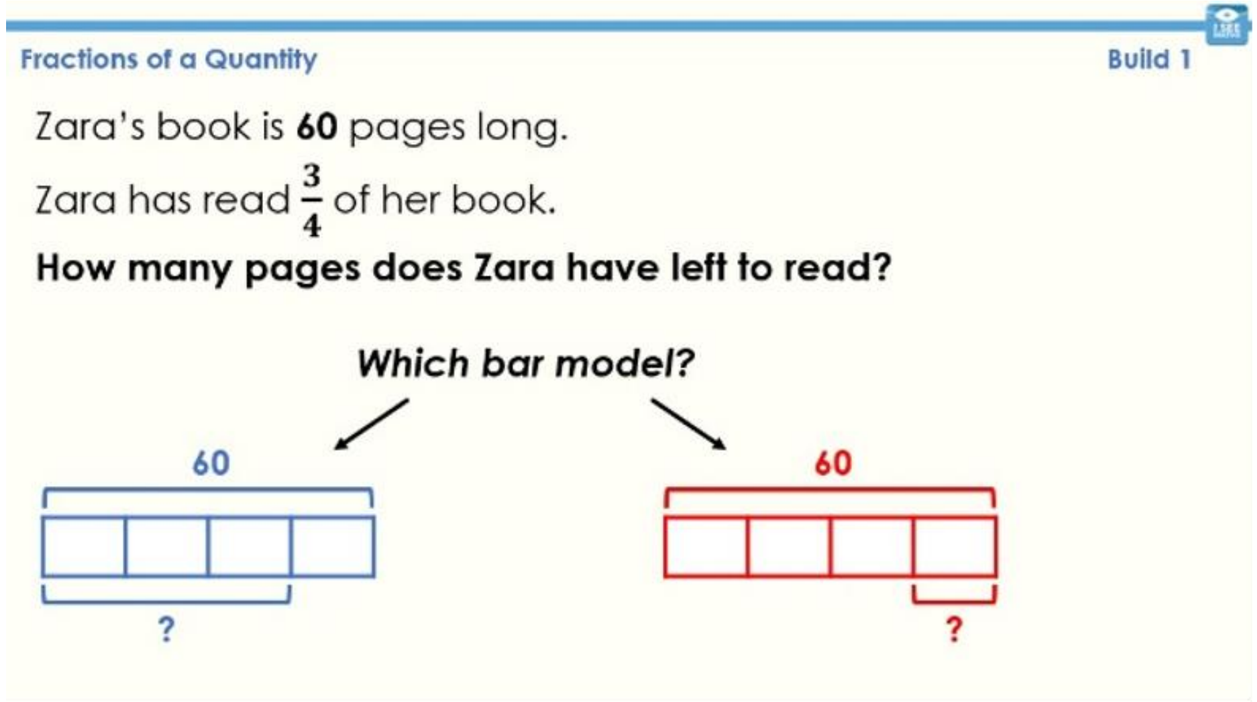
Tasks begin with example questions explored as a class. When first introduced, key information may be hidden so pupils cannot solve the problem immediately. Instead, they are encouraged to predict possible values and discuss their reasoning. Once revealed, pupils may:

- Match problems to bar models
- Compare related questions
- Identify and explain common errors

A strong emphasis is placed on discussion, with many opportunities for talk. For example, pupils might match questions to representations or explain their thinking to a partner.

Sequences of questions are carefully designed to increase in challenge. Scaffolds support pupils in organising calculations into clear steps, while similar concepts are presented in different contexts to strengthen connections.

Finally, a range of **Extend tasks** provide open-ended opportunities for deeper thinking, allowing pupils to explore ideas more creatively and apply their understanding in unfamiliar situations.



Supporting Children Working Behind ARE in Maths

Children within 2 years of the intended curriculum

Ensure children with gaps identified in the prior- learning check have had their remediation and are re-checked (while the rest do deepening activities

Pre-teach session – Available from White Rose

Introduce children to the lesson's concept/procedure and bridge some of the gaps in the current understanding. For example, a Y6 child approaching a PV lesson 1,000,000 who has knowledge to 1,000 (Y4). The pre-teach would look at how place value builds from what they know to 1,000,000 using representation and structure.

Within the lesson

•I do: adults ensure these children particularly are attending to the input and drawing children's attention to the working wall where there is also an example I do.
•We do: adult monitoring during 'we do' phase to nip errors in the bud straightaway or for questions to be asked therefore adults need to observe these children during this phase. Ensure you use the 'we do' guidance poster as this is key to moving these children.
•You do: regrouping based on checks for understanding (you do) so independent work is scaffolded by an adult.
•Focus group work: plan in advance the extra modelling they will need
•Adapted task design, for example visual prompts.
•Use of technology – provide children with a video of worked examples to refer back to when working (iPad screen record feature – a personalised video working wall).
•Intention being to still to BF, VF and Think.

SDI

Any further misconceptions from the lesson addressed rapidly before the next lesson or if children did not get VF and Think finished it will need doing.

Stop and think: is any provision outside of the classroom better than what they would receive in the classroom? There may be specific occasions where alternative provision is the best option.

Children working more than 2 years adrift with no CLL needs

• A parred-back and documented curriculum looking at place value and number to encourage catch-up.
• Teacher to find time within each day to ensure these children have input for their next step before they do their independent work in the maths lessons with their peers.

Children working more than 2 years adrift with CLL needs

• Use of PIVATS to track own curriculum but not an accelerated curriculum – progress against their own next steps.
• Teacher to find time within each day to ensure these children have input for their next step before they do their independent work in the maths lessons with their peers.
• These children will need more practice than others so an input every day may not always be needed; it could be a day of input and practice and then another day of practice.
• These CAN and MUST work on varied fluency, reason and solve problems, if you find the exact level they are working at. They need to do these phases to properly learn but at their level.

Targeted Intervention

Alongside the lesson-based model above these children to be targeted for academic intervention on:
•Subitising – ensure to go back and check children can subitise both perceptually and conceptually
•Doubles and halves
•Bonds within 10
•Bonds to 10
•Bridging 10
•Bridging other 10s
•Multiplication tables
•Place value
These facts open up nearly all maths and need prioritising.

Greater Depth

Children who grasp concepts quickly and confidently are challenged through two layers of greater depth work within lessons:

• ‘Stetch’ tasks are used after each to task to extend thinking, while also allowing other children
to catch up thus allowing our classes to move together.

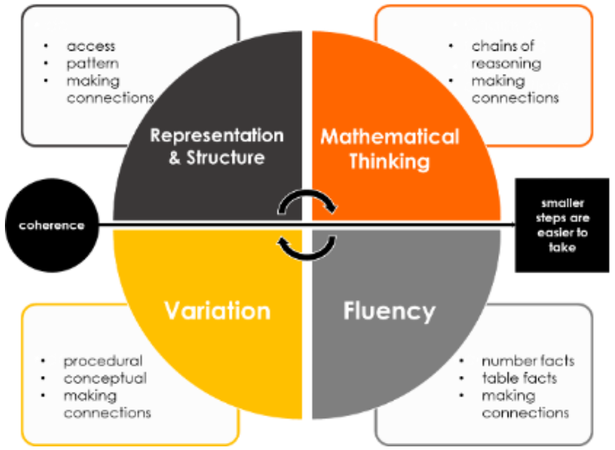
• Greater depth tasks are used at the end of learning steps to allow confident mathematicians extend their understanding further. The intention is that all children are competent enough to complete the greater depth task.

Our greater depth task bank is underpinned by the ideas from these two sources, namely that pupils working at this level should be able to:

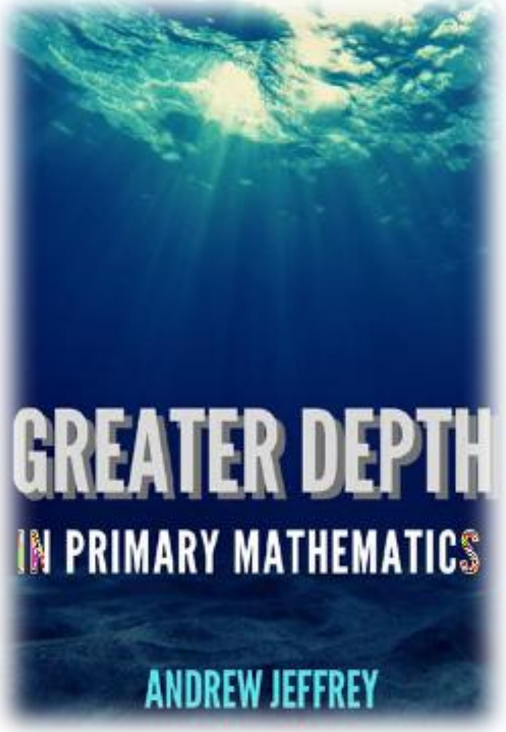
• solve problems of greater complexity (i.e. where the approach is not immediately obvious), demonstrating creativity and imagination;

• independently explore and investigate mathematical contexts and structures, communicate results clearly and systematically explain and generalise the mathematics.

(Askew et al. 2015, p.7)







Early Years Pedagogy

Culture… *to make lovers of maths*

Curriculum (as detailed as primary)

Reasoned Introduction… wonderings (valued wonderings)

Direct Instruction (ideally in a circle)

Focused, adult-led Maths play

Purposeful, adult-initiated maths play built around Shrec

Child initiated, free play using the maths

Lots of chances for **fine motor skills** – this is a real barrier for some of our Y1 chn in terms of pencils and manipulating manipulatives!

Dedicated maths area that had chances to revisit the key areas of early maths (matching, sorting, ordering, comparing, patterning, spatial reasoning.

Also lots of maths picture, story books available in said area

Simple shared whiteboard system to note who still needed to experience an area or had a gap to address

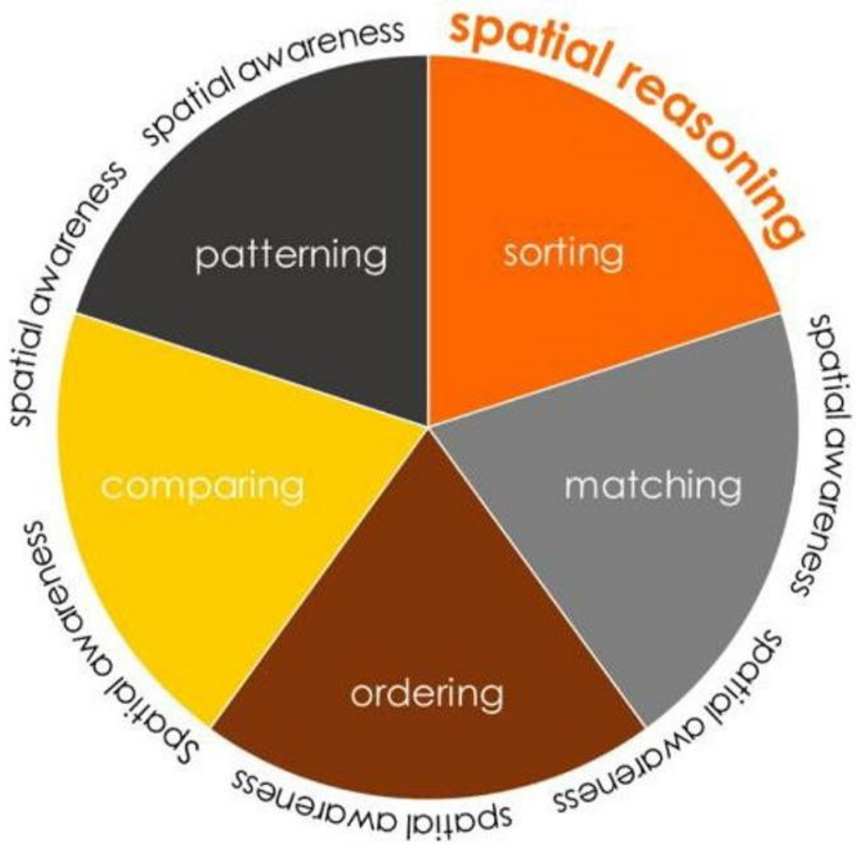
We know our target group and WE FIND THEM!

The key concepts of early maths

Schematic Maths Play

A repeated action that children use to learn about the world

Posting
Emptying
Enveloping
Filling
Rotating
Transporting
Connecting & Lining-Up
Enclosing



Subitising
Counting
Composition to 10

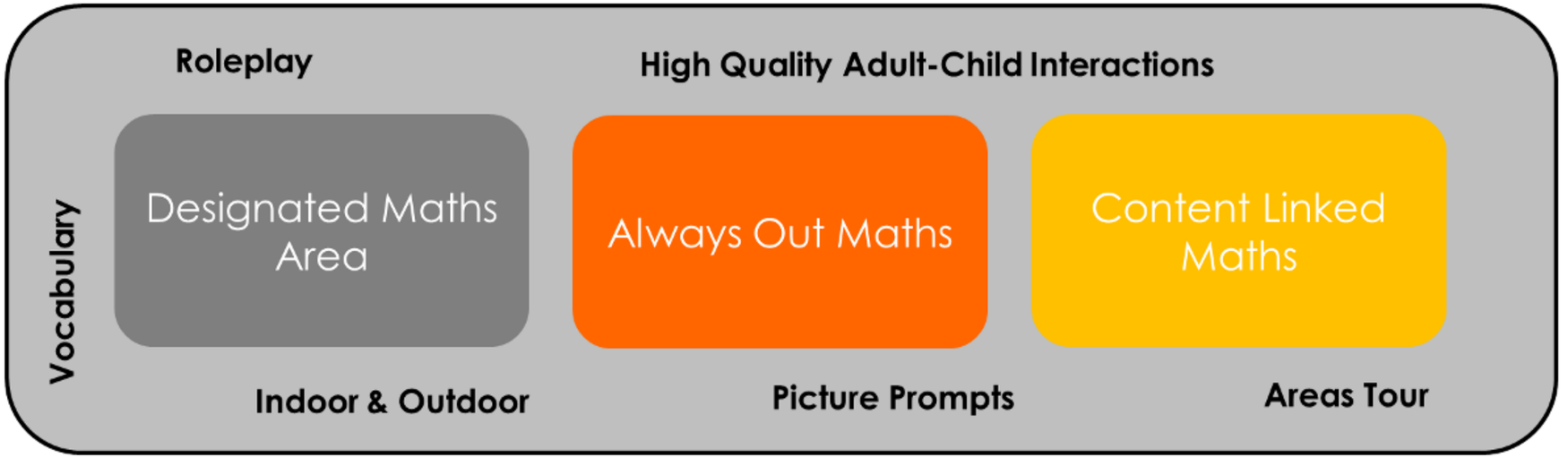
Early Parental Engagement

Maths in EYFS

- Direct mathematical teaching
- Play-based consolidation, intervention and stretch in areas

Mathematical Routines	Mathematical Input	Maths Through Provision (in and out)	
		Content Linked	*Always Out Maths*
• Register on five frames • Snacks from 5 frames • Paying for snacks • Tidying up through shadowing • Count in lines	• Subitising starter • Sat in circle • Direct teaching • Discussion • Reasoning • Choral recital • No opt out • Relatively short • **Teach how to use areas** • *Master the Curriculum* • *White Rose / NCETM Mastering Number*	• Defined areas • Engaging, lovely, enticing areas • Activities directly linked to the input some via adult some independent as you have taught the play • Vocabulary on boards for adults • Maths area used for further focus group teaching **while others play <u>maths</u>** • Tracking of areas	• Spatial awareness • Sorting • Matching • Ordering • Comparing • Patterning • Subitising • Counting • Number composition • Picture prompts

Assessment
• Shared SDI board • Areas Tracking • LET Trust Ready Documents



- Mathematical play based on unit of work
- Patterning and spatial awareness play always provided

CPD

We apply the mastery approach to our staff CPD to model ensure all teachers are as skilled as possible to teach maths. All staff means SLT, teachers and support staff!

Central Team CPD	Maths Lead CPD	Teacher CPD	Teaching Assistant CPD
NCETM School Development Lead Ofsted Inspector Training	ELT Maths Development NCETM Maths Hub National CPD Lead Visits (e.g. Gareth Metcalfe)	Monitoring & Assessment Evidence Drives CPD Whole-School Individual ELT Maths Development NCETM Maths Hub	ELT TA Development Programme NCETM Maths Hub