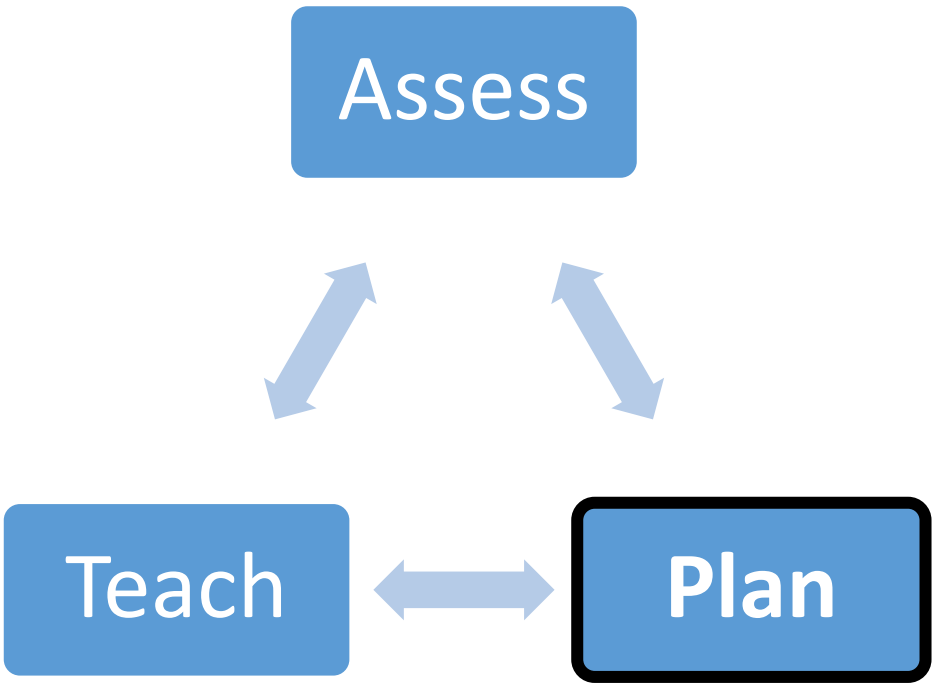
Birley Spa Primary Academy
A L.E.A.D. Academy



Maths Planning

A Guide for Staff

September 2022

Contents

1. Our vision for Maths at Birley Spa Primary Academy

Mathematics Intent

The 2014 National Curriculum for Maths aims to ensure that all children:

- Become fluent in the fundamentals of Mathematics.
- Are able to reason mathematically.
- Can solve problems by applying their Mathematics.

At Birley Spa Primary Academy, these skills are embedded within Maths lessons and developed consistently over time. We are committed to ensuring that children are able to recognise the importance of Maths in the wider world and that they are also able to use their mathematical skills and knowledge confidently in their lives in a range of different contexts. We want all children to enjoy Mathematics and to experience success in the subject, with the ability to reason mathematically. We are committed to developing children's curiosity about the subject, as well as an appreciation of the beauty and power of Maths.

Mathematics Implementation (including pedagogy)

Maths lessons can vary according to the needs of each group of children; however, many aspects of a maths lesson will be consistent throughout school. The usual lesson format is: Revisit/Anchor task, Teach, Practise, Apply, Review (Plenary). We have organised our curriculum so that topics are revisited regularly and pupils who find specific concepts more difficult to grasp will be given extra support during, before and/or after lessons as capacity allows. Those who demonstrate a secure knowledge will be encouraged to "get going" independently at the beginning of the lesson. We nurture positive attitudes by matching the task to the child. We feel that successful learning enables children to develop confidence to meet the challenge of new work. To ensure a coherent approach to pupils' learning, account is taken of what each individual already knows. We model ways to apply learning to everyday situations and help children to develop this skill.

EYFS:
In FS1, Maths is taught through small adult-led groups and within daily routines such as tidy up time and in continuous provision. In FS2, a daily adult led teaching input is planned and delivered to ensure the development of knowledge and understanding in mathematical thinking towards Early Learning Goals. This is informed by the LEAD EYFS Curriculum Assessment document. A discrete 10 minute session using NCETM's Mastering Number resources (see following paragraph) is taught for 10 minutes four times each week. The concepts are reinforced with the children who haven't grasped them. Children continually access Maths provision, not only in taught sessions but through continuous provision, daily routines and games.
Across EYFS, teachers are following NCETM's Mastery Number Project, which is a large-scale nationwide programme that is designed to help children embed good number sense, including fluency and flexibility with number facts. As part of this, teachers deliver a daily session of 10 to 15 minutes in addition to their daily maths lessons. Resources, including lesson plans, visual resources and practical equipment (Rekenreks) are provided by the NCETM. In this project, attention is given to key knowledge and understanding needed in Reception classes, and progression through KS1 to support success in the future.
In FS2, there should be at least one direct teaching session observation or recorded mathematical learning. The observations should include a comment about what the child was learning, direct speech from the child and how the learning was extended or moved on. When recording is appropriate, either independent or adult-led, children will complete their learning on a piece of paper which will then have a slip with the short date, learning objective and success criteria attached onto it. The paper will be trimmed neatly and stuck into the child's Maths Learning Journal. Observations of mathematical learning in FS1 will be collected on Tapestry.

In EYFS, we use a mastery approach to teach Maths. We give all children lots of opportunities to experience and develop the 5 big ideas of mastery- coherence, variation, mathematical thinking, representation and structure and fluency. We use the NCETM learning trajectories to help us to plan lessons to ensure that teaching follows small steps which are progressive (coherence). We expose children to the same mathematical skills in lots of different ways (variation) such as different activities in provision, through daily routines and through songs and games. Children are given lots of opportunities throughout the day to consolidate and master their learning independently. Open-ended challenges are set for all children to allow them to investigate mathematical areas and develop their mathematical thinking. We believe that it is important to encourage children to progress at the same stage in order to prevent gaps in knowledge forming and so all children are taught the same mathematical skill, by offering extra support/an extension for number novices and number experts. Interventions are also planned and delivered to number novices to close gaps of previous ages and stages which have already developed. In EYFS, all practical Maths learning will be recorded as an observation on Tapestry.
In EYFS, all children are taught and exposed to fluency and reasoning. In EYFS, fluency means that children are efficient; and can choose the most efficient strategy, they are accurate; they know some things about number facts such as two numbers that make 5 or two numbers that make 8, and they are flexible; they are able to solve problems and realise there's more than one way. We also model and encourage all children regardless of whether they are a number novice or a number expert to explain their reasoning using stem sentences and give them lots of opportunities to do this.
In FS1 and FS2, medium term planning (MTP) is completed following the agreed EYFS template including links to Early Learning Goals and an outline of planned learning and enhancements. Short term planning (STP) will be completed weekly. This will include planning for the adult led focus, opportunities in provision and the adult's role in provision.

Key Stage 1:

In KS1, maths lessons last around 1 hour. Due to the wide ranging abilities and number of children with our KS1 cohort this year, we are currently streaming the children during the 2022-23 academic year across 3 groups/sets. Flipcharts are used in terms of introducing the teaching and learning of maths in KS1. They include models, diagrams, visual learning to aid conceptual understanding and deeper learning/memory. However, not all maths is taught through the smartboard. Children carry out practical learning tasks at tables, whiteboard work and work collaboratively in groups (with CT and TAs). Focus teacher-led groups are an integral part of teaching and learning in KS1.

In KS1, children use maths books with cm squares. They have a slip of paper stuck in at the start of every maths lesson with the short date, learning objective and success criteria. Children are encouraged to write one digit per square and present their work neatly. Key resources should be trimmed neatly and stuck into books. An emphasis should be placed on children recording directly in their books wherever possible rather than completing worksheets.

Alongside EYFS, KS1 are following NCETM's Mastery Number Project (see EYFS section for more information).

Key Stage 2:

In KS2, daily maths lessons last for (at least) 1 hour. Maths lessons follow the agreed Teach – Practise – Apply model sequenced effectively through Active Inspire flipcharts. Flipcharts are an integral part of teaching and learning at KS2 and include models, diagrams, visual learning to aid conceptual understanding and deeper learning/memory. (Please see agreed Maths planning monitoring document).

In Y3, children follow a similar approach to KS1 in terms of the same type of maths book, slips stuck in at the start of the lesson. Children are expected to work independently for longer which should be reflected in terms of productivity/work produced every lesson. In Y4, this is the same as above, except children write the date and

learning objective independently (where possible). In Y5 and Y6, children use smaller squares. A greater emphasis is placed on working independently and high expectations in regard to presentation (one digit per square, underlining, sticking in resources etc) are expected of all children.

In KS2, children complete a daily multiplication check to ensure that they can learn and retain key multiplication facts. These results are tracked by class teachers on a weekly basis. Children move onto the next times table after getting full marks for three consecutive weeks and they are completed in this order: x2, x5, x10, x3, x4, x8, x11, x6, x9, x12 and x7. In addition, TT Rockstars is a key maths initiative used from Year 2. TT Rockstars should be introduced in Y2 in-line with NC expectations (x2, x5, x10). In Y3, children to consolidate x2, x5, x10 and TT Rockstars used to support the teaching and learning of x3, x4 and x8. In Y3, children to consolidate x2, x5, x10, x3, x4, x8 and TT Rockstars to support the teaching and learning of x6, x7, x8, x9, x11, x12. In Y5 and Y6, TT Rockstars to consolidate/revisit all times tables to ensure children have quick recall (including variation.) Both Year 4 and Year 5 are following a comprehensive MTC programme to enable children to have quick and accurate recall of tables.

All children from Y1-Y6 have access to Mathletics (which is a successful and engaging online Maths learning platform). Mathletics will be used in lessons to provide additional challenges, as a key intervention resource and for homework tasks.

Across KS1 and KS2, MTP and STP follow the agreed templates. MTP includes the clear identification/blocking in of units including the lesson-by-lesson overview: Lesson number, Objective, Key idea (Small steps), Representation, Technical vocabulary and Resources. STP (usually flipchart or PowerPoint-based) includes a one-page teaching overview at the start of every flipchart/PowerPoint with the following overview: Learning objective, Success Criteria, Possible misconceptions/key questions, Teaching (Re-visit/Anchor task – Teach – Practise – Apply – Plenary). The clear STP overview at the start of every maths flipchart is given to TAs prior to the teaching of the lesson (in addition to a copy of the MTP for the next unit).

Mathematics pedagogy

1. Key principles of Mathematics lessons at Birley Spa:

At Birley Spa Primary Academy, we base mathematics on several key principles. These are:

- Lessons should inspire children to want to ask questions and to discover for themselves.
- Lessons are created to develop fluent thinkers who can spot more than one way to solve a problem and can critique their own and others' choices.
- High quality questioning is used the whole class and/or groups in order to challenge children's thinking at all levels.
- Partner talk is used so that children are expected to explain their thinking to their peers.
- Effective, clear teacher modelling gradually helps to guide children towards independence.
- Developing maths skills across the curriculum, for example creating and interpreting graphs in science, working with temperatures in geography and using number lines in history. Furthermore, Maths taught in context where possible and real-life opportunities made the most of in order that children can apply the maths in a real-life context.
- A focus on drawing attention to misconceptions, including 'true or false?' 'always, sometimes, never?' 'odd one out' discussions, teachers incorrectly modelling, children 'marking' work in order to identify whether it is correct. This list is by no means exhaustive.

When you walk into a Mathematics lesson at Birley Spa Primary Academy, you can expect to see the class working together on the same topic, whilst at the same time addressing the need for all pupils to master the

curriculum and for some to gain greater depth of proficiency and understanding. Challenge is provided by going deeper rather than accelerating into new mathematical content. Teaching is focused, rigorous and thorough, to ensure that learning is sufficiently embedded and sustainable over time. Long-term gaps in learning are prevented through pre teaching, effective, speedy teacher intervention and effective home learning. More time is spent on teaching topics to allow for the development of depth and sufficient practice to embed learning. Carefully crafted lesson design through the use of Active Inspire flipcharts/PowerPoints provides a scaffolded, conceptual journey through the Mathematics, engaging pupils in reasoning and the development of mathematical thinking. Teachers incorporate the following elements into every maths lesson:

- Teach
- Practice
- Apply (using Reasoning and Problem solving/Depth)

In this way, every child is given the opportunity to practice the new skill learnt and is presented with routine and non-routine problems to solve. Every lesson, children are given the opportunity to attempt a deeper learning challenge (when ready) and to present verbal and written explanations.

2. <u>The Mastery Approach:</u>

As a school, we use a 'mastery approach' towards mathematics teaching. Supported by the NCETM – Developing Mastery in Mathematics Document (2014), we ensure that:

- Teachers reinforce an expectation that all pupils are capable of achieving high standards in mathematics.
- The large majority of pupils progress through the curriculum content at the same pace. Differentiation is achieved by emphasising deep knowledge and through individual support and intervention.
- A small step approach that makes connections between each learning step, and also makes connections between other areas of the maths curriculum.
- Teaching is underpinned by methodical curriculum design and supported by carefully crafted lessons and resources to foster deep conceptual and procedural knowledge.
- Practice and consolidation play a central role. Carefully designed variation within this builds fluency and understanding of underlying mathematical concepts in tandem.

3. <u>Language in Mathematics:</u>

Teaching and learning the language of mathematics is key for success in Mathematics. The pupils' mathematical vocabulary is a crucial part of their language development and their mathematical proficiency. Throughout school, children are expected to answer in full sentences in order to demonstrate active listening and model accurate mathematical statements. We use our Mathematics Working Walls to highlight key vocabulary/SLAM (Speak Like A Mathematician) throughout school. Teachers use the 'sentence support documents' created by our Maths practitioner from LEAD academy to support their planning. These documents include sentence scaffolds, sentence generalisations (definitions) and sentence stems. These sentence supports progress within each topic from EYFS to Year 6.

4. <u>The use of Mathematics resources:</u>

The use of Mathematics resources is integral to the concrete – pictorial – abstract approach and thus planned into our learning and teaching (please refer to our Calculation Policy for EYFS, KS1, Lower KS2 and Upper KS2

which can be found on our website in the Curriculum/Maths area.) The CPA approach should be utilised to deepen the understanding of the concept and exposure the structures of the Maths.

We have a wide variety of good quality equipment and resources, both tangible and ICT based, to support our teaching and learning. These resources are used by our teachers and children in a number of ways including:

- Demonstrating or modelling an idea, an operation or method of calculation, e.g. a number line; place value cards; dienes; money or coins; measuring equipment for capacity, mass and length; bead strings; the interactive whiteboards and related software; 3D shapes and/or nets.
- Numicon and related resources and software; multilink cubes; clocks; protractors; dice; number and fractions' fans; individual whiteboards and pens; and 2D shapes and pattern blocks, amongst other things.
- Enabling children to use a calculation strategy or method that they couldn't do without help, by using any of the above or other resources as required; and
- Providing a context, where possible and linking it to the application and practise of calculation strategies and number skills.
- Resources within individual classes are accessible to all pupils who should be encouraged to be responsible for their use.

All resources (including larger items shared by the whole academy) are located in the Mathematics area (located in the Dining Hall). Mathematics related software (apps) is also available, which children can access by using individual iPads or laptops (Mathletics and TT Rockstars).

Impact

The impact of this curriculum design will lead to outstanding progress over time across key stages relative to a child's individual starting point and their progression of skills. Children will therefore be expected to leave Birley Spa reaching at least age-related expectations for Mathematics. Our Mathematics curriculum will also lead pupils to be enthusiastic Maths learners, evidenced in a range of ways, including pupil voice and their work.

The school has a supportive ethos and our approaches support the children in developing their collaborative and independent skills, as well as empathy and the need to recognise the achievement of others. Students can underperform in Mathematics because they think they cannot do it or are not naturally good at it. Our Maths teaching and learning programme addresses these preconceptions by ensuring that all children experience challenge and success in Mathematics by developing a growth mindset.

1. Formative assessment:

Children receive effective feedback through teacher assessment, both orally and through written feedback, and AfL is integral to the design of each lesson. The structure of the teaching sequence ensures that children know how to be successful in their independent work. Guided practice, which provides further preparation for children to be able to apply the skills, knowledge and strategies taught during the 'Apply' phase is a key opportunity for common misconceptions to be addressed within the teaching sequence. Furthermore, essential understanding within each 'small step' is reviewed and checked by the teacher and the children before progression to further depth.

At the end of the lesson, the children review their work and self and peer assessment are used consistently as outlined by the school's 'Feedback and marking policy'. Where possible, the children are encouraged to indicate how confident they feel about their learning and identify next steps.

At the start of each blocked unit of work, the children complete the carefully aligned White Rose Maths 'Pre-assessment'. The outcome of this is used by the teacher to plan the new unit of work and ensure that any identified gaps in understanding are addressed through the sequence of planned lessons. Short term assessment is a feature of each lesson. Observations and careful questioning enable teachers to adjust lessons and brief other adults in the class if necessary. The lesson planning and structure at Birley Spa Primary Academy is designed to support this process and the Plenary task at the end of each lesson also allows for any further misconceptions to be addressed.

2. Summative Assessment:

Teachers administer a termly NFER arithmetic paper and reasoning and problem-solving paper which specifically links to the coverage for that term. The results of these papers are analysed through QLA (Question Level Analysis) and used to identify children's ongoing target areas, which are communicated to the children, as well as to parents and carers at Parent's Evening. In Year 2 and Year 6, past SATs papers are administered every half term. The results of these papers are analysed through QLA as well in order to identify gaps in children's knowledge and confidence. These assessments are also used alongside the end of unit assessments and outcomes of work and teacher judgement to inform the whole school tracking of attainment and progress of each child.

Assessment data in maths is reviewed throughout the year to inform interventions and to also ensure that provision remains well-informed to enable optimum progress and achievement. End of year data is used to measure the extent to which attainment gaps for individuals and identified groups of learners are being closed. This data is used to inform whole school and subject development priorities for the next school year.

2. The Planning Process

Planning for learning is part of the assess-plan-teach cycle.

Planning is informed by the National Curriculum and/or Year Group Milestones/Concept Progression objectives for each subject.

There is a **Long Term plan** that outlines units of work for each Year Group for each term. The **long term plan** follows the **scheme of work** for that year group.

Medium Term plans outline the learning objectives, small steps and representations for each term for each Year Group. Teachers should draw from the **scheme of work, sentence support documents, key misconceptions documents and calculation policy** when completing their MTP.

Short term plans outline the support and challenge for individuals/groups of children adapting the MTP for the needs of the class. It is important that differentiation doesn't cap the learning of any groups of learners. This is best achieved by having differentiated success criteria enabling all children to achieve and also to challenge themselves.

Short term planning should be in the format of a flipchart on Active Inspire and an overview of the planning at the front of each flipchart.

All teachers have the responsibility to check through and **adapt** any Medium-Term Planning and Short-Term Planning to match the needs of their class.

3. Planning expectations

i) Long Term Planning & Scheme of Work

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Year 6 Mathematics Planning Overview: 2021-22

Week	Autumn 1:	Autumn 2:	Spring 1:	Spring 2:	Summer 1:	Summer 2:
1	Number: Place value	Number: Properties of number	Calculation recap (2 days) / Geometry (3 days)	Calculation recap (2 days) / Fractions, Decimals & Percentages (3 days)	Measurement	Post SATs Maths
2	Number: Place value	Fractions, Decimals & Percentages	Geometry	Fractions, Decimals & Percentages	Statistics 1	Post SATs Maths
3	Number: Place value	Fractions, Decimals & Percentages	Position 1	Algebra	KS2 National Test Preparation	Post SATs Maths
4	Calculation	Fractions, Decimals & Percentages	Fractions, Decimals & Percentages	Measurement	KS2 National Test Week	Post SATs Maths
5	Calculation	Fractions, Decimals & Percentages	Mocks (2018 Paper)	Mocks (2019 Paper)	Post SATs Maths	Post SATs Maths
6	Calculation	Mocks (2017 Paper)	Fractions, Decimals & Percentages	Measurement	Post SATs Maths	Post SATs Maths
7	Mocks (2016 Paper)	Geometry				Post SATs Maths
8	Calculation					

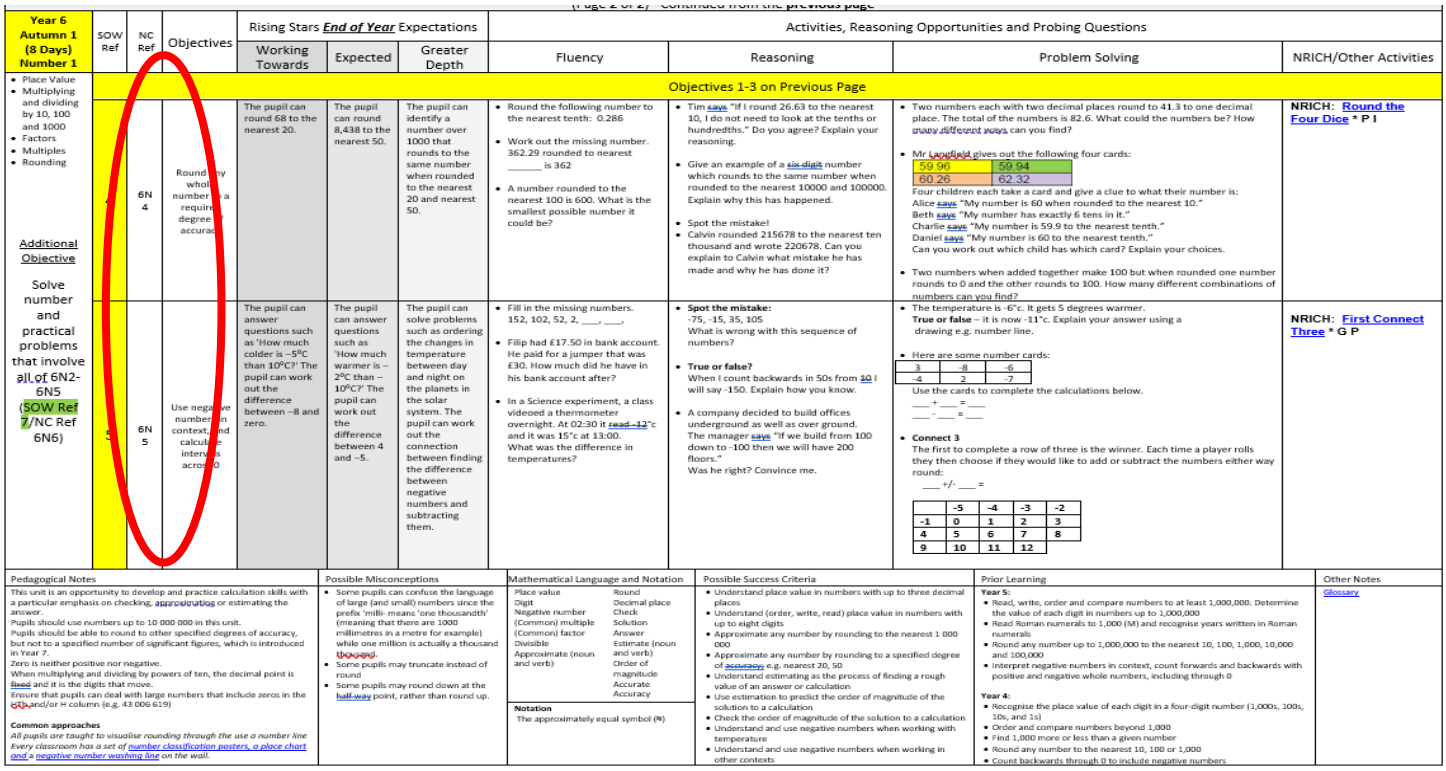
The scheme of work overview should be used to inform the long-term planning (LTP). Teachers can use this week-by-week breakdown in their LTP. **Please note that this year, KS1 are using the recent 3.0. White Rose LTPs so that their curriculum is aligned more closely together due to the Y1, Y1/2 and Y2 class structure.**

Within the Scheme of Work (SoW), teachers should use the objective breakdown below the overview to identify the National Curriculum objectives covered in each half term.

(Page 1 of 2) - Continued on the next page

Year 6 Autumn 1 (8 Days) Number 1	SOW Ref	NC Ref	Objectives	Rising Stars *End of Year* Expectations: Working Towards	Expected	Greater Depth	Activities, Reasoning Opportunities and Probing Questions: Fluency	Reasoning	Problem Solving	NRICH/Other Activities
• Place Value • Multiplying and dividing by 10, 100 and 1000 • Factors • Multiples • Rounding Additional Objective Solve number and practical problems that involve all of 6N2-6N5 (SOW Ref 7/NC Ref 6N6)	1	6N 2	Read, write, order and compare numbers up to 10,000,000	The pupil can read and write numbers to ten million that are multiples of 100. The pupil can choose the smaller number out of 800,000 and 8,000,000.	The pupil can form a number with up to seven digit cards and write it in words. The pupil can place the correct sign (=, < and >) in statements such as between 8,282,828 and 28,282,828.	The pupil can relate megabytes, gigabytes and terabytes and express each in terms of the others. The pupil can solve problems involving ordering the distances in light years to stars and galaxies.	• Which is greater? Seventy six thousand, eight hundred and twenty six or 78626 • Write the following number in words: 23650118 • Put a number in the missing space below to make the sentence correct. 4_236460 > 46236460	• Put a number in the missing space below to make the sentence correct. 4_236460 > 46236460 Explain why it is true. • **Do, then explain** Show the value of the digit 6 in these numbers? 6787555 95467754 Explain how you know. • Put one number in each box so that the list of numbers is ordered largest to smallest.	• **Do, then explain** Find out the populations in five countries. Order the populations starting with the largest. Explain how you ordered the countries and their populations. • Miss Jones, the teacher has four cards. On each card is a number: 42350, 43685, 56995, 56943. She gives one card to each pupil. They each look at them and say a clue. Alfie says, "My number is 57000 when rounded to the nearest 10." Ben says "My number has exactly 3 hundreds in it." Caleb says "My number is 44000 when rounded to the nearest thousand". Patrick says "My number is exactly 100 less than 57043." Can you solve who had which card and explain how you know this? • Claire is given the calculation below to estimate an answer to 1912 + 1888 Claire says "I will just double 1900 which is 3800". Why has Claire done that? Would you do anything differently?	• NRICH
	2	6N 3	Determine the value of each digit in numbers up to 10,000,000							
	3	6F 9a	Identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places	The pupil can identify the 7 in 5.78 as meaning seven-tenths. The pupil can calculate 5 x 10 = 50 and 34 x 100 = 3400 and, with prompting, work out 7 ÷ 10 = 0.7.	The pupil can identify the 7 in 9.587 as meaning seven-thousandths. The pupil can calculate 23 ÷ 100 = 0.23, and 306 ÷ 1000 = 0.306.	The pupil can identify the 7 in 6.578 as meaning seven-hundredths or 70-thousandths. The pupil can extend their understanding of multiplying and dividing whole numbers by 10, 100 and 1000 to calculating 5.8 ÷ 100 = 0.058 and 4.402 x 100 = 440.2.	• What is the value of the underlined digit in the following numbers? 3.42 4.562 34.621 54.36 • Fill in the table (X10, X100, X1000: 0.1; 3.42; 5.36; 1.872) • Find the value of the Δ in each statement 0.5 x Δ = 500; 367.2 ÷ 100 = Δ; 8.4 ÷ Δ = 0.084	• Ali says, "To multiply by 100, you should add two zeros." Do you agree with Ali? Explain your thinking. • True or False? In all of the numbers below, the digit 6 is worth more than 6 hundredths. 3.6 3.063 3.006 6.23 7.761 If it is false, can you change some of the numbers so it is true? • Kayleigh says; *"The more decimal places a number has, the smaller the number is."* Do you agree? Explain why.	• Four children are thinking of four different numbers. 3.454, 4.445, 4.345, 3.54. Yvonne: *"My number has four hundredths."* Alex: *"My number has the same amount of ones, tenths and hundredths."* Louise: *"My number has more tenths and hundredths than ones."* Emily: *"My number has 2 decimal places."* Can you match each number to the correct child?	• KM: Use Powers of ten to demonstrate connections

Objectives 4 and 5 continued on the next page



Year 6 Autumn 1 (8 Days) Number 1	SOW Ref	NC Ref	Objectives	Rising Stars *End of Year* Expectations: Working Towards	Expected	Greater Depth	Activities, Reasoning Opportunities and Probing Questions: Fluency	Reasoning	Problem Solving	NRICH/Other Activities
• Place Value • Multiplying and dividing by 10, 100 and 1000 • Factors • Multiples • Rounding							Objectives 1-3 on Previous Page			
Additional Objective Solve number and practical problems that involve all of 6N2-6N5 (SOW Ref 7/NC Ref 6N6)	4	6N 4	Round any whole number to a required degree of accuracy	The pupil can round 68 to the nearest 20.	The pupil can round 8,438 to the nearest 50.	The pupil can identify a number over 1000 that rounds to the same number when rounded to the nearest 20 and nearest 50.	• Round the following number to the nearest tenth: 0.286 • Work out the missing number. 362.29 rounded to nearest _____ is 362 • A number rounded to the nearest 100 is 600. What is the smallest possible number it could be?	• Tim says "If I round 26.63 to the nearest 10, I do not need to look at the tenths or hundredths." Do you agree? Explain your reasoning. • Give an example of a six-digit number which rounds to the same number when rounded to the nearest 10000 and 100000. Explain why this has happened. • Spot the mistake! • Calvin rounded 215678 to the nearest ten thousand and wrote 220678. Can you explain to Calvin what mistake he has made and why he has done it?	• Two numbers each with two decimal places round to 41.3 to one decimal place. The total of the numbers is 82.6. What could the numbers be? How many different ways can you find? • Mr Langfield gives out the following four cards: 59.96 | 59.94 60.26 | 62.32 Four children each take a card and give a clue to what their number is: Alice says "My number is 60 when rounded to the nearest 10." Beth says "My number has exactly 6 tens in it." Charlie says "My number is 59.9 to the nearest tenth." Daniel says "My number is 60 to the nearest tenth." Can you work out which child has which card? Explain your choices. • Two numbers when added together make 100 but when rounded one number rounds to 0 and the other rounds to 100. How many different combinations of numbers can you find?	NRICH: Round the Four Dice * P I
	5	6N 5	Use negative numbers in context, and calculate intervals across 0	The pupil can answer questions such as 'How much colder is –5°C than 10°C?' The pupil can work out the difference between –8 and zero.	The pupil can answer questions such as 'How much warmer is –2°C than –10°C?' The pupil can work out the difference between 4 and –5.	The pupil can solve problems such as ordering the changes in temperature between day and night on the planets in the solar system. The pupil can work out the connection between finding the difference between negative numbers and subtracting them.	• Fill in the missing numbers. 152, 102, 52, 2, ___, ___, • Filip had £17.50 in bank account. He paid for a jumper that was £30. How much did he have in his bank account after? • In a Science experiment, a class videoed a thermometer overnight. At 02:30 it read -12°c and it was 15°c at 13:00. What was the difference in temperatures?	• **Spot the mistake:** -75, -15, 35, 105 What is wrong with this sequence of numbers? • **True or false?** When I count backwards in 50s from 10 I will say -150. Explain how you know. • A company decided to build offices underground as well as over ground. The manager says "If we build from 100 down to -100 then we will have 200 floors." Was he right? Convince me.	• The temperature is -6°c. It gets 5 degrees warmer. **True or false** – it is now -11°c. Explain your answer using a drawing e.g. number line. • Here are some number cards: 3 | -8 | -6 -4 | 2 | -7 Use the cards to complete the calculations below. ___ + ___ = ___ ___ - ___ = ___ • **Connect 3** The first to complete a row of three is the winner. Each time a player rolls they then choose if they would like to add or subtract the numbers either way round: ___ +/- ___ = -5 | -4 | -3 | -2 -1 | 0 | 1 | 2 | 3 4 | 5 | 6 | 7 | 8 9 | 10 | 11 | 12	NRICH: First Connect Three * G P

Pedagogical Notes

This unit is an opportunity to develop and practice calculation skills with a particular emphasis on checking, approximating or estimating the answer.
Pupils should use numbers up to 10 000 000 in this unit.
Pupils should be able to round to other specified degrees of accuracy, but not to a specified number of significant figures, which is introduced in Year 7.
Zero is neither positive nor negative.
When multiplying and dividing by powers of ten, the decimal point is fixed and it is the digits that move.
Ensure that pupils can deal with large numbers that include zeros in the ~~CT~~ and/or H column (e.g. 43 006 619)

Common approaches

All pupils are taught to visualise rounding through the use a number line Every classroom has a set of number classification posters, a place chart and a negative number washing line on the wall.

Possible Misconceptions

- Some pupils can confuse the language of large (and small) numbers since the prefix 'milli- means 'one thousandth' (meaning that there are 1000 millimetres in a metre for example) while one million is actually a thousand thousand.
- Some pupils may truncate instead of round
- Some pupils may round down at the half-way point, rather than round up.

Mathematical Language and Notation

Place value, Digit, Negative number, (Common) multiple, (Common) factor, Divisible, Approximate (noun and verb), Round, Decimal place, Check, Solution, Answer, Estimate (noun and verb), Order of magnitude, Accurate, Accuracy

Notation
The approximately equal symbol (≈)

Possible Success Criteria

- Understand place value in numbers with up to three decimal places
- Understand (order, write, read) place value in numbers with up to eight digits
- Approximate any number by rounding to the nearest 1 000 000
- Approximate any number by rounding to a specified degree of accuracy, e.g. nearest 20, 50
- Understand estimating as the process of finding a rough value of an answer or calculation
- Use estimation to predict the order of magnitude of the solution to a calculation
- Check the order of magnitude of the solution to a calculation
- Understand and use negative numbers when working with temperature
- Understand and use negative numbers when working in other contexts

Prior Learning

Year 5:
- Read, write, order and compare numbers to at least 1,000,000. Determine the value of each digit in numbers up to 1,000,000
- Read Roman numerals to 1,000 (M) and recognise years written in Roman numerals
- Round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000
- Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through 0

Year 4:
- Recognise the place value of each digit in a four-digit number (1,000s, 100s, 10s, and 1s)
- Order and compare numbers beyond 1,000
- Find 1,000 more or less than a given number
- Round any number to the nearest 10, 100 or 1,000
- Count backwards through 0 to include negative numbers

Other Notes

Glossary

In addition to the Scheme of Work, teachers should refer to the Progression Maps for each unit of Maths. In this document, teachers can identify the progression that should be made throughout the year. In addition, this can be used to plug any gaps in pupils' knowledge which may have developed. These progression maps were put together from the NCETM progression maps and the NCETM Ready-to-progress criteria. Over the course of this academic year, we will look to further implement the new White Rose 3.0 planning materials and additional training will be provided in regards to using these resources.

COMPOSITION/ NUMBER BONDS								
Pre FS1	FS1	FS2	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		Have a deep understanding of numbers to 10- explore the composition of numbers to 10 automatically recall number bonds up to 5 (including subtraction facts) recall some number bonds to 10, including doubling facts explore and represent patterns within numbers up to 10	represent and use number bonds and related subtraction facts within 20 Compose numbers to 10 from 2 parts, and partition numbers to 10 into parts, including recognising odd and even numbers.	recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 recognise the place value of each digit in two-digit numbers, and compose and decompose two-digit numbers using standard and nonstandard partitioning	Know that 10 tens are equivalent to 1 hundred, and that 100 is 10 times the size of 10; apply this to identify and work out how many 10s there are in other three-digit multiples of 10 calculate complements to 100 compose and decompose three-digit numbers using standard and non-standard partitioning	Know that 10 hundreds are equivalent to 1 thousand, and that 1,000 is 10 times the size of 100; apply this to identify and work out how many 100s there are in other four-digit multiples of 100 compose and decompose four-digit numbers using standard and non-standard partitioning	Know that 10 tenths are equivalent to 1 one, and that 1 is 10 times the size of 0.1. Know that 100 hundredths are equivalent to 1 one, and that 1 is 100 times the size of 0.01. Know that 10 hundredths are equivalent to 1 tenth, and that 0.1 is 10 times the size of 0.01 compose and decompose numbers with up to 2 decimal places using standard and non-standard partitioning	Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000) compose and decompose numbers up to 10 million using standard and non-standard partitioning

Example of a Long-Term Plan (Year 6):

	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
Mathematics	**Number: Place value** Read, write, order and compare numbers up to 10,000,000 Determine the value of each digit in numbers up to 10,000,000 Identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places Round any whole number to a required degree of accuracy Use negative numbers in context, and calculate intervals across 0 **Calculation:** Use their knowledge of the order of operations to carry out calculations involving the 4 operations Perform mental calculations,	**Number: Properties of number** Identify common factors, common multiples and prime numbers **Fractions, Decimals & Percentages** Use common factors to simplify fractions; use common multiples to express fractions in the same denomination Compare and order fractions, including fractions >1 Generate and describe linear number sequences (with fractions) Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, 3/8]	**Calculation recap** **Geometry** Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius Describe simple 3-D shapes Recognise and build simple 3-D shapes, including making nets **Fractions, Decimals & Percentages** Solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison **Mocks (2018 Paper)** **Fractions, Decimals & Percentages** Solve problems involving unequal	**Calculation recap** **Fractions, Decimals & Percentages** Solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division **Fractions, Decimals & Percentages** Solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division **Algebra** Use simple formulae Express missing number problems algebraically Enumerate possibilities of combinations of 2 variables Find pairs of numbers that satisfy an equation with 2 unknowns **Measurement**	**Measurement** Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3 decimal places Convert between miles and kilometres Solve problems involving the calculation and conversion of units of measure, using decimal notation up to 3 decimal places where appropriate **Statistics** Interpret and construct pie charts and line graphs and use these to solve problems Calculate and interpret the mean as an average	**Post SATs work**

ii) Medium Term Planning

Birley Spa Primary Academy
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Curriculum Medium Term Planning 2020-2021

Year Group:	**Term:**	**Topic key question:**			**Subject:** Maths
SEN children:	**PP/Ever 6:**	**EAL:**	**Other potential barriers to learning:**	**TA: (If applicable)**	**Cross curricular links:**

AFL opportunities: (Are pupil groups fluid? Is teaching reactive to move pupils on in their learning during lessons?)
Fluid Grouping, Anchor Task, questioning during input
Verbal feedback during independent work
TA intervention group as necessary

Lesson number	**Objective**	**Key idea**	**Representation**	**Technical vocabulary**	**Resources**
1					
2					
3					
4					
5					

Pre-assessment

Before each new unit of work, teachers should plan in a pre-assessment task. This should take no longer than 20 minutes and should not take a whole lesson. Helpful pre-assessment sources can be found on White Rose (end of unit assessment) or you can develop your own to match your specific learning outcomes. **All pre-assessments should be completed at the end of the previous week before you start your new unit of work. For example, if you are starting a new Addition and Subtraction unit of work on Autumn 1, Week 4 then the pre-assessment should be completed at the end of Autumn 1, Week 3. This provides teachers with enough time to mark and then adapt future teaching and learning (based on the outcomes of the pre-assessment).**

Objective

Teachers should start by mapping out the main learning objectives into the 'Objective' column. These will come from Long-Term Planning/Scheme of Work/Progression Maps. The learning objectives in the SoW may take more than one lesson and teachers should avoid rushing through the objectives. For example, in Year 6, there are five National Curriculum objectives in Calculation in Autumn 1, but there are twelve days mapped out in the Scheme of Work to cover them. Therefore, careful thought should be put in when planning out these objectives to enable depth in this coverage. However, the objectives in the SoW are not necessarily in the order that they should be taught. Therefore, teachers should use their judgement to arrange the objectives themselves. In addition, the Progress Maps should be utilised effectively here to ensure that the 'Ready-to-progress' criteria from NCETM are also covered.

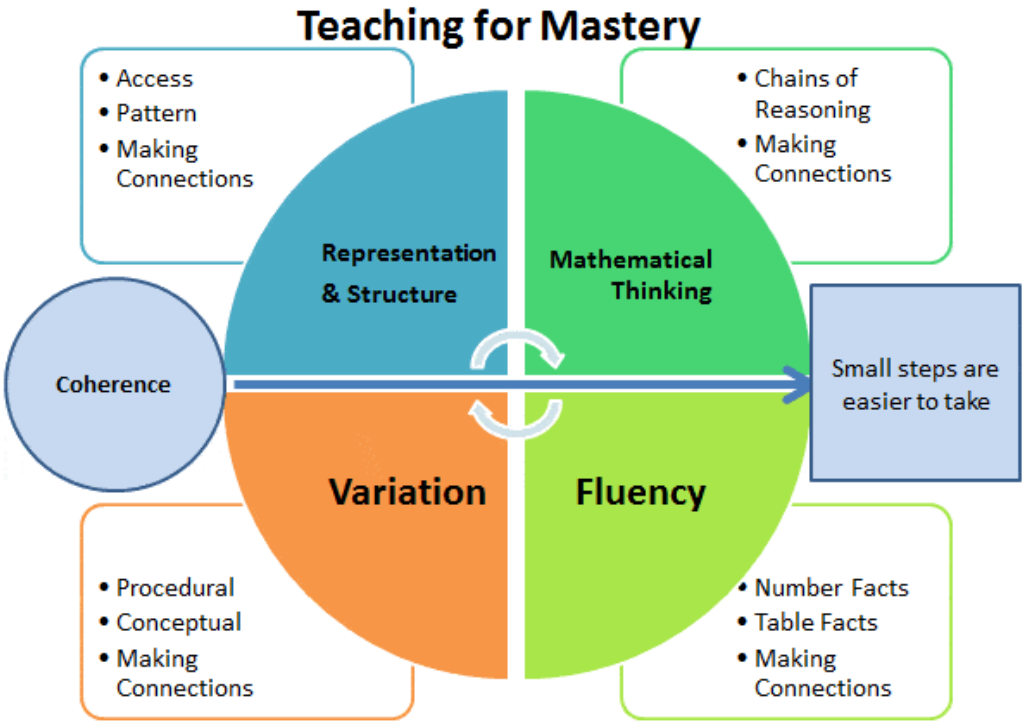
(Page 1 of 2) - Continued on the next page

Year 6 Autumn 1 (8 Days) Number 1	SOW Ref	NC Ref	Objectives	Rising Stars *End of Year* Expectations: Working Towards	Expected	Greater Depth	Activities, Reasoning Opportunities and Probing Questions: Fluency	Reasoning	Problem Solving	NRICH/Other Activities
• Place Value • Multiplying and dividing by 10, 100 and 1000 • Factors • Multiples • Rounding	1	6N 2	Read, write, order and compare numbers up to 10,000,000	The pupil can read and write numbers to ten million that are multiples of 100. The pupil can choose the smaller number out of 800,000 and 8,000,000.	The pupil can form a number with up to seven digit cards and write it in words. The pupil can place the correct sign (=, < and >) in statements such as between 8,282,828 and 28,282,828.	The pupil can relate megabytes, gigabytes and terabytes and express each in terms of the others. The pupil can solve problems involving ordering the distances in light years to stars and galaxies.	• Which is greater? Seventy six thousand, eight hundred and twenty six or 78626 • Write the following number in words: 23650118 • Put a number in the missing space below to make the sentence correct. 4_236460 > 46236460	• Put a number in the missing space below to make the sentence correct. 4_236460 > 46236460 Explain why it is true. • **Do, then explain** Show the value of the digit 6 in these numbers? 6787555 95467754 Explain how you know. • Put one number in each box so that the list of numbers is ordered largest to smallest.	• **Do, then explain** Find out the populations in five countries. Order the populations starting with the largest. Explain how you ordered the countries and their populations. • Miss Jones, the teacher has four cards. On each card is a number: 42350, 43685, 56995, 56943 She gives one card to each pupil. They each look at them and say a clue. Alfie says, "My number is 57000 when rounded to the nearest 10." Ben says "My number has exactly 3 hundreds in it." Caleb says "My number is 44000 when rounded to the nearest thousand". Patrick says "My number is exactly 100 less than 57043." Can you solve who had which card and explain how you know this? • Claire is given the calculation below to estimate an answer to 1912 + 1888 Claire says "I will just double 1900 which is 3800". Why has Claire done that? Would you do anything differently?	• NRICH
Additional Objective Solve number and practical problems that involve all of 6N2-6N5 (SOW Ref 7/NC Ref 6N6)	2	6N 3	Determine the value of each digit in numbers up to 10,000,000							
	3	6F 9a	Identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places	The pupil can identify the 7 in 5.78 as meaning seven-tenths. The pupil can calculate 5 x 10 = 50 and 34 x 100 = 3400 and, with prompting, work out 7 ÷ 10 = 0.7.	The pupil can identify the 7 in 9.587 as meaning seven-thousandths. The pupil can calculate 23 ÷ 100 = 0.23, and 306 ÷ 1000 = 0.306.	The pupil can identify the 7 in 6.578 as meaning seven-hundredths or 70-thousandths. The pupil can extend their understanding of multiplying and dividing whole numbers by 10, 100 and 1000 to calculating 5.8 ÷ 100 = 0.058 and 4.402 x 100 = 440.2.	• What is the value of the underlined digit in the following numbers? 3.42 4.562 34.621 54.36 • Fill in the table • Find the value of the Δ in each statement 0.5 x Δ = 500 367.2 ÷ 100 = Δ 8.4 ÷ Δ = 0.084	• Ali says, "To multiply by 100, you should add two zeros." Do you agree with Ali? Explain your thinking. • True or False? In all of the numbers below, the digit 6 is worth more than 6 hundredths. 3.6 3.063 3.006 6.23 7.761 If it is false, can you change some of the numbers so it is true? • Kayleigh says; *"The more decimal places a number has, the smaller the number is."* Do you agree? Explain why.	• Four children are thinking of four different numbers. 3.454 4.445 4.345 3.54 Yvonne: *"My number has four hundredths."* Alex: *"My number has the same amount of ones, tenths and hundredths."* Louise: *"My number has more tenths and hundredths than ones."* Emily: *"My number has 2 decimal places."* Can you match each number to the correct child?	• KM: Use Powers of ten to demonstrate connections.

Objectives 4 and 5 continued on the next page

Key Ideas (including SLAM and Misconceptions)

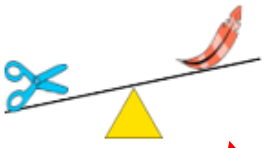
After mapping out the objectives, teachers should complete the 'Key Idea' column. In this column, teachers will bullet point the small steps within each lesson that will gradually build the pupils' understanding in order to meet the learning objective. Teachers should consider the 'Teaching for Mastery' cycle when planning these steps to ensure they have utilised variation throughout and enabled pupils to make connections.



In addition to the small steps, teachers should identify the SLAM that will be used throughout that lesson. The sentence support documents should be used when selecting SLAM sentences for a lesson. The selected sentence scaffold or generalisations may be carried over and practised through more than one lesson.

Number, Addition and Subtraction

Click on any subheading within the document to return to the contents.

Key generalisation		
Addend + addend = sum. **Sum = addend + addend.**	Generalisation	
Minuend - subtrahend = difference. **Difference = minuend - subtrahend.**	Generalisation	
Comparison of quantities and measures		
The ___ is **heavier** than the ___. The ___ is **lighter** than the ___.	Scaffold	 The elephant is heavier than the mouse. The mouse is lighter than the elephant.  The scissors are heavier than the feather The feather is lighter than the scissors.

Sentence support

Type of sentence support

Examples

At the top of each sentence support document, there are hyperlinks to the appropriate topic you are covering. Underneath that, there are key generalisations and language that should be used throughout school.

Within the 'Key Ideas' box on the Medium-Term Plan, teachers should also include one (maximum two) misconception that will be unpicked within the lesson. When including these misconceptions, teachers should use the 'Key Maths Misconceptions' document that is appropriate to their year group.

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Key Maths Misconceptions: YEAR 6

Number Systems and Place Value

- Pupils may forget about the existence of ten thousands and hundred thousands prior to a million.
- They may also then think that the next place from 1 million is a billion.
- Children struggle to understand place value of decimals when expressed in numbers greater than 10. For example, they understand 2 tenths and 4 hundredths better than 24 hundredths.
- Children often see the size of a negative number rather than its sign – therefore, they may wrongly say that "-25 > -1)
- When rounding, some children look at the wrong column to decide whether to leave the stem as it is or to round up - they may also begin a chain of rounding from the end of the number, instead of simply looking at the next number after the required degree of accuracy.
- Children think that longer decimals are greater e.g. that 0.099 is bigger than 0.1, as they see the numbers 99 and 1.
- Children reduce multiplying and dividing by powers of 10 to adding and removing zeroes and hence struggle when decimals are involved.
- Pupils are often misled by the idea of 'rounding down', thinking this means that, for example, 0.72 will round to 0.6 and not 0.7 (to 1 decimal place).
- Children round from the end of the number, not just the adjacent number (so they end up with a chain of rounding)
- When rounding a large number, pupils forget to use 0s as placeholders to maintain the order of magnitude e.g. they round 456,879 to 457 to the nearest thousand rather than 457 000.
- Pupils confuse a visual pattern with the corresponding number sequence. They do not realise that there is more than one way to represent the same number sequence.
- Pupils sometimes do not produce a genuine pattern with objects or images that reflect the number sequence (they do not apply the same rule each time)

Within the document, teachers will find the unit of work and a bullet-pointed list of the key misconceptions that they will need to unpick throughout that unit. These misconceptions should be mapped out across lessons to ensure they are all covered. If other misconceptions come up within lessons, teachers may add these onto their MTP as they go.

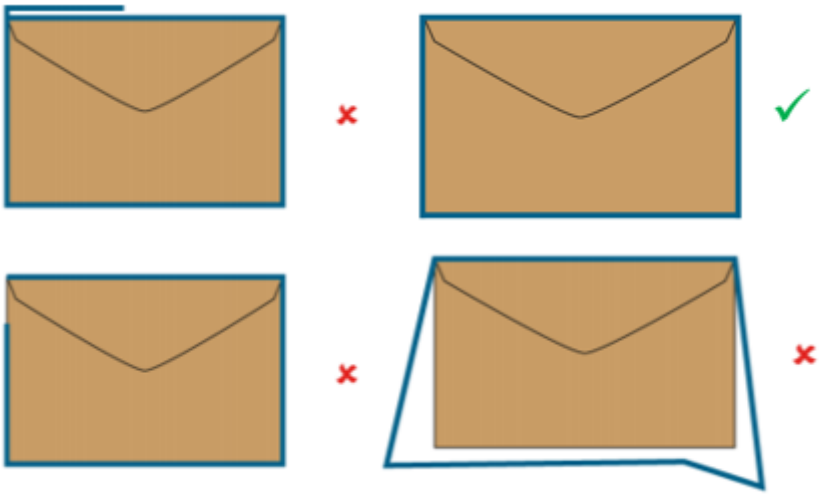
Representations

In this column, teachers should identify the way that they intend to represent the learning within that lesson e.g. place value grids, bar models, part-whole models, tens frame, dienes, etc.

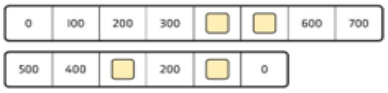
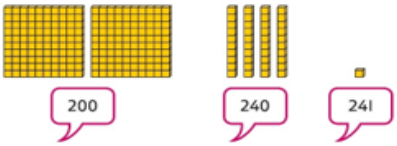
This column is not to be used as a space for questions that the children will complete; it should wholly include representations of the pupils' learning.

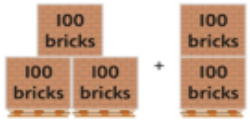
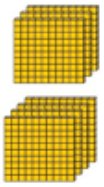
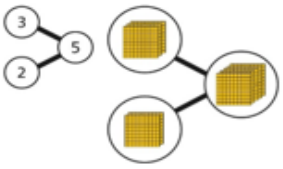
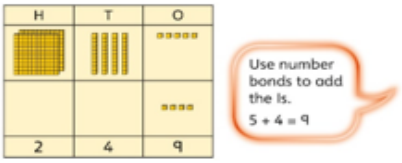
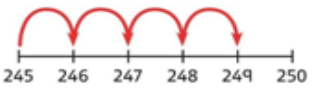
In this column, you may also identify a practical activity that pupils will complete. If it is something where there will be no written outcome in the books, make this clear in the MTP. The children in KS2 could write a reflection about what they did and what they learned.

Representations may include representations that will support in unpicking the misconceptions that you have identified in your 'key ideas' column e.g., when discussing perimeter, this representation may be useful in defining what a perimeter is:



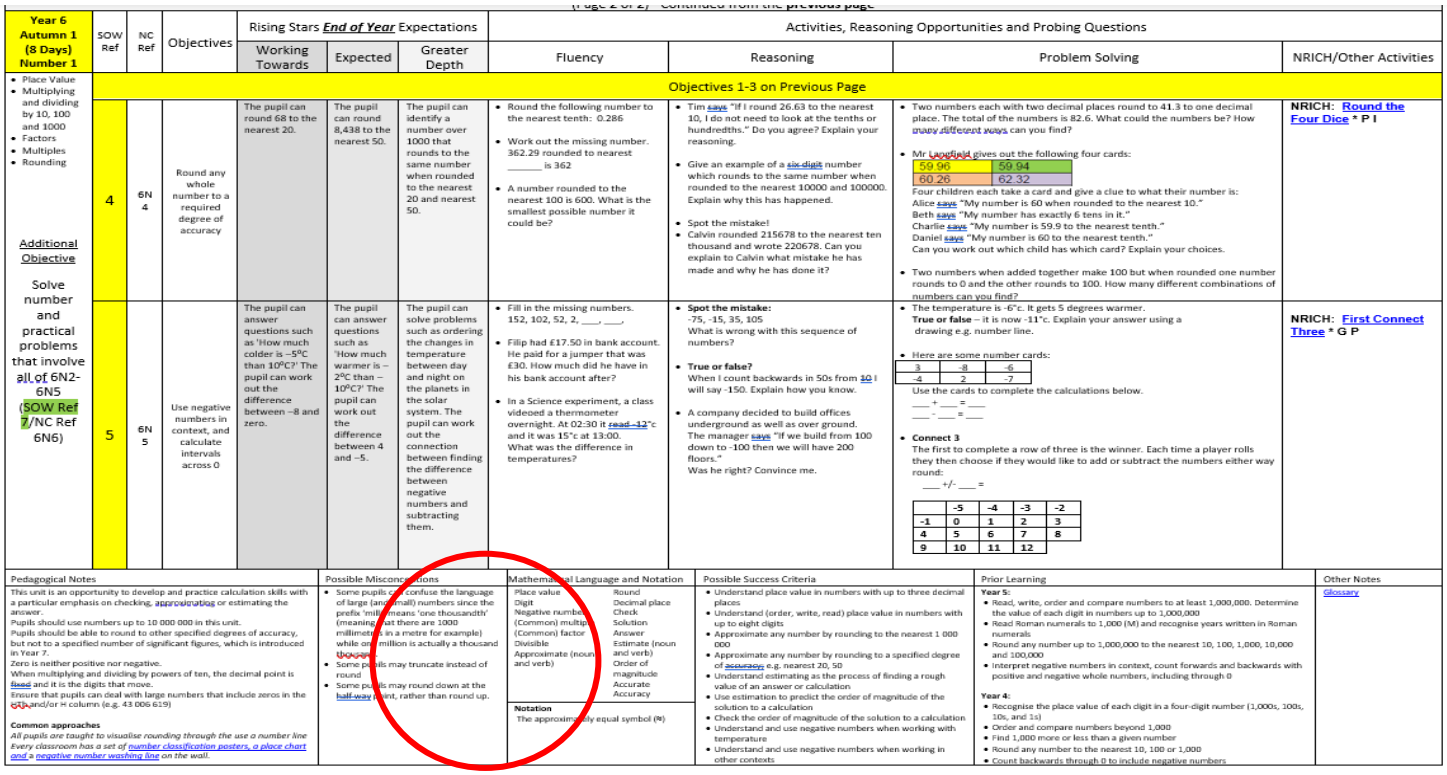
Teachers should also follow the Calculation Policy when completing their Medium-Term Planning. The calculation policy includes examples for the 'Concrete-Pictorial-Abstract' for each National Curriculum objective, broken down into small steps e.g.

Year 3			
	Concrete	**Pictorial**	**Abstract**
Year 3 Addition			
Understanding 100s	Understand the cardinality of 100, and the link with 10 tens. Use cubes to place into groups of 10 tens. 	Unitise 100 and count in steps of 100.  	Represent steps of 100 on a number line and a number track and count up to 1,000 and back to 0. 
Understanding place value to 1,000	Unitise 100s, 10s and 1s to build 3-digit numbers.  	Use equipment to represent numbers to 1,000.  Use a place value grid to support the structure of numbers to 1,000. Place value counters are used alongside other equipment. Children should understand how each counter represents a different unitised amount.	Represent the parts of numbers to 1,000 using a part-whole model.  *215 = 200 + 10 + 5* Recognise numbers to 1,000 represented on a number line, including those between intervals.

Adding 100s	Use known facts and unitising to add multiples of 100.  *3 + 2 = 5* *3 hundreds + 2 hundreds = 5 hundreds* *300 + 200 = 500*	Use known facts and unitising to add multiples of 100.  *3 + 4 = 7* *3 hundreds + 4 hundreds = 7 hundreds* *300 + 400 = 700*	Use known facts and unitising to add multiples of 100. Represent the addition on a number line. Use a part-whole model to support unitising.  *3 + 2 = 5* *300 + 200 = 500*
3-digit number + 1s, no exchange or bridging	Use number bonds to add the 1s.  *214 + 4 = ?* *Now there are 4 + 4 ones in total.* *4 + 4 = 8* *214 + 4 = 218*	Use number bonds to add the 1s.  *245 + 4* *5 + 4 = 9* *245 + 4 = 249*	Understand the link with counting on. *245 + 4*  Use number bonds to add the 1s and understand that this is more efficient and less prone to error. *245 + 4 = ?* *I will add the 1s.* *5 + 4 = 9* *So, 245 + 4 = 249*
3-digit number + 10s, no exchange	Calculate mentally by forming the number bond for the 10s.	Calculate mentally by forming the number bond for the 10s.	Calculate mentally by forming the number bond for the 10s.

Technical Vocabulary and Resources

In the final two columns, teachers should include the technical vocabulary and notation that they will be using throughout the lesson. This can be found on the Scheme of Work:



Year 6 Autumn 1 (8 Days) Number 1	SOW Ref	NC Ref	Objectives	Rising Stars *End of Year* Expectations: Working Towards	Expected	Greater Depth	Activities, Reasoning Opportunities and Probing Questions: Fluency	Reasoning	Problem Solving	NRICH/Other Activities
• Place Value • Multiplying and dividing by 10, 100 and 1000 • Factors • Multiples • Rounding	Objectives 1-3 on Previous Page									
Additional Objective Solve number and practical problems that involve all of 6N2-6N5 (SOW Ref 7/NC Ref 6N6)	4	6N 4	Round any whole number to a required degree of accuracy	The pupil can round 68 to the nearest 20.	The pupil can round 8,438 to the nearest 50.	The pupil can identify a number over 1000 that rounds to the same number when rounded to the nearest 20 and nearest 50.	• Round the following number to the nearest tenth: 0.286 • Work out the missing number. 362.29 rounded to nearest _____ is 362 • A number rounded to the nearest 100 is 600. What is the smallest possible number it could be?	• Tim says "If I round 26.63 to the nearest 10, I do not need to look at the tenths or hundredths." Do you agree? Explain your reasoning. • Give an example of a six-digit number which rounds to the same number when rounded to the nearest 10000 and 100000. Explain why this has happened. • Spot the mistake! • Calvin rounded 215678 to the nearest ten thousand and wrote 220678. Can you explain to Calvin what mistake he has made and why he has done it?	• Two numbers each with two decimal places round to 41.3 to one decimal place. The total of the numbers is 82.6. What could the numbers be? How many different ways can you find? • Mr Langfield gives out the following four cards: 59.96, 59.94, 60.26, 62.32 Four children each take a card and give a clue to what their number is: Alice says "My number is 60 when rounded to the nearest 10." Beth says "My number has exactly 6 tens in it." Charlie says "My number is 59.9 to the nearest tenth." Daniel says "My number is 60 to the nearest tenth." Can you work out which child has which card? Explain your choices. • Two numbers when added together make 100 but when rounded one number rounds to 0 and the other rounds to 100. How many different combinations of numbers can you find?	NRICH: Round the Four Dice * P I
	5	6N 5	Use negative numbers in context, and calculate intervals across 0	The pupil can answer questions such as 'How much colder is −5°C than 10°C?' The pupil can work out the difference between −8 and zero.	The pupil can answer questions such as 'How much warmer is −2°C than −10°C?' The pupil can work out the difference between 4 and −5.	The pupil can solve problems such as ordering the changes in temperature between day and night on the planets in the solar system. The pupil can work out the connection between finding the difference between negative numbers and subtracting them.	• Fill in the missing numbers. 152, 102, 52, 2, ___, ___ • Filip had £17.50 in bank account. He paid for a jumper that was £30. How much did he have in his bank account after? • In a Science experiment, a class videoed a thermometer overnight. At 02:30 it read -12°c and it was 15°c at 13:00. What was the difference in temperatures?	• **Spot the mistake:** -75, -15, 35, 105 What is wrong with this sequence of numbers? • **True or false?** When I count backwards in 50s from 10 I will say -150. Explain how you know. • A company decided to build offices underground as well as over ground. The manager says "If we build from 100 down to -100 then we will have 200 floors." Was he right? Convince me.	• The temperature is -6°c. It gets 5 degrees warmer. **True or false** – it is now -11°c. Explain your answer using a drawing e.g. number line. • Here are some number cards: 3, -8, -6, -4, 2, -7 Use the cards to complete the calculations below. ___ + ___ = ___ ___ - ___ = ___ • **Connect 3** The first to complete a row of three is the winner. Each time a player rolls they then choose if they would like to add or subtract the numbers either way round: ___ +/- ___ =	NRICH: First Connect Three * G P

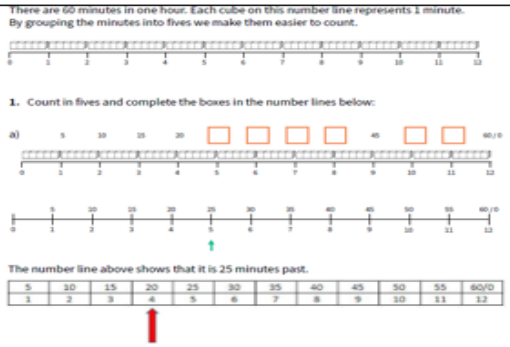
Pedagogical Notes	Possible Misconceptions	Mathematical Language and Notation	Possible Success Criteria	Prior Learning	Other Notes
This unit is an opportunity to develop and practice calculation skills with a particular emphasis on checking, approximating or estimating the answer. Pupils should use numbers up to 10 000 000 in this unit. Pupils should be able to round to other specified degrees of accuracy, but not to a specified number of significant figures, which is introduced in Year 7. Zero is neither positive nor negative. When multiplying and dividing by powers of ten, the decimal point is fixed and it is the digits that move. Ensure that pupils can deal with large numbers that include zeros in the TTh and/or H column (e.g. 43 006 619) **Common approaches** *All pupils are taught to visualise rounding through the use a number line* *Every classroom has a set of number classification posters, a place chart and a negative number washing line on the wall.*	• Some pupils can confuse the language of large (and small) numbers since the prefix 'milli' means 'one thousandth' (meaning that there are 1000 millimetres in a metre for example) while one million is actually a thousand thousand. • Some pupils may truncate instead of round • Some pupils may round down at the half-way point, rather than round up.	Place value Digit Negative number (Common) multiple (Common) factor Divisible Approximate (noun and verb) Round Decimal place Check Solution Answer Estimate (noun and verb) Order of magnitude Accurate Accuracy **Notation** The approximately equal symbol (≈)	• Understand place value in numbers with up to three decimal places • Understand (order, write, read) place value in numbers with up to eight digits • Approximate any number by rounding to the nearest 1 000 000 • Approximate any number by rounding to a specified degree of accuracy e.g. nearest 20, 50 • Understand estimating as the process of finding a rough value of an answer or calculation • Use estimation to predict the order of magnitude of the solution to a calculation • Check the order of magnitude of the solution to a calculation • Understand and use negative numbers when working with temperature • Understand and use negative numbers when working in other contexts	**Year 5:** • Read, write, order and compare numbers to at least 1,000,000. Determine the value of each digit in numbers up to 1,000,000 • Read Roman numerals to 1,000 (M) and recognise years written in Roman numerals • Round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000 • Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through 0 **Year 4:** • Recognise the place value of each digit in a four-digit number (1,000s, 100s, 10s, and 1s) • Order and compare numbers beyond 1,000 • Find 1,000 more or less than a given number • Round any number to the nearest 10, 100 or 1,000 • Count backwards through 0 to include negative numbers	Glossary

and in the calculation policy:

LOWER KEY STAGE 2		
In Years 3 and 4, children develop the basis of written methods by building their skills alongside a deep understanding of place value. They should use known addition/subtraction and multiplication/division facts to calculate efficiently and accurately, rather than relying on counting. Children use place value equipment to support their understanding, but not as a substitute for thinking. They should be exposed to a variety of strategies, including non- efficient strategies, in order to have the experience of critiquing methods and making informed decisions about the ones they choose to use. They should be able to make connections between the different methods.		
Key language: partition, place value, tens, hundreds, thousands, column method, whole, part, equal groups, sharing, grouping, bar model		
Addition and subtraction: In Year 3 especially, the column methods are built up gradually. Children will develop their understanding of how each stage of the calculation, including any exchanges, relates to place value. The example calculations chosen to introduce the stages of each method may often be more suited to a mental method. However, the examples and the progression of the steps have been chosen to help children develop their fluency in the process, alongside a deep understanding of the concepts and the numbers involved, so that they can apply these skills accurately and efficiently to later calculations. The class should be encouraged to compare mental and written methods for specific calculations, and children should be encouraged at every stage to make choices about which methods to apply. In Year 4, the steps are shown without such fine detail, although children should continue to build their understanding with a secure basis in place value. In subtraction, children will need to develop their understanding of exchange as they may need to exchange across one or two columns. By the end of Year 4, children should have developed fluency in column methods alongside a deep understanding, which will allow them to progress confidently in upper Key Stage 2.	**Multiplication and division:** Children build a solid grounding in times-tables, understanding the multiplication and division facts in tandem. As such, they should be as confident knowing that 35 divided by 7 is 5 as knowing that 5 times 7 is 35. Children develop key skills to support multiplication methods: unitising, commutativity, and how to use partitioning effectively. Unitising allows children to use known facts to multiply and divide multiples of 10 and 100 efficiently. Commutativity gives children flexibility in applying known facts to calculations and problem solving. An understanding of partitioning allows children to extend their skills to multiplying and dividing 2- and 3-digit numbers by a single digit. Children learn the grid method and use this to make connections into the column methods to support multiplications in these cases. For successful division, children will need to make choices about how to partition. For example, to divide 423 by 3, it is effective to partition 423 into 300, 120 and 3, as these can be divided by 3 using known facts. They will also use short division to begin to calculate most efficiently with more complex calculations. Children will also need to understand the concept of remainder, in terms of a given calculation and in terms of the context of the problem.	**Fractions:** Children develop the key concept of equivalent fractions, and link this with multiplying and dividing the numerators and denominators, as well as exploring the visual concept through fractions of shapes. Children learn how to find a fraction of an amount, and develop this with the aid of a bar model and other representations alongside. in Year 3, children develop an understanding of how to add and subtract fractions with the same denominator and find complements to the whole. This is developed alongside an understanding of fractions as numbers, including fractions greater than 1. In Year 4, children begin to work with fractions greater than 1. Decimals are introduced, as tenths in Year 3 and then as hundredths in Year 4. Children develop an understanding of decimals in terms of the relationship with fractions, with dividing by 10 and 100, and also with place value.

In addition to this, teachers should identify what resources they will be using throughout the lesson.

Example Medium-Term Plan for time in Year 2:

8 Telling the time to 5 minutes (past)	To read and write times past the hour to the nearest five minutes.	• Practise counting around the clock – use groups of 5 cubes to model we are adding 5 each time • Create a number line to show how each multiple of 5 matches up to a number on the clock • Use the number line to show that if the arrow points to 4 it means 20 past etc. • Explain if the arrow points to 12 it's a whole arrow – eg. we don't say 3.60 we say 4 o'clock • Use the cubes to create a clock face • Practise reading minute times by pointing the arrow to different numbers – count in 5s or use the number to support • Introduce the hour hand and practise reading more times		Clock, time, hour, hand, later, earlier, half, half past, halfway, quarter, quarter past, fraction, minute hand, quarter to, past,	Post –its, cut out arrows, small clocks, interactive clock, cubes
		• Children draw hands on clocks to show different past times SLAM When looking at the **hour**, each number on a **clock represents** one **hour**. When looking at the **minutes**, each number on a **clock represents** five **minutes**. Misconceptions: • The concept of past and to the hour can confuse children in terms of deciding which hour to reference. Children particularly may incorrectly tell 'to' times using the previous hour. For example, they may read the time of 'ten to eleven' incorrectly as 'ten to ten'.	 		

iii) Short-term planning

At Birley Spa Primary Academy, we use Active Inspire flipcharts to produce short-term planning (used to deliver lessons).

Lesson Overview Page:

The first slide on every lesson should include a lesson overview page. On this page, teachers should include/ensure:

- Key headings: Unit: Lesson number: L.O: Success Criteria**: *Challenge 1 (replaces the old 'Base' red level), *Challenge 2 (replaces the old 'Expected' blue level) and Challenge 3 (replaces the old 'Deep' gold level):** Possible misconceptions/Key questions: Key teaching points
- <u>All planned tasks throughout the lesson relate to the learning objective</u> – unless specifically used to inform new learning e.g. plenary activity.
- Clear small steps are identified during the Teaching part of the lesson overview page and are used to structure the slides/pages.
- Quoted misconceptions on the flipchart Lesson overview page match the learning objective of the lesson and are not just a generic list.
- All spelling (especially key vocabulary) is accurate and consistent throughout.

<u>The lesson overview page should be shared with TAs (in advance of the lesson) so that they are well prepared and know their role within each lesson.</u>

Example Lesson Overview Page (Y6 Ratio):

Unit: Ratio and proportion
Lesson number: 2
<u>L.O. To recognise the relationship between ratio and fractions.</u>

- Base: To begin making connections between the 'For every' statement and fractions.
- Expected: Understand the connection between ratio and fractions, identifying the fraction and ratios represented and using bar models for support.
- Deep: Apply knowledge of ratio and fractions in a range of contexts.

<u>Misconception</u>

- Children may find it difficult to use a ratio statement to find the fraction of the amount. They might not yet recognise that the parts of the ratio represent the parts in the whole e.g., 3 to 4 = a total of 7 parts.

<u>Key Teaching Points:</u>

- Key vocabulary: recap key vocab regarding ratio.
- Anchor task – provide children with a fraction bar – 4/9 of the fruit are apples. What is the ratio of apples to pears? See if pupils can recognise and begin making connections with yesterday's learning. If children struggle, put up the 'for every…' statement we were using yesterday. Once pupils get the answer that for every 5 pears there are 4 apples, or for every 4 apples there are 5 pears, begin to investigate the relationship to the fraction. Where does the denominator 9 come from? Total number of equal parts. What did the numerator 4 represent? Number of apples. What would the fraction of pears be?
- Teach – move through a couple of different examples represented in different ways (with counters and with a fraction bar). Use stem sentences to support children's understanding (see each slide for examples and MTP).
- Discuss – provide a fraction bar which represents 3/7 green and 4/7 yellow. Have a statement on the board for children to discuss. "The fraction of green parts is $\frac{3}{7}$ because for every 3 green there are 4 yellow parts."
- Practise – pupils are provided with an image of coloured counters. Chn to write the stem sentences in their books about these counters.
- Investigate: provide pupils first with the ratio this time "There are 3 blue counters from every 4 green counters." Can you say the stem sentences without an image? What about now that you can see the counters? Model using the stem sentences again where we are just given a ratio.
- Discussion – provide pupils with a fraction bar which shows 1/6 shaded. Have 3 statements from the pupils to choose from and decide which they think are correct: 1) The fraction shaded is $\frac{1}{5}$ and the ratio of shaded to non-shaded parts is 1 to 5 2) The fraction shaded is $\frac{1}{6}$ and the ratio of shaded to non-shaded parts is 1 to 6 3) The fraction shaded is $\frac{1}{6}$ and the ratio of shaded to non-shaded parts is 1 to 5. Move through and discuss why the first two statements are incorrect. Ask children to draw what these would look like on their whiteboards.
- Practical activity – Choose any number of red counters (less than 10). Then choose any number of yellow counters (less than 10). Now complete the statements below about your counters.
- Discussion – Millie fills her pencil case with pencils and pens. $\frac{3}{8}$ are pencils. What is the ratio of pencils to pens? Model drawing the pencils or pens for visual support.
- Apply – independent work.
- Self-marking

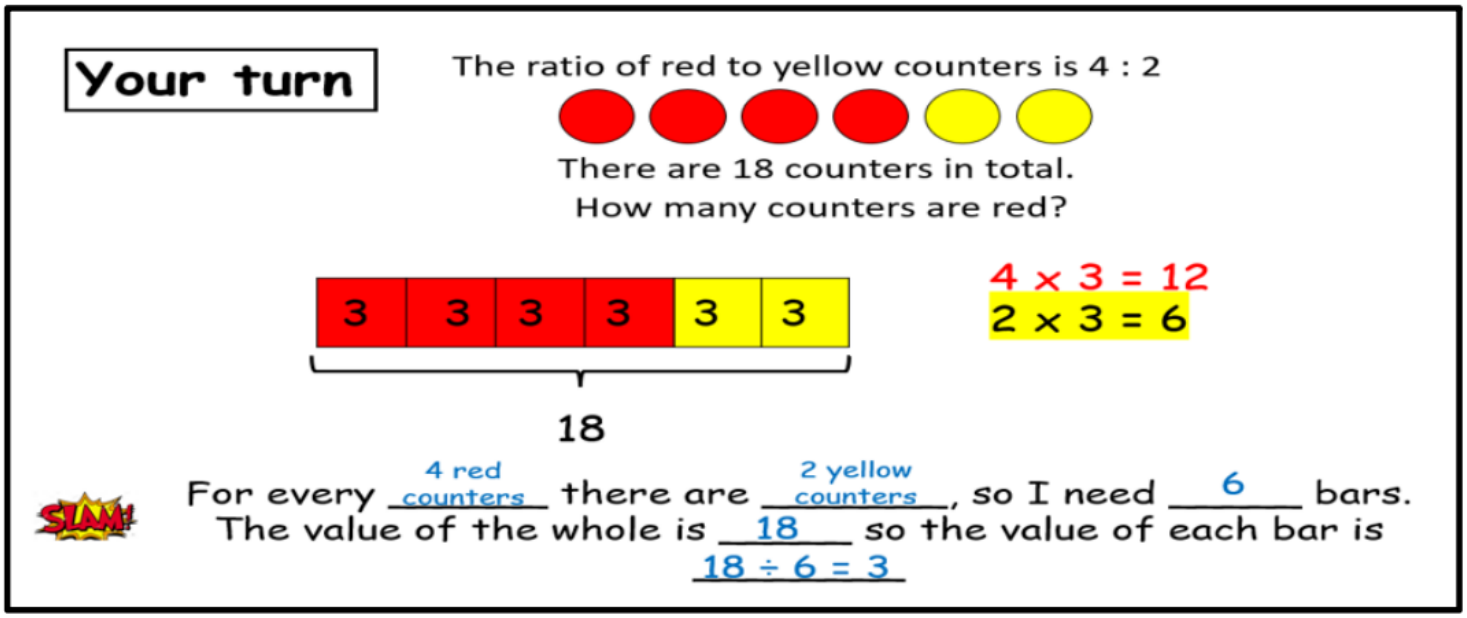
Teach/Practise:

Following the lesson overview page, teachers should have a number of teach/practise slides which follow the small steps identified in their Medium-term plan. The non-negotiables for an effective teach/practise section of a lesson is as follows:

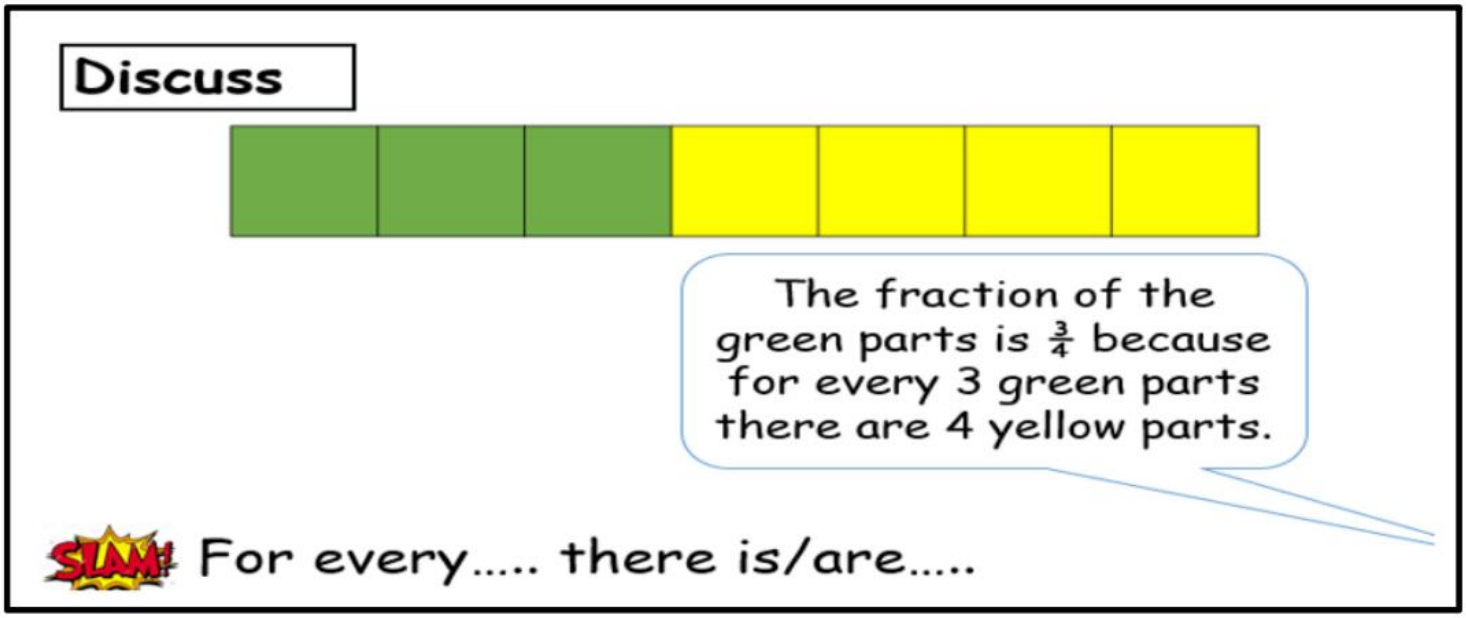
- Opening page is well presented: cursive school font is used and clearly visible to all children. Short date is used and underlined once, learning objective is learning-based and not task-based, clear progression in success criteria. Following slides should use comic sans for clear symbols and notation.
- Revisit tasks/Anchor tasks are relevant to the lesson content or address misconceptions from previous marking/learning.
- You may use a useful vocabulary recap slide – which makes links to the classroom Maths Working Wall.
- Full sentence reminders/Sentence scaffolds/SLAM – Speak Like A Mathematician in evidence.
- Effective partner talk tasks identified to allow for SLAM.
- Clear consideration about how to use practical resources i.e. dienes in Y2-Y4, place value counters in Y4-Y6 on place value grids. Opportunities for children to manipulate resources themselves, not just view them on the board.
- Correct use of terminology e.g. Ones rather than Units.
- Whole class teaching which draws attention to misconceptions identified on lesson overview page. (Misconception page 'what mistake did they make?' is a really good way of identifying potential misconceptions and identifying how to address them.)
- Sentence generalisations 'I say, you say' or 'My turn, our turn, your turn' enable good interactions between teacher and children.
- Useful memory prompts/images used alongside high quality models and images e.g. NCETM/Maths Hubs.
- Conceptual variation with different representations used (see Calculation Policies C-P-A).
- Good variety of reasoning questions in the whole class teaching to ensure that the children have been given the skills necessary to complete the independent work.
- Effective signposts of 'talk task', 'model' or 'independent' evident in flipcharts lessons.

Within the teach/practise part of the lesson, teachers should adopt a 'my turn, your turn' approach, where pupils are given opportunities to practise their learning throughout the lesson after each small step is taught.

Example 'teach/practise' slide from Y6 Ratio:



Example 'misconceptions' slide from Y6 Ratio:



Misconception: Children may find it difficult to use a ratio statement to find the fraction of the amount. They might not yet recognise that the parts of the ratio represent the parts in the whole e.g., 3 to 4 = a total of 7 parts.

Apply

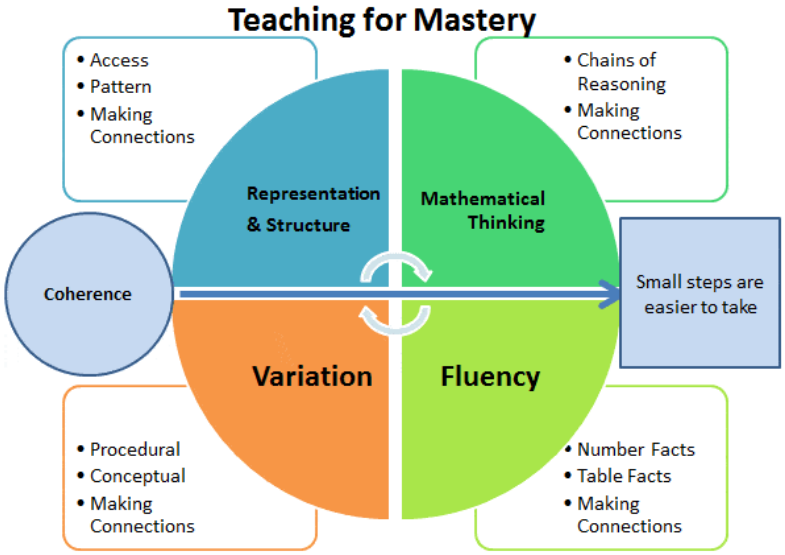
Apply refers to the independent tasks that the pupils will complete following the teach/practise section of the lesson. Within the apply part of the lesson, teachers should include:

- Clear evidence of SoW being used/tasks from SoW.
- Appropriate use of different levels of difficulty.
- Inclusion of relevant SATs questions (linked to learning objective).

- ‘True or false’ reasoning.
- **In general, tasks should be labelled as Challenge 1, Challenge 2 and Challenge 3 (with a single black or green border).**
- **Challenge 3 work should use the SoW to reinforce ‘deeper practice’ and not just different expected level work.**
- **Be mindful to actively challenge any comments/perceptions from children that they only do one particular level. They should always aim to challenge themselves at all levels and this should be the culture that we promote across every subject and every lesson we deliver (not just in Maths).**
- **A good way of looking at this (when using Challenge 1, Challenge 2 and Challenge 3) is that whichever level children start on, they should aim to finish the lesson on a higher level. For example, if a child does choose to complete a ‘Challenge 1’ activity to begin with, they should (generally) aim to get onto the ‘Challenge 2’ activity by the end of the lesson. This shows good progress and ambition.**
- **Where appropriate, the low threshold, high ceiling tasks (promoted through high calibre maths sites such as Nrich) are an effective way of engaging all pupils and enabling them to challenge themselves further.**
- **As we continue to further develop and improve our teaching and learning of Maths at Birley Spa, we will look at ways in which these tasks can be implemented further into our Maths teaching. However, it is essential to remember the key differentiation principles behind the activities. If all the children are to do a whole class challenge, <u>it must still be differentiated</u> through:**
  ***Amount of examples children create**
  ***Difficulty of examples that children create**
  ***A set of steps that increase in difficulty**
  ***The numbers the children choose**
  ***The accuracy of explanation/what the children notice**
  There should be a focus on pattern-spotting and reasoning, even during ‘fluency’ type activities.
- **During the Autumn term, low threshold, high ceiling tasks should be used with children once a week (where appropriate) and should be checked by Simon Smith or Cat Stone prior to delivery.**
- **As with all subjects at school, children are expected to engage well in all lessons and this should be reflected in the good amount of work they produce daily. Our expectations for work produced in books will remain high, regardless of whichever tasks they complete.**

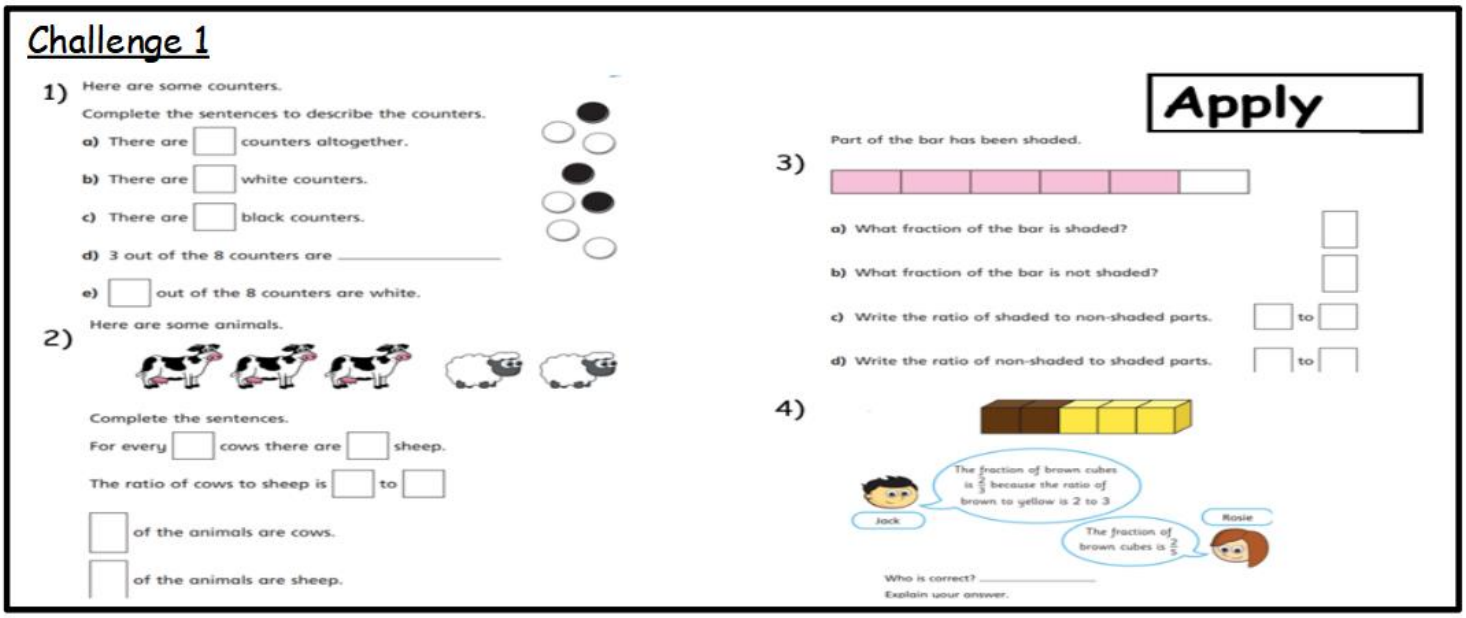
As stated above, it is crucial that teachers ensure reasoning and problem-solving is evident in each challenge level of work. When selecting independent tasks, teachers should look to a range of sources e.g. White Rose, the Scheme of Work, Nrich, ‘I see reasoning’ documents, ‘Marvellous Maths’ booklet, Testbase etc. Independent tasks should not be sourced from one place.

Ensure independent tasks include ‘procedural variation’ as opposed to practising the same skill with different numbers.



It may be helpful to complete the 'Apply' part of a lesson before the 'Teach/Practise' part so that the small steps can be planned out to match the final outcome.

Example Apply slides from Year 6 Ratio



Challenge 2

1) Here are some shapes.

a) What fraction of the shapes are circles?

b) What fraction of the shapes are stars?

c) What is the ratio of stars to circles? to

d) What is the ratio of circles to stars? to

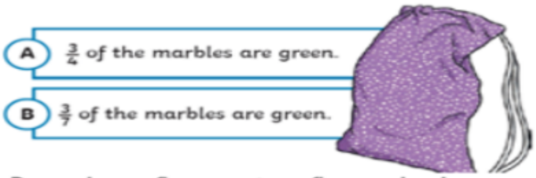
Can you find a different answer to each of these questions?

2) Which is the odd one out?

Explain your answer.

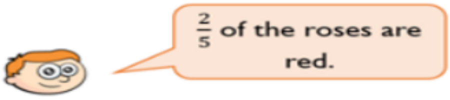
Apply

3) In this bag, there are 3 green marbles for every 4 blue marbles. Which statement is true? Prove it!



4) Ron plants flowers in a flower bed.
For every 2 red roses he plants 5 white roses.

He says,



Is Ron correct?

Challenge 3

1) A pencil case contains felt tips and pencils.
$\frac{3}{8}$ of the contents are pencils.
What is the ratio of felt tips to pencils?

2) Scott draws a bar and divides it into 8 equal parts.

He shades 25% of the bar.
What is the ratio of shaded to non-shaded parts? to

3) There are some red and green cubes in a bag.
$\frac{2}{5}$ of the cubes are red.

True or False?

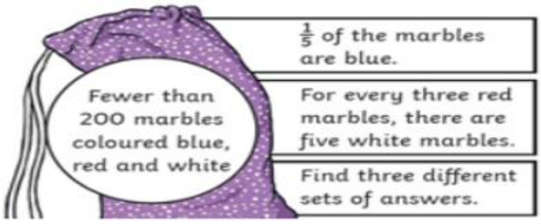
- For every 2 red cubes there are 5 green cubes.
- For every 2 red cubes there are 3 green cubes.
- For every 3 green cubes there are 2 red cubes.
- For every 3 green cubes there are 5 red cubes.

Explain your answers.

Apply

4) Zara and Ella played basketball.
For every 3 shots that Zara scored with, she missed 2 shots.
Ella scored with 3 out of every 4 shots.
Which player is a more accurate shooter, Zara or Ella?

5) Look at the ratio and fraction statements for this bag of marbles. Find the possible number of each different colour marble in the bag.



4. Supporting Documents (saved in Curriculum (N): 2022-23: Subjects: Maths)

School's **Long Term Plan** outlining key objectives throughout each half term.

Schools **Medium Term Plan** outlining the key objectives, key ideas (small steps, SLAM and misconceptions), representations, technical vocabulary and resources used in each lesson.

Sentence support document

Scheme of work for each year group

Key misconceptions for each year group

Calculation policy

Progression maps

NCETM – Ready to progress powerpoints

NCETM Mastery Documents

Our vision for Maths at Birley Spa Primary Academy document

Expectations for Maths book scrutiny

Expectations for Maths planning scrutiny

School Self Evaluation: Maths Book Scrutiny (2022-23)

Colleague: _____ Monitored by: _____

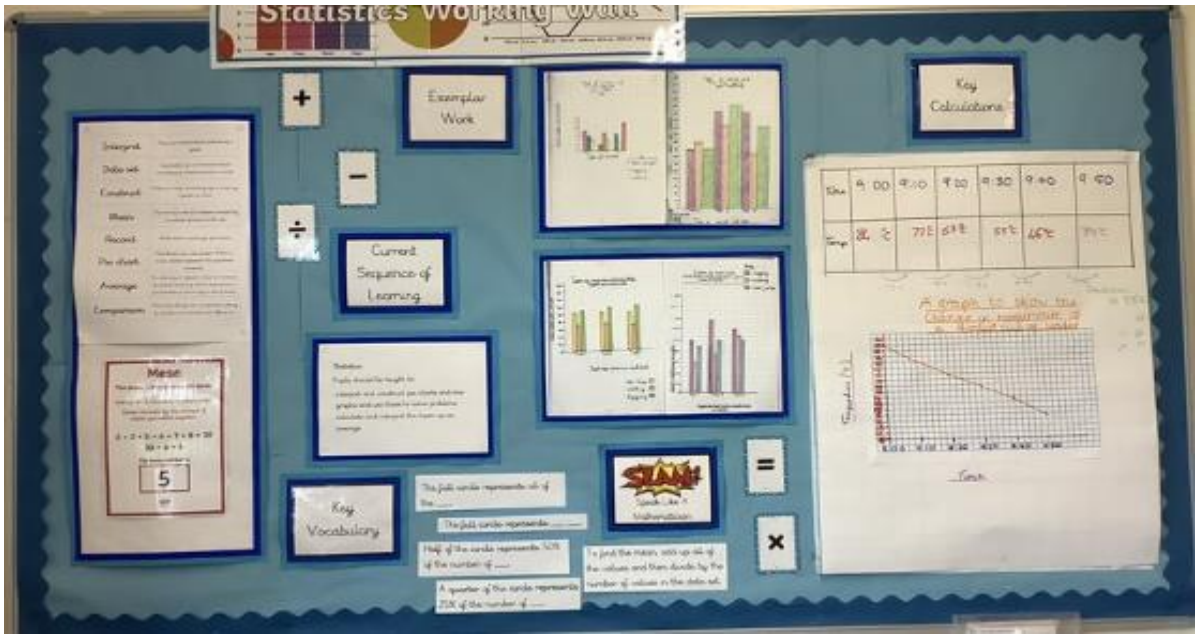
	Criteria	Evidence in books
Productivity	• All lessons accounted for • Evidence that children are doing more work each day • High expectations	
Presentation	• Each page well-presented e.g. LO, date, handwriting is neat and in line with Marking and feedback policy • Resources stuck in neatly • Teachers comments neatly presented • Some evidence of photographs used with commentary	
Differentiation and challenge	• All groups working with different tasks/resources • Scaffolds in the book i.e. stickers/small sheets to model/exemplify/ vocabulary • Evidence that children have been moved on within a lesson if they have been getting everything right • Open ended challenges set (problem solving and reasoning) • GDS children well catered for equally SEND/Pupil Premium well catered for • Evidence of TAs working regularly with children other than LA • TA marking to same standard, initialled and working with a variety of groups	
Marking	• All work marked and acknowledged • Green pen/next steps used regularly by the teacher • Some evidence of early self-assessment/	

	dialogue with the child (e.g. VF)	
Feedback	• Plenty of meaningful, impactful pieces of feedback • Comments build on previous feedback • TA marking mirrors the teacher and is easily identifiable • Actions from feedback are done during the next lesson/earliest opportunity and acknowledged • Next steps in learning very clear • The feedback is very focussed on what the child needs to do to improve	
Impact of marking and feedback	• Purple pen evidence that show children have actioned the feedback and improved the quality of work due to the feedback and the teacher/TA has acknowledged this and fed back on the improvement	

5. Maths Working Walls

The table below shows the non-negotiable expectations for Maths working walls throughout the academy. At the end of every Maths unit of work, a photo should be taken of the Maths working wall and saved by each class teacher. Over time, we will build up a portfolio/bank of evidence about how we use our working walls at Birley Spa and the impact on teaching and learning in Maths.

Label	What to include
• Multiplication Tables	All multiplication tables that are the end of year expectations for your year group. For Y4-Y6 this will be the full set to 12 x 12.
• Key Vocabulary	This should include all the vocabulary as identified in the Scheme of Work for your current topic. Definitions of each word would be really useful too. E.g. **Improper fraction** - a fraction in which the numerator is greater than the denominator, such as 5/4.
• Key Calculations	Any important calculations that are relevant to a lesson or sequence of lessons (taken from the school Calculation Policy).
• Exemplar work	A photocopied piece of work produced by a child which either models excellent presentation or excellent learning.
• Current Sequence of Learning	This should be an overview i.e. Maths learning objectives of the current unit overview/ sequence of learning mapped out on the wall.
• SLAM! Speak Like A Mathematician	A reference point for any sentence supports (as delivered through Cat's training).
• Number line	Use the provided number line – consistent throughout school



6. Planning Checklist

Steps to success		✓
1.	Complete the Long-Term Plan, using the Scheme of Work and Progression Map for support.	
2.	Map out the objectives onto a Medium-Term plan, using the Long-Term Pan, Scheme of Work and Progression Map for support.	
3.	Write the small steps that will occur throughout each lesson in the 'Key ideas' section on the MTP.	
4.	Identify the SLAM (sentence supports) that will be utilised in each lesson and include this in the 'Key Ideas' section on the MTP.	
5.	Identify the key misconception (maximum 2) that you will unpick in that lesson, ensuring it is relevant to the Learning Objective. Include this in the 'Key Ideas' section on the MTP.	
6.	Identify the Representations you will use in each lesson and include an example representation in the 'Representations' column. Ensure you are using the Calculation Policy where necessary.	
7.	Add in the technical vocabulary and key resources you will use in that lesson, using the Scheme of Work for support.	
8.	Begin your Short-Term Planning by completing the Lesson Overview Page.	
9.	Next, create flipchart pages for the teach/practise part of the lesson. Planning in a 'my turn, your turn' approach where pupils are able to practise applying their learning in small steps.	
10.	Finally, create independent tasks for the Apply section of the lesson, where tasks are differentiated into Challenge 1, Challenge 2 and Challenge 3 (no colours or references now to Base/Expected/Deep). Ensure a range of tasks are included, where all pupils are accessing reasoning and problem-solving questions in relation to the stated learning objective. Alternatively, a low threshold, high ceiling task can be used (once a week initially) provided it has been checked by Simon Smith or Cat Stone.	