



GREAT ORTON PRIMARY SCHOOL

Mathematics Policy

2022

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Intent

We want the children to see Mathematics as being relevant to their world and applicable to everyday life as well as being something that they will need as they move on through their school life and ultimately to the world of employment.

It is important that children can explore Maths and present their findings not only in a written form but also visually and verbally; to that end the school will adopt the CPA approach: concrete, pictorial, abstract. This will allow the children to experience the physical aspects of Maths before finding a way to present their findings and understandings in a visual form before relying on the abstract numbers.

The school has been involved with the NCETM and NNW Maths Hub through the Maths Lead for the school being part of the Mastery Readiness Program. Our approach to planning and delivery of high quality teaching and learning is based around the 5 Big Ideas of Mastery in Mathematics produced by the NCETM.



Opportunities for Mathematical Thinking allow children to make chains of reasoning connected with the other areas of their mathematics. A focus on Representation and Structure ensures concepts are explored using concrete, pictorial and abstract representations, the children actively look for patterns as well as specialise and generalise whilst problem solving. Coherence is achieved through the planning of small connected steps to link every question and lesson within a topic. Teachers use both procedural and conceptual Variation within their lessons and there remains an emphasis on Fluency with a relentless focus on number and times table facts.

Implementation

Teaching and Learning - A 'Mastery' Approach

The teaching and learning of mathematics at Great Orton Primary School should include aspects of the following Mastery approach strategies in every lesson and/or over a series of lessons:



'Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths.' (Maths - no problem!)

CONCRETE

Concrete is the “doing” stage, using concrete objects to model problems. Instead of the traditional method of mathematics teaching, where a teacher demonstrates how to solve a problem, the CPA approach brings concepts to life by allowing pupils to experience and handle physical objects themselves. Every new abstract concept is learned first with a “concrete” or physical experience.

For example, if a problem is about adding up four baskets of fruit, the pupils might first handle actual fruit before progressing to handling counters or cubes which are used to represent the fruit.

PICTORIAL

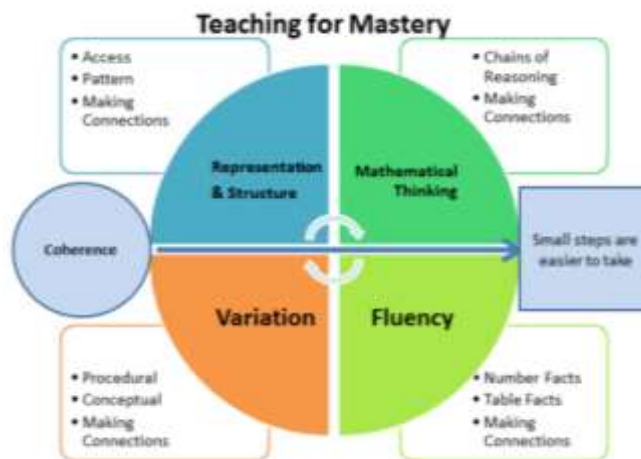
Pictorial is the “seeing” stage, using representations of the objects to model problems. This stage encourages pupils to make a mental connection between the physical object and abstract levels of understanding by drawing or looking at pictures, circles, diagrams or models which represent the objects in the problem.

Building or drawing a model makes it easier for pupils to grasp concepts they traditionally find more difficult, such as fractions, as it helps them visualise the problem and make it more accessible.

ABSTRACT

Abstract is the “symbolic” stage, where pupils are able to use abstract symbols to model problems (Hauser).

Only once a child has demonstrated that they have a solid understanding of the “concrete” and “pictorial” representations of the problem, can the teacher introduce the more “abstract” concept, such as mathematical symbols. Pupils are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols, for example +, −, x, ÷ to indicate addition, subtraction, multiplication, or division.



What is Fluency?

Fluency comes from deep knowledge and practice. This is the first stage of pupils' understanding.

Fluency includes: conceptual understanding, accuracy, rapid recall, retention and practice

- Accuracy – Pupils carefully completing calculations with no or few careless errors.
- Pace – Pupils are able to quickly recall the appropriate strategy to solve the calculation and progress through a number of questions at an age appropriate pace.
- Retention – Pupils will be able to retain their knowledge and understanding on a separate occasion to when the concept was first introduced.

The key to fluency is deep knowledge and practice and making connections at the right time for a child.

What is Reasoning?

Verbal reasoning demonstrates that pupils understand the mathematics. Talk is an integral part of mastery as it encourages students to reason, justify and explain their thinking. This is tricky for many teachers who are not used to focusing on verbal reasoning in their mathematics lessons. You might, for example, get young learners to voice their thought processes. Older students could take part in class debates, giving them the space to challenge their peers using logical reasoning.

Mathematical Talk

A mastery classroom should never be a quiet classroom. The way pupils speak and write about 5 mathematics transforms their learning. Mastery approaches use a carefully sequenced, structured approach to introduce and reinforce mathematical vocabulary. To encourage talk in mathematics, teachers may introduce concepts by including sentence structures (stem sentences). Pupils should be able to say not just what the answer is, but how they know it's right. This is key to building mathematical language and reasoning skills. This gives pupils the confidence to communicate their ideas clearly, before writing them down.

Example Stem Sentences:

The denominator is 5 because the whole has been divided into 5 equal parts.

The numerator is 3 because 3 equal parts have been shaded/circled.

Teachers then maintain a high expectation upon pupils to repeat and use the correct mathematical vocabulary to explain their understanding verbally and in their reflection comments. By also displaying the vocabulary during the lesson, pupils will be able to use this independently.

When questioning and encouraging mathematical talk, teachers should provide regular, purposeful opportunities. For example:

- Show me how to complete the calculation
- Teach your friend how to complete the calculation
- How do you know which operation to use?
- Why have you chosen this method?
- How else can you represent this number?
- What have you learnt today?
- True or False
- Odd one out
- Sometimes, always, Never

What is Problem Solving?

Mathematical problem solving is at the heart of the Mastery Approach. Pupils are encouraged to identify, understand and apply relevant mathematical principles and make connections between different ideas. This builds the skills needed to tackle new problems, rather than simply repeating routines without a secure understanding.

Mathematical concepts are explored in a variety of representations and problem-solving contexts to give pupils a richer and deeper learning experience. Pupils combine different concepts to solve complex problems, and apply knowledge to real-life situations. Through problem solving, pupils are required to select their mathematical knowledge and apply this to a new concept.

Problem solving is more than just word problems but the RUCSAC approach can be applied to

this style of question:

- 1) Read / look at the problem
- 2) Understand the problem by underlining or discussing: What is the problem about?
- 3) Choose – Choose the operation required, the number facts or the approach.
- 4) Solve – Solve the problem by completing jottings on the page
- 5) Answer – complete the answer to the problem
- 6) Check – have I correctly answered the given problem or is there another step?

Lesson Structure

- Mixed ability groupings / seating which allows children to work with different people over the course of time.
- Lots of talk—Reasoning/Mathematical Inquiry/Maths Talk/Use Mathematical Vocabulary
- Problem solving throughout – puzzles/investigations/misconceptions/corrections and mistakes
- Mini plenaries to share misconceptions, pose questions, challenge ideas
- Free access to manipulatives/concrete resources
- Feedback given to pupils at point of need, usually within the lesson – allowing teacher to adapt/extend/challenge or support immediately.

EYFS and Key Stage One

A daily maths session allows the children to develop their mathematical skills at an appropriate level using practical resources which is evidence through an online learning journal and children complete suitable written activities either on worksheets, White Rose workbooks or their maths books.

Key Stage Two

As children enter school on a morning they are given time on Doodle Maths until it is time for Register. After this the children then have a 15 minute TimesTables Rockstars session. This then leads into the maths sessions where children are taught in Upper and Lower Key Stage Groups.

Planning

At Great Orton Teachers follow the White Rose Planning for EYFS to Year Six. This provides the yearly overview and Medium Term planning for each year group. For calculation, we follow the White Rose Calculation Policy, which follows our Mastery Approach, should be adhered to and displayed in the classroom.

The current documents are saved in:

Staff Drive -> White Rose Maths Resources 2021

These include:

- Planning for each year group.
- Calculation Policy
- Reception guidance
- End of term assessments
- End of Block assessments
- Tracking spreadsheets

Number:

A large proportion of time is spent reinforcing number to build competency and fluency. Number is usually at the heart of any primary mastery scheme of learning, with more time devoted to this than other areas of mathematics. It is important that pupils secure these key foundations of mathematics before being introduced to more difficult concepts. This increased focus on number will allow pupils to explore the concepts in more detail and secure a deeper understanding. Key number skills are fed through the rest of the scheme so that students become increasingly fluent.

Planning should aim for all pupils to master the age group expectations of the National Curriculum by including rich, deep activities. Rapid graspers should not be accelerated through concepts, instead they should complete Challenge questions from NCETM, White Rose, Classroom Secrets etc.

The Yearly overview provides a Long Term Plan for each Year Group (See whole school Planning and Assessment Overview Appendix A) and is arranged into blocks.

WRM – Year 3 – Scheme of Learning 2.0s



	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	

Planning files are available for each term. Within these documents are list of the small steps to be taught, along with notes and guidance. It refers back to the main planning document as to when each block should be taught.

Comparing Statements

Notes and Guidance

Children use their knowledge of multiplication and division facts to compare statements using inequality symbols.

It is important that children are exposed to a variety of representations of multiplication and division, including arrays and repeated addition.

Mathematical Talk

What other number sentences does the array show?

If you know your 4 times-table, how can you use this to work out your 8 times-table?

What's the same and what's different about 8×3 and 7×4 ?

Varied Fluency

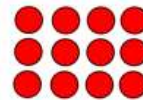
Use the array to complete the number sentences.

$3 \times 4 = \square$

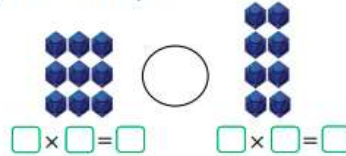
$4 \times 3 = \square$

$\square \div 3 = \square$

$\square \div 4 = \square$



Use $<$, $>$ or $=$ to compare.



$\square \times \square = \square$

$\square \times \square = \square$

$8 \times 3 \bigcirc 7 \times 4$

$36 \div 6 \bigcirc 36 \div 4$

Complete the number sentences.

$5 \times 1 < \square \times \square \quad 4 \times 3 = \square + 3$

Comparing Statements

Reasoning and Problem Solving

Whitney says,



8×8 is greater than two lots of 4×8

Do you agree?
Can you prove your answer?

Possible answer:
She is wrong because they are equal.



True or false?

$6 \times 7 < 6 + 6 + 6 + 6 + 6 + 6 + 6$

False

$7 \times 6 = 7 \times 3 + 7 \times 3$

True

$2 \times 3 + 3 > 5 \times 3$

False

Can you find three different ways to complete each number sentence?

$\square \times 3 + \square \times 3 < \square \div 3$

$\square \div 4 < \square \times 4 < \square \times 4$

$\square \times 8 > \square \div 8 > \square \times 8$

Possible answers include:

$1 \times 3 + 1 \times 3 < 21 \div 3$

$1 \times 3 + 1 \times 3 < 24 \div 3$

$1 \times 3 + 1 \times 3 < 27 \div 3$

$24 \div 4 < 8 \times 4 < 12 \times 4$

$16 \div 4 < 5 \times 4 < 7 \times 4$

$8 \div 4 < 3 \times 4 < 4 \times 4$

$4 \times 8 > 88 \div 8 > 1 \times 8$

$2 \times 8 > 80 \div 8 > 1 \times 8$

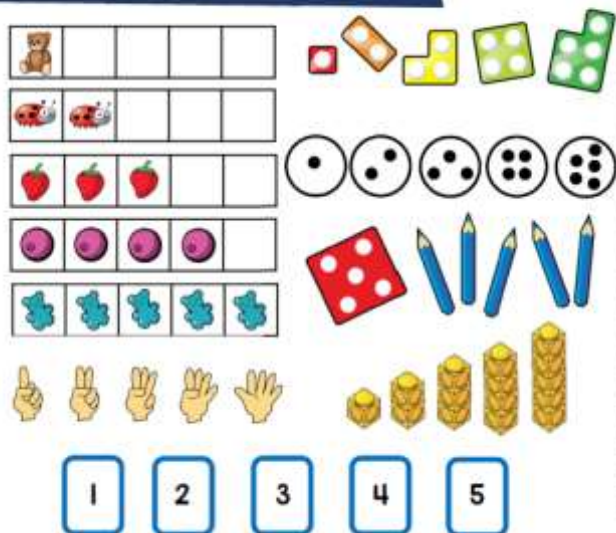
$6 \times 8 > 96 \div 8 > 1 \times 8$

Calculation policy

We follow the White Rose Maths Reception Guidance and Calculation Policy within school. This details the various methods and representations that the children will become familiar with in each year group.

Reception – Notes and Guidance

Key Representations



Skill: Add 1 and 2-digit numbers to 20	Year: 1/2
<p>$8 + 7 = 15$</p>	<p>When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.</p> <p>Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.</p>

These are located in:

Staff drive-> White Rose Maths Resources 2021

Times Tables

Times Tables are a mathematics 'Non-negotiable' and must be taught and then practised. TT Rockstars is available for the practice of times tables.

We teach times tables using the following progression:

Year 1 – Be able to count in multiples of twos, fives and tens

Year 2 - Be able to recall 2, 5 and 10 multiplication and division facts

Year 3 - Be able to recall 3, 4 and 8 multiplication and division facts

Year 4 - Be able to recall 6, 7 and 9 multiplication and division facts

Year 5/6 - application of multiplication and division facts to problem solving

NB: All times tables to be learnt up to 12×12

From 2021/22 Year 4 pupils will take an online Times Table test* which will be a timed assessment testing their speed of recall for multiplication and division facts.

TT Rockstars



TT Rockstars is an initiative for Year 2 – 6. It is a fun way to practise times tables. In school, awards are given for pupils who participate and make progress on TT Rockstars. A leader board is displayed in the school hall and updated regularly.

*The 'Sound Check' programme on TT Rockstars follows the exact structure of the 2020 Year 4 Times Table Test.

Pupils are expected to log onto TT Rockstars at home for 15 minutes per week.

In school, pupils complete the TT Rockstar Paper worksheets 3-5 times per week. Each worksheet is timed and takes 3 minutes and the results are recorded. At the start of the year, a baseline test is completed and then repeated at the end of the programme.

Children in Year Two complete a daily session of TTRockstars at the beginning of their maths lesson on the app, and within Key Stage Two the children have a daily 15 minute session where they complete the paper-based activity and then complete some time on the app. Lucy Shannon (Maths Subject Leader) will set up all of the pupils and staff with accounts and will support with the use of this application.

Resources

When resourcing and planning using the White Rose Planning, teachers to also choose resources which complement it and follow the Mastery Approach: Concrete, Pictorial and Abstract. Teachers have the flexibility to choose resources they feel are most effective to support the needs of all learners (differentiation) and ensure they achieve the aims of fluency, reasoning and problem solving.

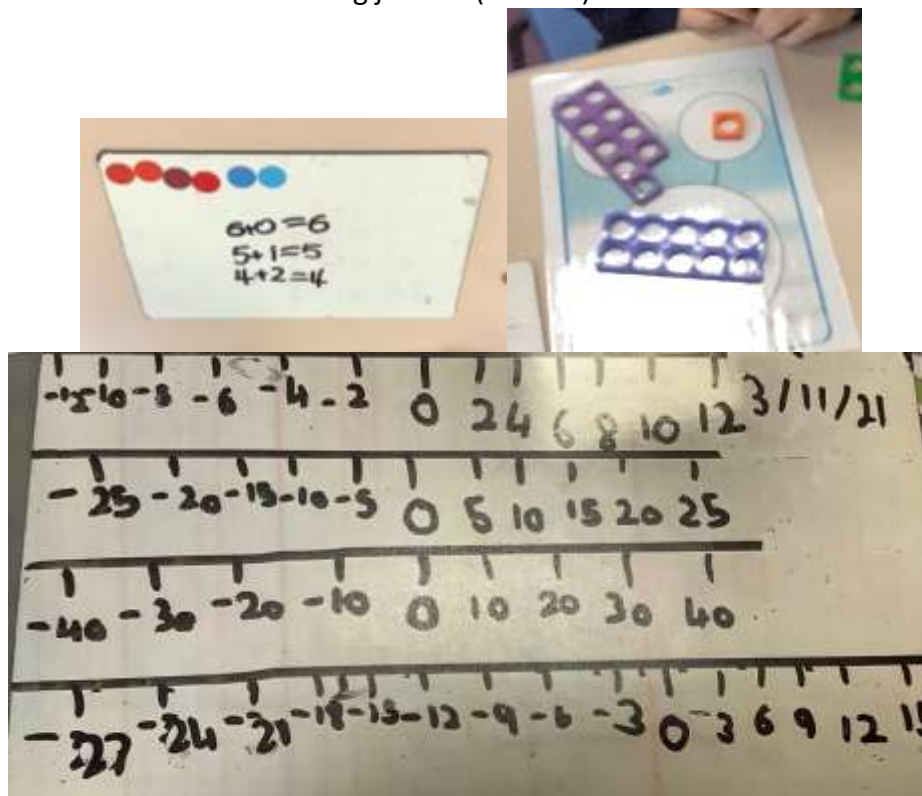
Resources are kept online, in classrooms and in the storage area within the school house building:

- A range of 'Concrete' manipulates e.g. fraction walls, counting beads, place value counters etc.
- Measuring equipment (Meter sticks, measuring jugs/cylinders, balance and weighing scales)
- White Rose Premium Subscription
- Classroom Secrets Website
- NCETM website
- Numberblocks
- NRich
- Twinkl website
- Master the Curriculum
- Diagnostic Questions
- Top Marks Maths online learning games

Recording of learning

Each child has a maths book with squared paper (EYFS 1.5cm square and Years One-Six 1cm squares). From Year One to Year Six children also work through the White Rose Workbooks for each block.

For practical activities work is recorded by photographs which can be stuck in books or uploaded to the child's online learning journal (Seesaw).



Within Maths books the date is to be written in figures e.g. 27.5.2021

Children are taught to write one digit per square.

Sheets to be stuck in should be trimmed to fit on the page.

Children may use their maths books as jotters – to record their learning when solving problems or as a space to complete working out.

Children are to write in pencil (pen only permitted with a pen licence) and corrections should be completed with pink pen.

Marking and feedback

Discussion at the point of learning is essential. A pupil should leave each lesson feeling successful and any misconceptions or concerns to be addressed immediately. Mini plenaries should be conducted throughout the lesson to check in on the progress of children and address any misconceptions at the point of learning. All teachers to follow the Marking Policy. On occasion and where appropriate, pupils should have the opportunity to self and peer mark their work but the teacher should always complete their own marking and assessment.

Staff are to mark in black pen and pupils are to respond to marking in pink pen to show corrections or completion of challenges given in response to their learning. Appropriate time should be given for children to respond to the marking (EYFS and KS1 at the beginning of the day during morning activities and for KS2 at the start of the maths lesson).

Give change

1 How much change would you get from a £10 note?

a £5 and p ✓

b £2 and p ✓

c £2 and 80p and p ✓

d £8 and 50p and p ✓

e £2 and 75p and p ✓

2 Anne buys some veggie. She pays with a £5 note. She gets this change. Has Anne been given the correct amount of change? ✓

3 Hannah buys a hot chocolate for £2 and 90p. He pays with a £5 note. How much change does he get? and p

Assessment of Maths

There are frequent opportunities to assess in mathematics. Staff work closely with children to check for errors and misconceptions within daily lessons.

Formative assessment – completed regularly to inform planning and teaching

- Questioning
- Completed written work
- Observation of practical activities
- TTRockstars – paper based learning and online
- End of block assessments
- Review of completed work in White Rose workbooks

Children will be assessed at the start of each block within mathematics using the previous year group's end of block assessment to gauge the children's level of retention and understanding. The children will then complete the appropriate end of block assessment as to what they have been learning to check for progress. These assessments will take place throughout the academic year.

Summative assessment

Children will complete End of Term assessments at the end of Autumn, Spring and Summer Terms. These assess the learning that has been taught that term and so applies to the blocks covered in that term. This will allow staff to check for any concepts that have not been retained or that need further consolidation. This data will be used to track children's progress throughout school.

At the end of term, teachers attend pupil progress meetings to share data and discuss pupils who are not on track and suitable interventions that can take place.

Children are assessed at the end of EYFS, Year Two and Year Six for mathematics as part of the end of Key Stage assessments.

All assessments can be found in:

Staff drive -> White Rose Maths Resources 2021

Staff are to use the End of Block trackers and the End of Term RAG spreadsheets to record the results.

There are no official grade boundaries for the White Rose Assessments, however within the end of block and end of term assessments the following percentages are used as a guide as to where children are within that year groups expectations:

- 0% - 29% Working below the year group expectations.
- 30% – 59% Working towards the year group expectations.
- 60% - 79% Working at the year group expectations.
- 80% - 100% Working at greater depth for the year group.

Key Stage One SATS – a consistent score of 60% (21/35) would indicate “Expected” and 85% (30/35) would indicate Great Depth.

Key Stage Two SATS - a consistent score of approximately 55% (28/50) would indicate Expected’ and 86% (43/50) would indicate ‘Greater Depth’.

Classroom Environment

Mathematics should be visible in all classrooms. This could be an interactive display on the wall and/or a Maths table.

Expectations:

- Relevant concrete apparatus should be readily available for all pupils to refer to.
- Key vocabulary, pictorial and abstract representations should be visible for reference.
- Relevant sections of our academy's Calculation Policy to be displayed (either directly from the policy document or another child friendly version e.g. pupils' poster)

Homework - Online Learning Applications



To support children with their fluency of multiplication and division facts the children have access to the online learning application: TimesTables Rockstars. The Key Stage Two children have a 15 minute time allocation daily to complete a paper based times table activity match to their level and then have time to access and complete a daily session using the online platform.

KS1 children begin to access this after the children have covered multiplication and division in Year One and use this as part of their maths lessons.

The children also use DoodleMaths as an online learning tool to support the children at a level appropriate to them and staff also use this to set focused work based on the concept being taught within the maths lesson.

Children are expected to complete 15 minutes of TTRockstars at home each week.

Children will also be set "extras" to complete on DoodleMaths which will consolidate what they have been learning in class. Along with this children can complete their daily learning (- a day) and will be given new learning at an appropriate stage for them to progress. Children are challenged to collect stars and this is celebrated in our weekly assemblies.

Impact

Through following our maths curriculum our children will be equipped with the mathematical skills they will need for life. They will be proficient with the four operations and be able to apply their problem solving and reasoning skills to everyday situations e.g. using money, measuring and handling data. Children will feel confident in approaching mathematical problems and be able to use a range of strategies to solve these. Children will demonstrate their skills in a range of ways using the CPA approach and will show mastery in being able to explain their thought processes. Finally, children will have a love of maths and enjoy their maths lessons as it allows them to make connections and access other areas of the curriculum.

This will be evident in the KS1 and KS2 mathematics results and from the multiplication tables check within Year Four. It will also show within the wider curriculum as the children use their skills in other subjects such as science and design technology.

COVID adaptations

In light of the affect COVID has had on teaching and learning from 2020, the curriculum has adapted to meet the needs of our learners.

Children should we be assessed to see where they are at and taught from there as to progress they need to have a secure understanding of previous concepts. (Ready to Progress DfE June 2020).

From Spring Term 2021 the children have been reassessed when returning to school and children are being taught at a level that best supports their understanding and allows them to progress through the objectives.