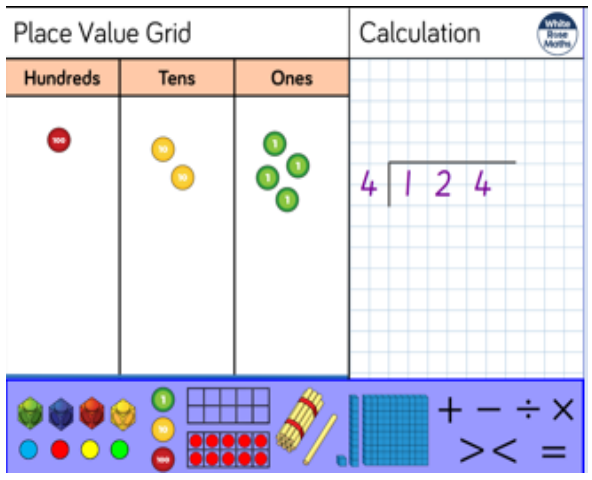
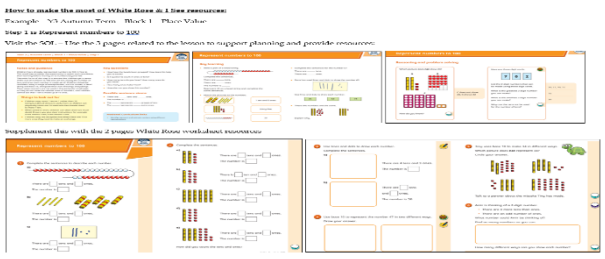
Mathematics – Operational Guidance

Key Messages and Reminders for Summer Term

- **Coverage:** 5 core lessons of 1 hour (5 hours); 4 morning starter boards based on written methods (28 minutes) (NOTE – in Y5, one of these morning sessions focusses on multiplication to help recall knowledge acquired in previous years); at least 2 Turbo Maths sessions per week (1 hour in total – suggested 2 x 30 mins but can be 3 x 20, 4 x 15) (NOTE – in Y6, half of this time is assigned to arithmetic practice)
- **Starter Boards** – these are 4 days a week – **all of this time must be spent on Maths** – if children finish early, they should be challenged to reason (e.g., explain why they had to exchange), demonstrate related facts e.g., with multiplication 3 x 47 (I know 3 x 4 = 12 so 3 x 40 = 120), and check their calculation using inverse operation. Where methods are new or children need it, starter boards should follow I do – We do – You do. This is likely to be more common in the autumn term and lower down the school. When children are secure and modelling is not required at the start of the session, a method should be modelled and then discussed towards the end of the starter boards session, rather than simply revealing all answers. Children should make corrections/notes using purple pen. **The phrase FEMA should be shared with children – Faster Easier Most Accurate when discussing the methods used – this helps justify the journey towards compact written methods.** When children are new to a method/complexity of a calculation, the method should be modelled pictorially in addition to the written method – for instance columns in counters next to the written method. See example right:



- Coverage in core lessons should largely follow the White Rose Scheme of Learning 3.0. Where changes are necessary to reflect our coverage, these should be indicated on the medium-term planning document. Within White Rose there are 2 collections of fluency, reasoning and problem solving questions – one is included in 'download' on the lesson step on White Rose and in the scheme of learning; the other is in the worksheet write-on part. These should be used together to resource the bulk of the lesson. See diagrams further down this document:

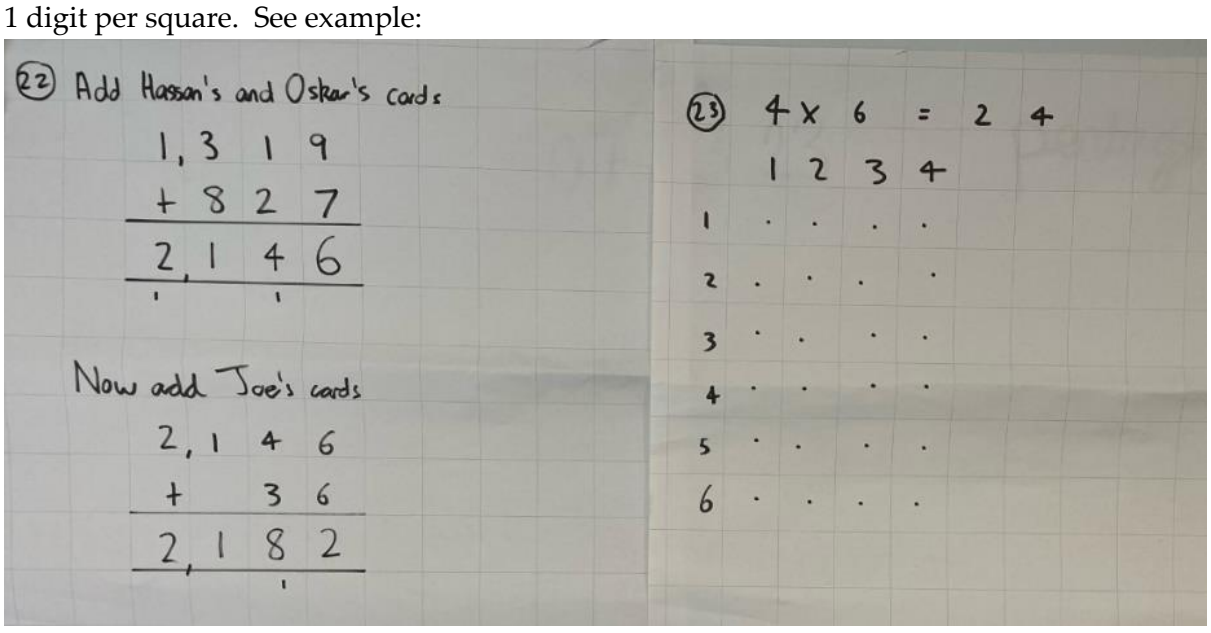


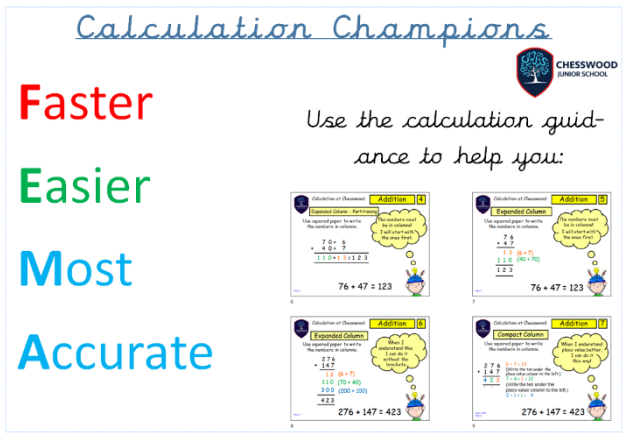
- Coverage should follow the concrete – pictorial – abstract process. As children become more fluent, they will require concrete resources less. The pictorial process is vital as it will support children's reasoning. All new learning and question styles should be delivered through our key teaching strategies of explicit instruction, following I do, We do and You do as needed for the needs of the children.
- Where new learning is introduced, connections should be made as appropriate with prior knowledge but only as appropriate to avoid cognitive overload. An example of appropriate prior knowledge would be the use of number bands to 20 to support addition and subtraction in columns with a formal written method for addition or subtraction. The White Rose Notes and Guidance will also refer to useful prior learning.
- **Nasty Maths** is every lesson (if assessment isn't required for this stage of the learning– use problems based on the same learning and model how to solve to demonstrate a specific approach to problem solving). The GDS children should be part of the feedback discussion around Nasty Maths to challenge their reasoning skills – If they have answered it right and are confident, they should then start to work independently. Children who are Meeting ARE, are confident and demonstrated they don't require input at that time should also move on to work independently. This can change from lesson to lesson and is at teacher discretion based on the needs of the children.
- **Work in the lessons should follow a journey from fluency to solving problems.** This should predominantly be White Rose but will need supplementing. I suggest CGP or Target Maths for extra fluency, and the I See Reasoning and I See Problem Solving for children to move onto after fluency. Testbase questions should also be included to help expose children to this style of question. There is a Y6 Deconstructing word problems resource made by the author of I See to support with problem solving in Y6. It is vital that there is variance in question styles – which White Rose provides – to enable interleaving.
- Children working at GDS or GDS RFC should not only start their work sooner than others (indicated after the Nasty Maths) but should not start on the first question like the rest of the class, to insure they are being consistently challenged. It's important that they don't routinely work without timely feedback as they could complete work continually incorrectly due to a misconception. This is going to look different in different year groups, but I suggest children mark every 2-3 questions. Depending on the age and independence of the children, it may work better for the children working independently to complete one fluency question, marking it and then continuing if they answer this correctly. The start point for children who are ready to commence work independently should be noted on the flipchart to ensure consistency when there is supply or ECT cover.
- **Key vocabulary and/or sentence stems should be identified for each lesson –** the same terms are likely to be used in multiple lessons across a unit. This will support oral and written reasoning. These should be visible either on the working wall, flipchart or a support sheet.
- **Reasoning must not be seen as an optional add on or extra – all children must routinely be given the chance to reason at their level. This should be a minimum of every 2 or 3 questions.** Key questions to reason should be identified at the planning stage. Reasoning may need to be scribed by an adult – if written it should include key terms e.g., aim to use the term numerator rather than saying the top number. Reasoning can also be a diagram for instance drawing an array to demonstrate how a child knows a multiplication fact. Drawing a visual representation of the question would also count as reasoning, for instance a bar model. Children should reason as they go along, rather than completing sheets and going back to reason at the end of the session.
- **Problem Solving must not be viewed as a generic skill** – i.e. it must be taught within context alongside the relevant objectives. Children should be taught how to solve problems and contrast and compare different approaches to solve them.

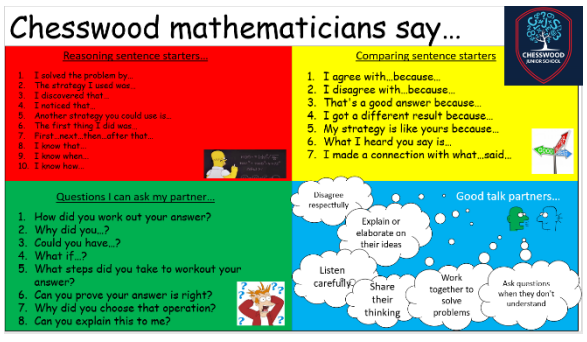
- **Turbo Maths** – Turbo Maths should focus on key mental recall (e.g., number bonds, times tables) and reasoning (I See Reasoning). There shouldn't be any written expectation for Turbo Maths. A coverage sheet should be completed to ensure breadth of coverage in Turbo Maths. These help children to dip in on topics which otherwise wouldn't be covered for a prolonged period due to the schedule of White Rose. A number of the I See questions include worked examples, which helps children to focus on reasoning and strategies rather than processes. This enables for spaced-learning. It is vital that children need to share and explain contrasting opinions and viewpoints as this has a positive impact on pupil outcomes. Suggested Mental Maths key facts to target:

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number					
count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens	count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward	count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number	count in multiples of 6, 7, 9, 25 and 1000		
given a number, identify one more and one less					
identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least					
represent and use number bonds and related subtraction facts within 20	recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100				
	add and subtract numbers using concrete objects, pictorial representations, and mentally, including: ♣ a two-digit number and ones ♣ a two-digit number and tens ♣ two two-digit numbers ♣ adding three one-digit numbers	add and subtract numbers mentally, including: ♣ a three-digit number and ones ♣ a three-digit number and tens ♣ a three-digit number and hundreds		add and subtract numbers mentally with increasingly large numbers	
	recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers	recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	recall multiplication and division facts for multiplication tables up to 12 × 12		
			use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers	multiply and divide numbers mentally drawing upon known facts	perform mental calculations, including with mixed operations and large numbers
			recognise and use factor pairs and commutativity in mental calculations		

- **Maths Assessments** – Years 3-5 should complete these within 2 weeks of finishing a unit. Planners let NG know these are needed. NG will then share the link to view results with planners so they can identify development areas for discussion as part of curriculum review and to target coverage in Turbo Maths.
- **Interventions including Tutorials** – Number Stacks (minimum 3 x 15 minutes per week) should be used to support children on the SEN register. This provides targeted support. The RTP Ark Academy resources should be used to support provision in tutorials if the objectives are appropriate for the children in your tutorial group.
- **Visible consistencies** – Maths working wall, supporting current learning. Calculation progression slides displayed as appropriate for written methods. Reasoning talk mat used to support reasoning in all lessons. Radical Reasoning poster displayed. Reference to FEMA (Calculations Champions poster) when calculations are being completed. Children begin to use 1cm square books in Y3 and typically progress onto 7mm books in Y4. This can be adjusted to support the needs of the children. Modelling complete on gridded paper so that adults can model 1 digit per square. See example:





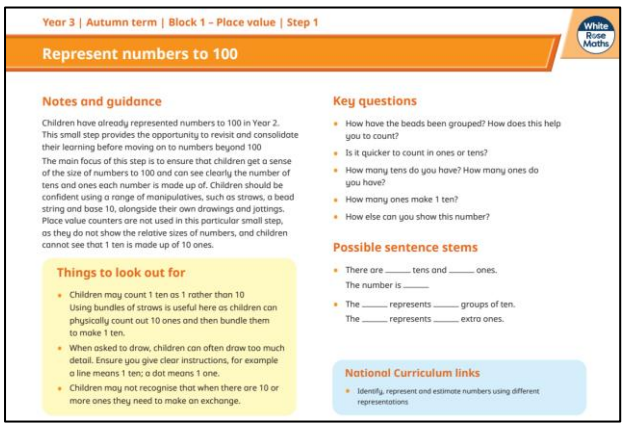


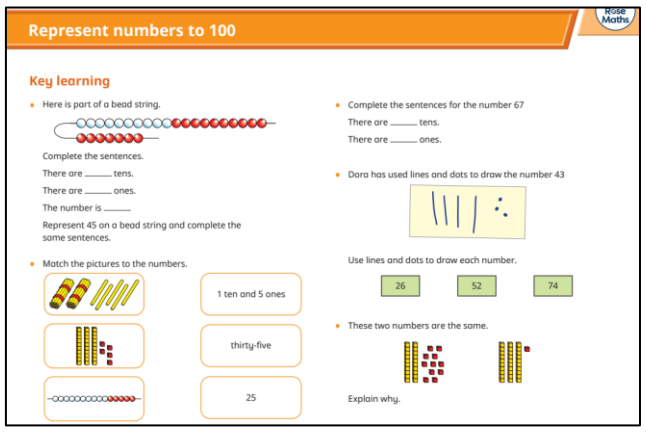
How to make the most of White Rose & I See resources:

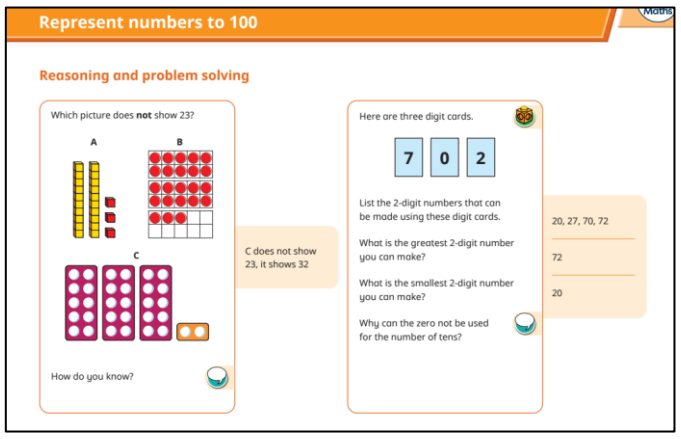
Example – Y3 Autumn Term – Block 1 – Place Value

Step 1 is Represent numbers to 100

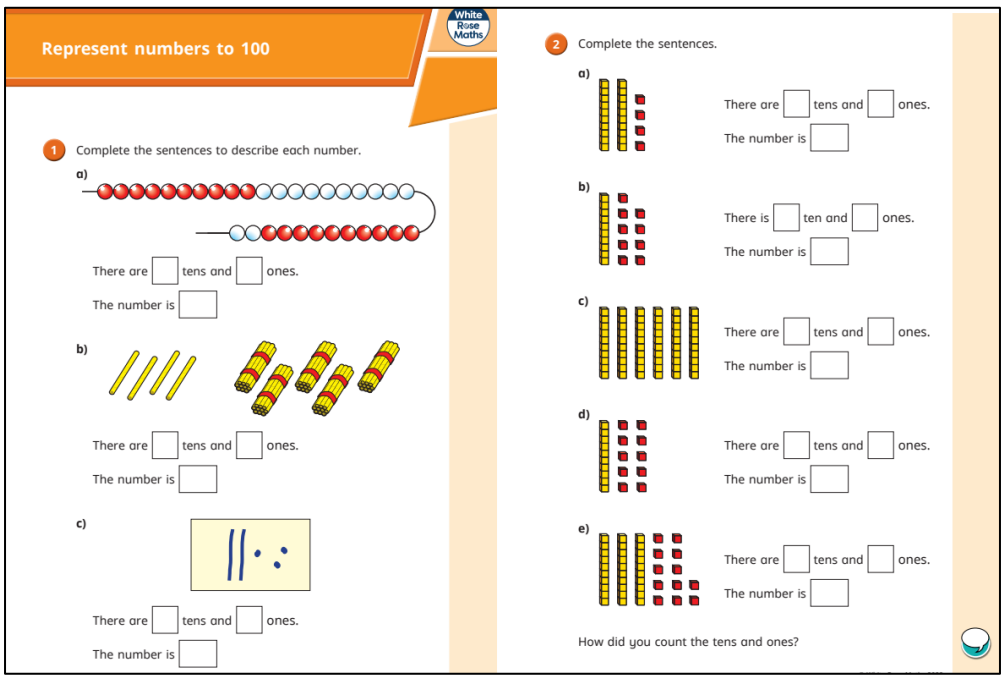
Visit the SOL – Use the 3 pages related to the lesson to support planning and provide resources:

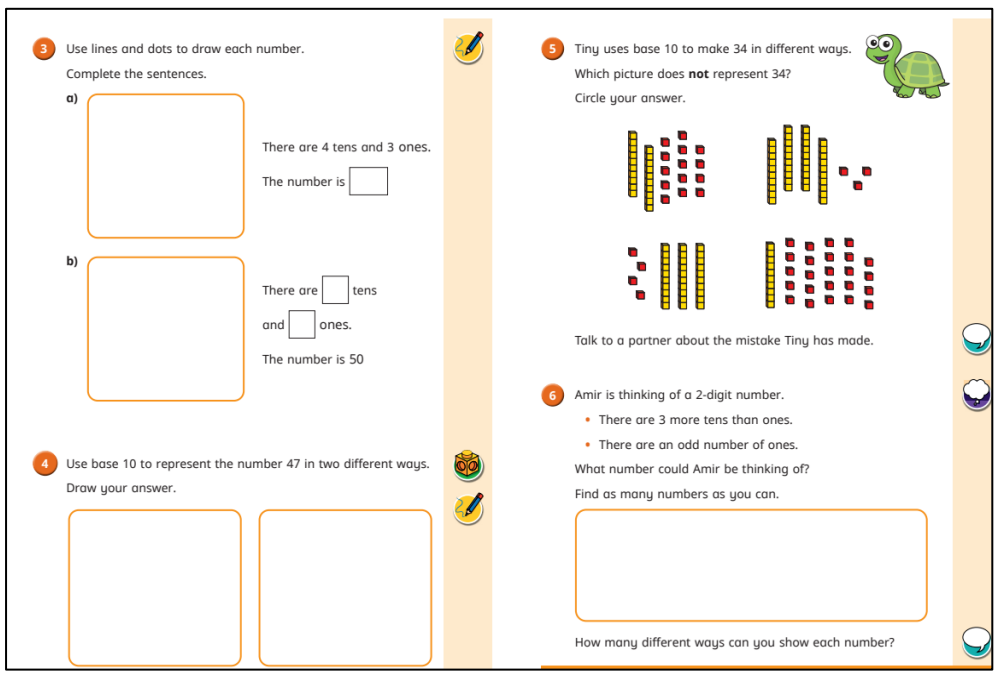




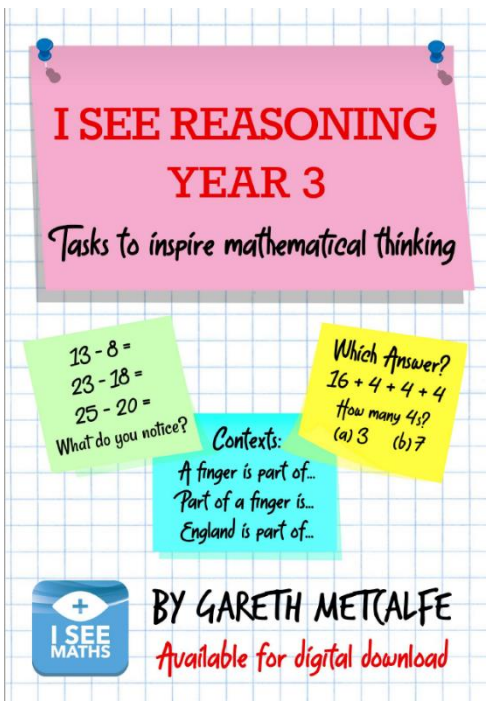


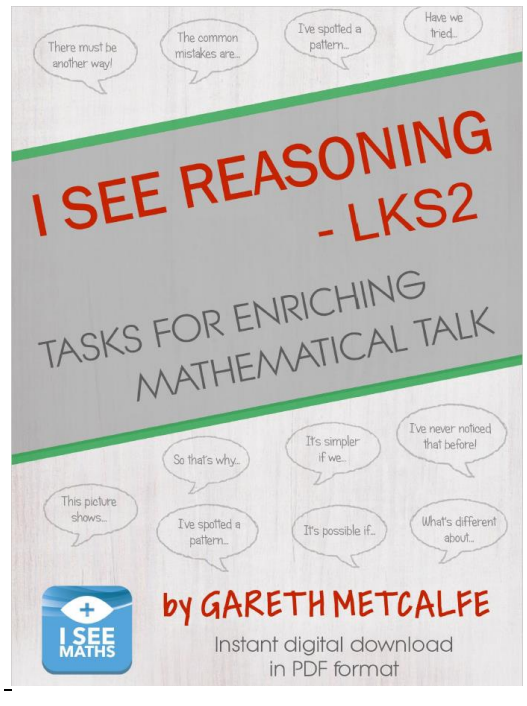
Supplement this with the 2 pages White Rose worksheet resources

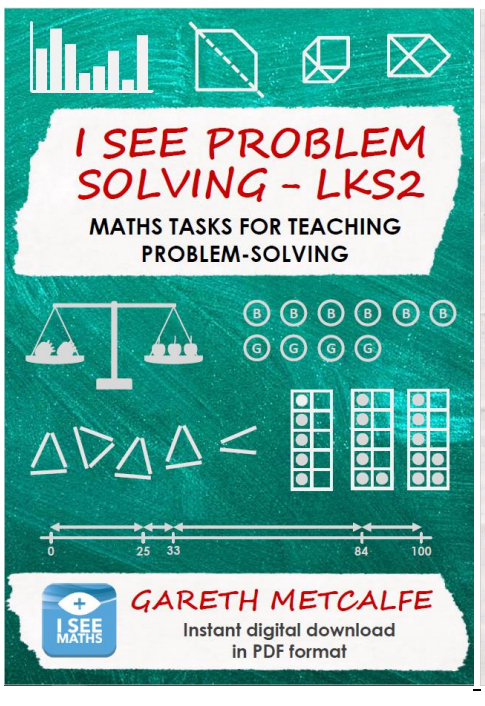


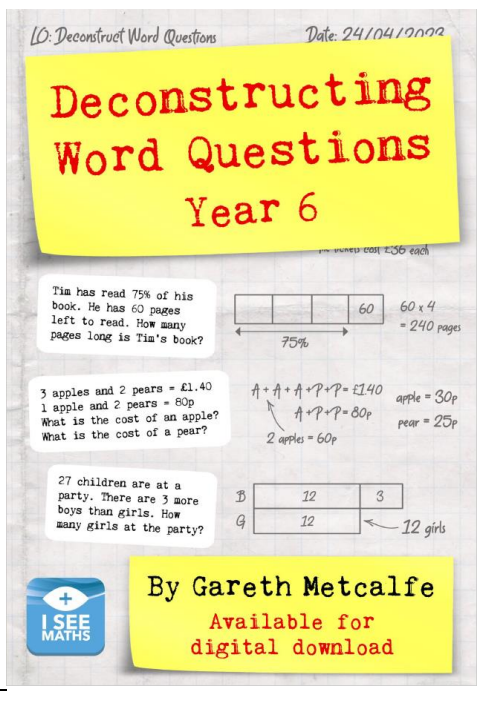


Then look at the I See Reasoning and Problem Solving resources and supplement as appropriate:



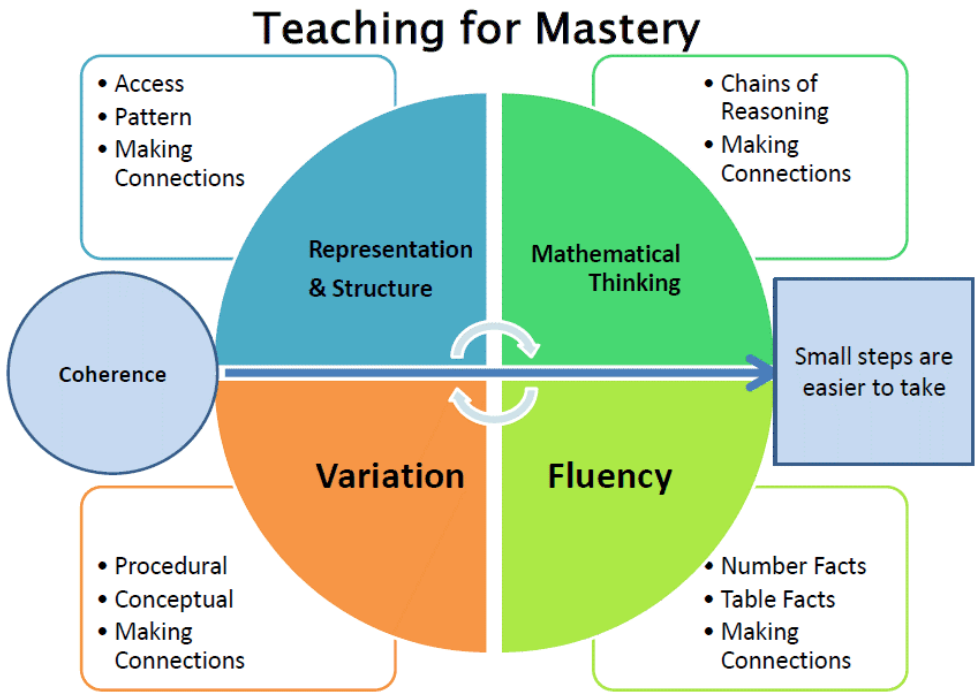




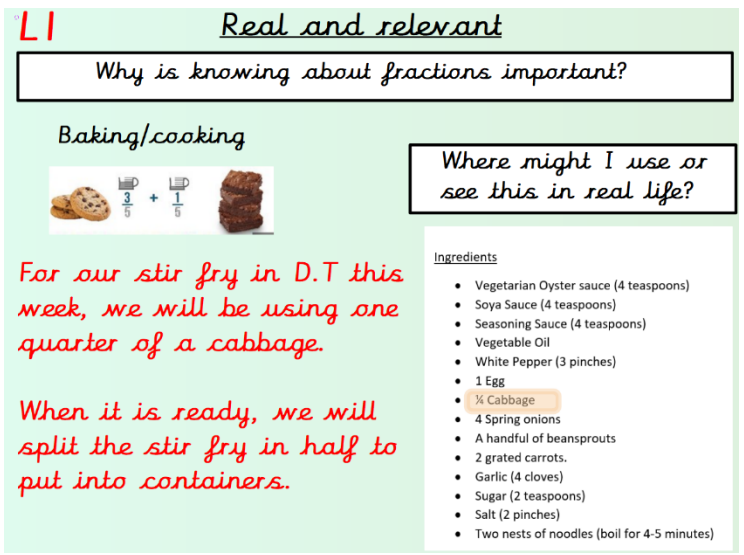


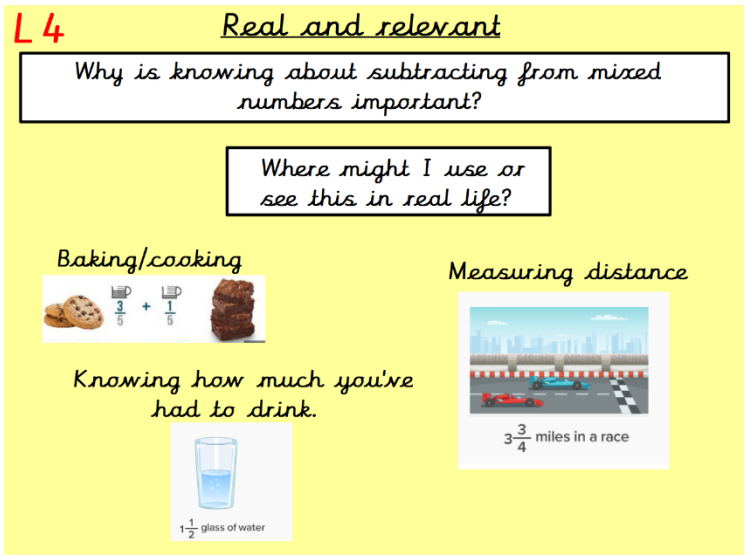
Securing Effective Learning

- We teach for mastery: Underpinned by **CONCRETE – PICTORIAL - ABSTRACT**



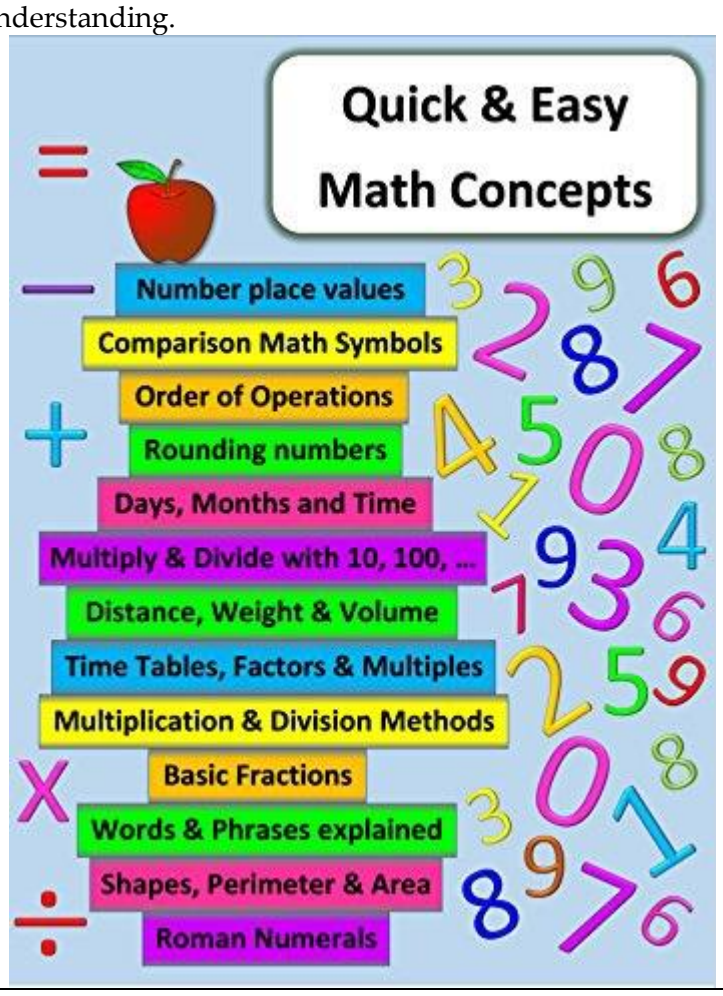
- Real, Relevant & Engaging (Page 14 of Securing Effective Learning) – at the start of a unit of work, links should be made to justify why this maths is important – this should be a brief intro – one slide is fine. This can be revisited at various points during the unit and may need tweaking – for instance there may be different versions of what is real and relevant for different objectives within fractions. See the examples below:





- Knowledge, Skills, Concepts and Vocabulary (Page 7 of Securing Effective Learning)

FEATURE	NOTES/LINKS
Knowledge	Key **Knowledge is stated in the national curriculum objectives and broken down into small steps within White Rose sessions – these should form the WALTs for each lesson (some steps will require multiple lessons). As part of the learning journey, knowledge should be considered as:** 1. **Declarative knowledge:** This can be introduced with "I know that" and refers to facts and formulae, and the relationship between facts; Ofsted refer to the latter as conceptual understanding. 2. **Procedural knowledge:** This can be introduced with "I know how" and refers to methods, and the principles underpinning them. An example of this is a missing number problem. 3. **Conditional knowledge:** This can be introduced with "I know when" and refers to knowledge and understanding of strategies which can be used to reason and solve problems. This extends to combinations of declarative and procedural knowledge which then become strategies for particular types of problems. **The sentence stems I know that/how/when are shown on the Radical Reasoning poster.**
Skills	Key skills identified depending on the small step – often Maths is a combination of knowledge and skills (such as applying a method or problem solving). Our calculation progression supports consistency – rehearsed during Starter Boards sessions. Reasoning both verbal and written is supported in each lesson. LINKS: Calculation Progression Reasoning Talk Mat Support children to make links by asking helpful questions such as: 'Can you tell me a bit more about…?' 'Can you give me an example to illustrate your point here?' 'Who can build on what has been said here?' Encourage children to contrast and compare answers and reasoning.

Concepts	The national curriculum is divided into different concepts e.g., number and place value. White Rose identify notes and guidance and things to look out for to support key understanding. 
Vocabulary	**Key vocabulary and/or sentence stems should be identified for each lesson –** the same terms are likely to be used in multiple lessons across a unit. This will support oral and written reasoning. These should be visible either on the working wall, flipchart or a support sheet. White Rose Steps identify sentence stems. Key vocabulary should also be supported by the Non-statutory Key Stage 1 and 2 guidance from June 2020. Oracy resources may also support this. LINKS Non-Statutory Guidance Oracy Resources including Reasoning Poster and Talk Mat Use the TOLD guidance to support children's talk in Maths.

- Securing appropriate challenge for children who are either in the comfort zone or likely to be in the overwhelming zone (Page 11 of Securing Effective Learning):

Children in the overwhelming zone (most likely children working Below – potentially some children Accessing)

- Consider different types of scaffolding for instance adult modelling/group work or use of concrete apparatus. Working memory can be supported by providing fact sheets to help – for instance a multiplication grid with times table facts could support a task which uses this knowledge but the main focus of the learning isn't the recall of the fact.
- If children are lacking confidence or fluency, overlearning facts can support them – this may mean they need to spend longer on fluency based tasks. At this stage, they should still be expected to reason to further their understanding.

Children in the comfort zone (most like children securely Meeting/GDS RFC or GDS)

- Ensure that the children have sufficient challenge with the questions they are attempting – this should typically be richer problems – these are often on page 2 of the White Rose lesson resources and identified as Reasoning and Problem Solving on the White Rose Scheme of Learning.
- The I See Reasoning & Problem Solving resources should also be used to provide additional challenge.
- Ensure children are attempting to use conditional knowledge (I know when..., always/sometimes/never)
- Encourage children to compare and contrast reasoning – who is right / which method is FEMA? Convince each other (red pen).

How to teach problem solving:

Problem Solving

- Problem solving is not a generic skill. Strategies are topic-specific.
- Children need to be trained how to solve specific problems – build this into planning.
- We already have systems in place for this in school – I do, we do, you do.
- As children become more confident with ways of solving problems, planning should include different methods to compare like questions so that children can help identify which method is best.
- Children should monitor, reflect on and communicate their problem solving.
- White Rose resources typically include problems – we also have I See Problem Solving resources.
- We need to equip children with the tools to unpick questions and try to turn complicated word problems into simple equations.

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Problem Solving – Planning my approach

- What is the problem asking me to do?
- Have I seen problems before that look like this one?
- What mathematics might help me to solve this problem?
- What information in the problem is important?
- What information is less important?
- What might I need to work out?
- Would drawing a diagram help?

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Problem Solving – Monitoring my progress

- Is my chosen strategy working?
- Are there different ways to solve this problem?
- Should I think about solving this problem in a different way, or should I stick with my plan?
- Has my teacher shown me anything which might help me here?
- Would it help if I asked another pupil to check my work so far?
- Look back: have I made any obvious mistakes?

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Problem Solving – Evaluating my success

- Does my answer make sense? How do I know?
- Is there any way that I can check my answer?
- Am I sure I have answered the question? (Re-read the problem and your solution to make sure!)
- Does my answer need units?
- Would another pupil understand my working out? (You could ask a friend to check.)
- Can I explain to someone else what I did and why I did it?
- Would a different way of solving this problem have been quicker?
- Would I solve the problem in a different way if I tried it again?
- Could I share and discuss these different approaches with another pupil?

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Using Worked Examples

- Children should be encouraged to look at worked examples to help develop metacognitive thinking. This helps to focus attention on reasoning and strategies and removes the need to focus on processes.

Helpful locations for resources mentioned above:

To support planning –

Resource(s)	Where is it?	What will it help with?
White Rose Maths	https://resources.whiterosemaths.com/resources/ Y:\Teaching & Learning\Subjects\Mathematics\2022-23\White Rose Downloads Interactive White Board resources: Y:\Teaching & Learning\Subjects\Mathematics\2022-23\White Rose Downloads\Primary-IWB-Files.zip\Primary-IWB-Files	Planning – Scheme of Learning. Within the premium resources, each lesson has a teacher flipchart and resources provided. There are also guide videos (used for home learning) which can help demonstrate ways to explain concepts to the children. The latest Schemes of Learning are downloaded in the file path shown on the left.
Turbo Maths Coverage	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Turbo Maths	Turbo Maths coverage map to help ensure breadth of coverage – there should be one of these per term, saved in the folder path on the left. It's fine if a shortcut is saved here to the main document to save copy and pasting.
Core lesson coverage	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Planning	Core lesson coverage – there should be one of these per term, saved in the folder path on the left. It's fine if a shortcut is saved here to the main document to save copy and pasting.
Number Stacks	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Number Stacks	SEN Intervention User guide, assessment information and certificates saved in the folder. This helps to identify what topics to cover with each child.
Ark Academy RTP	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Ark Academy RTP	Tutorial/NTP User guide. Resource includes diagnostic tools and resources to support delivery as an intervention.
Maths Concrete Resources Guide	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\White Rose Downloads	Year Group guides current under development.
Mathematics guidance: key stages 1 and 2 June 2020	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Government Guidance	Planning – this has teacher guidance for teaching various aspects of the curriculum, including pictorial representations and key vocab/phrases. The ready-to-progress criteria (key objectives in this document) are referenced on the White Rose SOL – assessments for most of these are on the Chesswood website here: https://www.chesswood.w-sussex.sch.uk/page/?title=In+School+Maths+Assessments&pid=1104
NCETM Primary Video Lessons	https://www.ncetm.org.uk/in-the-classroom/teaching-maths-through-the-pandemic/primary-video-lessons/	Support resources provided for certain aspects of the curriculum which may support consolidation lessons.
Oracy Resources	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Oracy & Vocab	Supporting the use of key vocabulary and sentence stems within lessons.
Calculation Progression Document	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Calculation Policy	To support Starter Boards and progression of methods throughout the school.

For within lessons –

Resource(s)	Where is it?	What will it help with?
Numbots	App installed on children's iPads https://numbots.com/	Children's place value knowledge and mental calculations – typically KS1 knowledge but useful for LKS2.
TT Rock Stars	App installed on children's iPads https://ttrockstars.com/	Children's times table and division facts knowledge.
IXL	App installed on children's iPads https://uk.ixl.com/maths	Targeted skills practice related to all areas of Maths curriculum. Best used either to reactive prior learning or consolidate current learning as it doesn't offer prior teaching.
White Rose 1-Minute Maths	App installed on children's iPads	Subitising, Addition and Subtraction mentally. Most useful in LKS2 or with significant SEN.
Multiplication Tables Check (MTC)	https://www.chesswood.w-sussex.sch.uk/page/?title=Multiplication+Tables+Check&pid=1332	Guidance for parents and staff ahead of the MTC including supporting resources.
End of Unit White Rose Assessments	https://www.chesswood.w-sussex.sch.uk/page/?title=In+School+Maths+White+Rose+Blocks+Assessments&pid=1363	Low-stake end of unit assessments to help capture children's attainment at the end of a unit and inform Teacher Assessment. This can also help to identify objectives to focus on during interventions or Turbo Maths.
Target Your Maths Y1/2/3/4/5/6 CGP Maths Y3/4/5/6	PPA/Year 3 corridor	Extra Fluency needed - Based on feedback and experiences.
I See Reasoning (Y3, Y4, Y5, Y6, LKS2 and UKS2)	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\I See Resources	Turbo Maths/Lesson Resources - Great source of ready-to-use reasoning questions from across the curriculum which could be used for Turbo Maths questions or as extra rich resources within core lessons if needed.
Freckle	Y:\Teaching & Learning\Subjects\Mathematics\2022-23\Freckle - Star Maths	Targeted homework support – speak to NG if more details required.