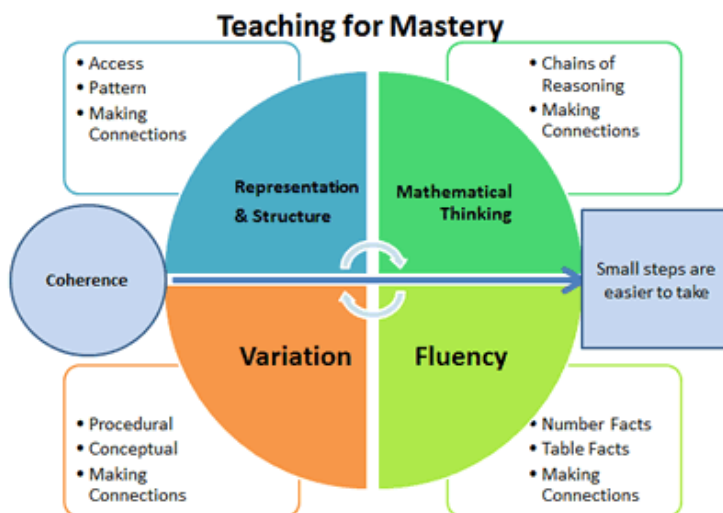




Teaching Mathematics at Drybrook Primary School

Ethos - The answer is only the beginning...

At Drybrook we believe that mathematics is best learnt through the children having a deep, conceptual understanding of a range of mathematical ideas and a real enjoyment for mathematical learning. We believe it is important for children to not only be able to find the answers to problems but to also be able to explain their reasoning to enable them to become lifelong learners. Deepening children's learning involves presenting the same content in many different contexts and through conceptual and procedural variation begin to understand concepts at a relational level rather than a set of procedures. This encourages children to make strong connections across mathematical concepts and solve problems. Through our mathematics curriculum we will help children to become fluent in the fundamentals of mathematics, reason mathematically and be able to solve problems.



The 'Mathematics' Day

Where possible children are taught in their individual year groups. The use of the TA is vital to ensure support is given through the fluency and independent practice aspect of the lesson.

Example structure of the lesson

Year 1	Year 2
Lesson (teacher)	Fluency (TA)
Independent learning (TA)	New learning (teacher)
Fluency (TA)	Independent learning (teacher)

New learning is always delivered by the class teacher.

Long term Covid Curriculum Adaptations

- As a school we focus heavily on core arithmetic skills, place value and fractions and as a result have stretched these areas of the curriculum to ensure the children are secure in these important parts of the maths curriculum.
- Using the White Rose's update schemes of learning which include planned in-recap lessons to reinforce core aspects from the previous year's learning. This will allow us to ensure that the children have retained key information from the previous year and then link it smoothly to the current year's new learning.
- Fluency sessions to reinforce the previous year's learning that was identified as insecure from our pre-unit assessments undertaken prior to the current year's unit of work.

Planning

Long and Medium Plans

• Look at the White Rose yearly overview for your year group on White Rose Website or the launcher on the Google Drive.

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6							
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value			Number: Addition and Subtraction					Number: Multiplication and Division			
Spring	Number: Multiplication and Division			Measurement: Money	Statistics		Measurement: Length and Perimeter			Number: Fractions		Consolidation
Summer	Number: Fractions			Measurement: Time			Geometry: Properties of Shape	Measurement: Mass and Capacity			Consolidation	

- Look at Lesson by lesson overview to identify the recap lessons from the previous year group
- Identify which DfE Ready-to-progress criteria that block links to.

Year 3 – Autumn Term		
Lesson by lesson overview 2020/21		
Week	Day	Topic
1 07/09/2020	Monday	Represent numbers to 100 NPV-2 R
	Tuesday	Tens and ones using addition NPV-2 R
	Wednesday	Hundreds NPV-1 NPV-2
	Thursday	Numbers to 1,000 NPV-2
	Friday	Numbers to 1,000 on a place value grid activity NPV-2
2 14/09/2020	Monday	100s, 10s and 1s (1) NPV-2
	Tuesday	100s, 10s and 1s (2) NPV-2
	Wednesday	Number line to 100 NPV-4 R
	Thursday	Number line to 1,000 NPV-4
	Friday	Find 1, 10, 100 more or less NPV-3
3 21/09/2020	Monday	Compare objects NPV-3
	Tuesday	Compare numbers NPV-3
	Wednesday	Ordering numbers NPV-3
	Thursday	Count in 50s NPV-4
	Friday	Mini-assessment
4 28/09/2020	Monday	Add and subtract multiples of 100 AS-2
	Tuesday	Add and subtract 1s AS-2 R
	Wednesday	Add and subtract 3-digit and 1-digit numbers - not crossing 10 AS-2
	Thursday	Add a 2-digit and 1-digit number - crossing 10 AS-2 R
	Friday	Add 3-digit and 1-digit numbers - crossing 10 AS-2

Ready-to-progress criteria: year 1 to year 6

The table below is a summary of the ready-to-progress criteria for all year groups.

Strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
NPV	1NPV-1 Count within 100, forwards and backwards, starting with any number.		2NPV-1 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.	4NPV-1 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.	5NPV-1 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.	6NPV-1 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).
		2NPV-2 Recognise the place value of each digit in two-digit numbers, and compose and decompose two-digit numbers using standard and non-standard partitioning.	3NPV-2 Recognise the place value of each digit in three-digit numbers, and compose and decompose three-digit numbers using standard and non-standard partitioning.	4NPV-2 Recognise the place value of each digit in four-digit numbers, and compose and decompose four-digit numbers using standard and non-standard partitioning.	5NPV-2 Recognise the place value of each digit in numbers with up to 2 decimal places, and compose and decompose numbers with up to 2 decimal places using standard and non-standard partitioning.	6NPV-2 Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and non-standard partitioning.
	1NPV-2 Reason about the location of numbers to 20 within the linear number system, including comparing using < > and =	2NPV-2 Reason about the location of any two-digit number in the linear number system, including identifying the previous and next multiple of 10.	3NPV-3 Reason about the location of any three-digit number in the linear number system, including identifying the previous and next multiple of 100 and 10.	4NPV-3 Reason about the location of any four-digit number in the linear number system, including identifying the previous and next multiple of 1,000 and 100, and rounding to the nearest of each.	5NPV-3 Reason about the location of any number with up to 2 decimal places in the linear number system, including identifying the previous and next multiple of 1 and 0.1 and rounding to the nearest of each.	6NPV-3 Reason about the location of any number with up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts.

- Using the White Rose Medium Term Plan and DfE/NCETM Ready-to-Progress Powerpoints and Document ensure you are confident with the language, representations and structures as well as the coherence of the learning journey before planning.

Represent Numbers to 100

Notes and Guidance

Children need to be able to represent numbers to 100 using a range of concrete materials, such as bead strings, straws, Base 10 equipment etc.

Children should also be able to state how a number is made up. For example, they can express 42 as 4 tens and 2 ones or as 42 ones.

Varied Fluency

Here is part of a bead string.

Complete the sentences.
There are _____ tens and _____ ones.
The number is _____.

Represent 45 on a bead string and complete the same sentence stems.

Match the number to the correct representation.



One ten and five ones

Thirty-five

25

Represent 67 in three different ways.

Mathematical Talk

How have the beads been grouped? How does this help you count?

Can you show me the tens/ones in the number?

Which resource do you prefer to use for larger numbers? Which is quickest? Which would take a long time?

3NPV-2 Place value in three-digit numbers



- Represent this number using place value counters and a part-part-whole model.
- What digit is in the tens place? What is the value of the hundreds digit?
- What does the 2 represent?

The 2 represents two ones.

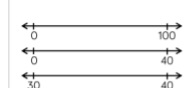
- Repeat for different 3-digit numbers
- Show children representations of numbers either using part-part-whole or place value counters and ask them to write the value of each number represented.

ncetm.org.uk

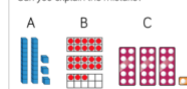
Represent Numbers to 100

Reasoning and Problem Solving

Where would 36 go on each of the number lines?



One of these images does not show 23. Can you explain the mistake?



How many two digit numbers can you make using the digit cards?



What is the largest number? Prove it by using concrete resources.

What is the smallest number? Prove it by using concrete resources.

Why can't the 0 be used as a tens number?

70, 20, 72, 27

The largest number is 72

The smallest number is 20

Because it would make a 1 digit number.

Lesson structure

- Flips and Powerpoint should make use of *Rosenshine's Principles of Instruction* structure to aid lesson design.
- Resources to create these questions could come from **White Rose Hub, Classroom Secrets, Deepening Understanding and NCETM**

- 1) **Recap it** – Retrieval practice to review previous learning to check understanding and to uncover and challenge misconceptions and correcting mistakes. This will strengthen understanding and the connections between ideas.
- 2) **Teach it** – Teacher led and children guided. Presenting new information in small, bite-sized chunks increases the progress made by the students. This reduction in cognitive load allows metacognition to take place (it allows them to think about how they are thinking about the task).

To add depth with a large number of question to all students to encourage children to make conceptual connections (show the mathematics in a relational different way) and explain (both verbally or written) the mathematics using correct mathematical language allowing pupils to refine, consolidate and develop their mathematical understanding by entering into learning conversations with their peers and teacher.

- 3) **Practice it (Assess it)** – Children led and teacher intervene. Practice makes Progress. This is true of physical, vocal and mental practice. Obtaining a high success rate in ensures all students in a class are ready to move on to the next stage in the topic, thus preventing students from taking misunderstanding into their future learning. Successful teachers allow more time for guidance, questioning and repetition of processes.

To add depth, children practice making the connections between concrete, pictorial, abstract and explanations (both verbally or written) all using correct mathematical language.

- 4) **Challenge it (What it's not)** - Children led and teacher intervene. Check understanding of children's reasoning and explanations by providing a question that is not the same as the new learning from earlier in the lesson. Children should be able to provide high quality explanations as to why it is wrong.
- 5) **Do it** – independent/group work – Do it activities form the basis for learning and provide variation both conceptually and procedurally. These should be shown in a standard and non-standard way. E.g. $5 + 3 = 8$ or $8 = 5 + 3$ and in a mixture of concrete, pictorial and abstract views.
To add depth, children should be encouraged to represent the concept using different representations and structures to understand the mathematics a relational level, explain (both verbally or written) the mathematics using correct language modelled by the teacher in the Teach it (direct instruction), solve the problem in a different way and explain the difference.
- 6) **Twist it** – independent/group work – a single Apply it activity should involve reasoning (*what it's not*) – Prove it / True or false / active arguments / misconceptions/ explanations of the mathematics using correct mathematical language.
- 7) **Solve it** – independent/group work - Solve it activities include consolidation of learning and put the mathematics in different contexts and encourage more connections within different concepts of mathematics. For example: word problems, missing digits, generating the question, probing questions, linking conceptual previously taught concepts in maths (not future concepts)
- 8) **Open ended task** – independent/group work – A task that can be displayed from children to 'grapple' with and explore multiple answers.

Learn by Questions

In years 5 and 6, independent learning is enhanced by using Learn by questions. It is an online tool that allows teachers to set question sets linking to the learning intentions of that learning. The extremely tight feedback loop provides instant feedback to the questions,

Different levels of reasoning (depth)

How to tell if a child is advanced (5 indicators)

https://www.youtube.com/watch?v=inwB3975iko&t=6s&ab_channel=Maths%E2%80%94NoProblem%21

- 1) Show a physical model - place value counters, Base 10, numicon
- 2) Draw something appropriate to the mathematics – bar models, Part whole model (place value counters, Base 10, numicon)
- 3) Explain how to solve it verbally
- 4) Write an explanation how to solve it
- 5) Challenge yourself to solve it a different way and explain it.
- 6) Create your own extended version of the question

Can you edit the question to write a similar question that extends your learning and deepens your own understanding?

Primes	Negatives	Empty boxes
Rounding	Factors	Inverse
Comparing	= < >	Word problems

Learning Intentions using WALT (We Are Learning To)

- Learning intentions should be skills led and taken from curriculum objectives and be specific to the small step in learning being taken in that lesson.

The objective is taken from the white rose medium term plan for example:

Year 2 objective – Recognise the place value of each digit in a two digit number (tens, ones)

Becomes – *WALT: identify and understand the place value of ones and tens*

The learning intention needs to focus on the skill and not the context for example:

NOT – *WALT: To say how many tens and ones are in a number*

Precision is key to the exact small step being taken

For example;

WALT: subtraction 2 digit numbers from 2 digit numbers

This is not precise enough as it doesn't define exchanging or not

It should be *WALT: subtract 2 digit numbers from 2 digit numbers with no exchanging*

Success Criteria – WILF (What I'm Looking For)

STEM Sentences

- To be used to model precise mathematical language.
- Correct mathematical language can be found in the NCETM Ready-To-Progress Powerpoints. Using this language will allow correct consistent explanations across the whole school provide continuity year on year.

If language of Stem Sentence isn't needed

- A sequence of steps that enable the children to be successful in achieving the WALT
- Where possible, create steps to success with the children and display in the classroom.
- WILF referred to at the end of the lesson for children to self-assess

For example, for the WALT above the WILF could be:

- Know the term 'place value'
- Understand ones and tens
- Identify ones and tens

Lesson flips

- Use of the interactive whiteboard to demonstrate resources being used and a record of the lesson.
- Create your own lessons following the lesson structure based on Rosenshine's principles.
- Don't not just use the White Rose Powerpoints but adapt and ideally use them to inform your own resources.
- Modelling the process both verbally and physically is vital to the children's understanding of the mathematics.
- Depth should be encouraged throughout the whole of the lesson to make links to prior learning and other links.

Presentation in mathematics

- All learning must have a sticker in 'WALT' which includes the short date,
- Do it, apply it and solve it should be clearly titled within the learning in their books.

Fluency Sessions

Why we do fluency

Avoid Cognitive overload - When your brain has too much to compute so shuts down.

Fluency allows children have an *unconscious competence in mathematic knowledge* so they can solve questions at there age.

Free Up Working memory

Children's *working memory can focus on the problem* in front of them and not focus on finding the 'facts' learnt years ago.

How to Plan for fluency

Efficiency - An efficient strategy is one that the student can carry out easily.

Accuracy - Careful recording and knowledge of number facts and other important number relationships.

Flexibility - The knowledge of more than one approach to solving a particular kind of problem.

- Adapt to personalities in your class.
- Be critical about what works in your room.
- Do your class have specific gaps that need filling.

What each fluency sessions looks like

- Keep in mind the individual core skill you want them to obtain and become fluent in
- Constant links between Concrete, Pictorial and Abstract to add depth the learning.
- Use the sessions to recap prior learning to reinforce key concepts.

Times tables

To aid with rapid recall on times tables, outside of the normal maths lesson children will spend 5/10 minutes per day on their own specific times table to aid rapid recall on the fact.

To do this children will us Times Table Rockstars across Key Stage 2 and Year 2 in Key Stage 1

Maths Homework

Our philosophy around homework at Drybrook is that it should be to consolidate the learning taking place in school and that it should a form of long term retrieval practice to ensure the long term memory is altered.

To achieve this, we use Doodle Maths from Year 1 to Year 6. Each child is working on their own personal objectives the ensure they are secure at previous learning from younger year groups. The personalisation and 'game' like presentation encourages children to undertake homework at home and this builds good habits for the future.

On a weekly basis the children who have made the most progress will the celebrated in school and over a longer period of time the children who have the highest 'effort' score will be rewarded.

Maths Summative Assessment

- End of term assessments will be from NFER papers which will give us a Standardised Score.
- Throughout the year when needed teachers will use White Rose End of Unit assessments for pre (previous year) and post (current year) assessments to inform gap analysis. This will be recorded on a separate document.
- Reception Baseline will be completed during the first six weeks of reception and then the Early Years Profile evidence will be collected on Tapestry throughout the year.

Year Group	Autumn Term		Spring Term		Summer Term	
	AP1 First 2 weeks	AP2	AP3	AP4	AP5	AP6
Nursery		Early Year Profile		Early Year Profile		Early Year Profile
Reception	Baseline	Early Year Profile		Early Year Profile		Early Year Profile
Year 1	Previous Year NFER Paper SS Score	Autumn NFER Paper SS Score		Spring NFER Paper SS Score		Summer NFER Paper SS Score
Year 2	Previous Year NFER Paper SS Score	Autumn NFER Paper SS Score		Spring NFER Paper SS Score		Summer NFER Paper SS Score
Year 3	Previous Year NFER Paper SS Score	Autumn NFER Paper SS Score		Spring NFER Paper SS Score		Summer NFER Paper SS Score
Year 4	Previous Year NFER Paper SS Score	Autumn NFER Paper SS Score		Spring NFER Paper SS Score		Summer NFER Paper SS Score
Year 5	Previous Year NFER Paper	Autumn NFER Paper		Spring NFER Paper		Summer NFER Paper
	SS Score	SS Score		SS Score		SS Score
Year 6	Previous Year NFER Paper SS Score	2017 SATs Paper Sat in class SS Score	2018 SATs Paper Sat in class SS Score	2019 Paper Mock SATs SS Score Run as a practice week	2022 Actual SATs SS Score WBS,WTS,EXS,GDS	

Mathematics working walls

Our Mathematics Working Wall is designed to be a dynamic and evolving educational tool, aligning with our students' learning journey over the course of a half term. It is essential to understand that this wall is not a static display; rather, it should grow and adapt in response to the new learning that occurs in the classroom. As we introduce new mathematical concepts, these should be promptly incorporated into the wall, ensuring that it remains a relevant and current resource. In cases where we are revisiting concepts learned in previous terms, the wall should be rebuilt to reinforce and reiterate these ideas, particularly during our fluency sessions. This approach ensures that the wall is not just a backdrop for the entire year, but an active part of our teaching and learning process, reflecting the ongoing development and consolidation of mathematical skills and knowledge in our students.

1. Core Concept Areas:

Sections for addition, subtraction, multiplication, division, fractions, and place value, each with clear, distinct headers.

2. Visual Aids with Colour Coding and Labelling:

Different colours to distinguish components of methods like column addition, with labels for each part.

3. Bar Models for Each Operation:

Bar models for each mathematical operation, using colour differentiation and labels to clarify different parts.

4. Vocabulary Section:

- **Addition:** Terms like *addend* (numbers being added) and *sum* (the total).
- **Subtraction:** *Minuend* (the starting number), *subtrahend* (the number being subtracted), and *difference* (the result).
- **Multiplication:** *Multiplicand* (the number being multiplied), *multiplier* (the number it is multiplied by), and *product* (the result).
- **Division:** *Dividend* (the number being divided), *divisor* (the number it is divided by), and *quotient* (the result).
- **Fractions:** *Numerator* (the top number) and *denominator* (the bottom number).
- **Place Value:** Terms like *ones*, *tens*, *hundreds*, and so on.

5. **Accessibility Considerations:** Large, clear fonts, high-contrast colours, and considerations for colour blindness to ensure accessibility for all students.

This detailed approach in the vocabulary section will help students familiarize themselves with specific terms associated with each mathematical operation, reinforcing their understanding of each concept. The use of colour coding and labelling in the visual aids will further enhance their learning experience.

Early Years

Our working wall in Nursery and Reception will play an active role as part of our enhanced curriculum for Mathematics supporting the pictorial, concrete, abstract approach to learning. We will focus on number and number sense, number bonds, cardinality (the threeness of three) and counting, subitising, addition, subtraction, doubling, halving and place value. It will show examples of children's work and we will use the wall to support children's thinking threaded throughout the day (in child-initiated time and direct teaching times) to consolidate what has been taught, developed and discussed.

Maths specific SEN Interventions

- Number stacks – to target specific gaps in learning.