



*Aim High*

*Never Give Up*

*Follow Your Dream*

*Lead By Example*

# MATHEMATICS POLICY

Mathematics is an incredibly creative and highly inter-connected area of learning that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary in most forms of employment. A high-quality mathematics education, therefore, provides a foundation for understanding the world, the ability to reason mathematically and a sense of enjoyment and curiosity about the subject.

Ratified By	Curriculum Committee
Date	08/02/2021
Minute	10
Review Date	Spring 2024
<b>Policy Statement</b>	
What is the policy for?	A framework for teaching of Mathematics across the school
Who has devised and contributed to this policy?	The policy has been written by the subject leader and staff in school have been fully consulted
How will this policy be communicated?	Website and 365
How will this policy be monitored?	As outlined in the policy
Which other policies are linked to this policy?	EYFS policy Feedback and Assessment Policy SEN policy Homework Policy Acceptable Use

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## **Aims**

### **Intent - What are we trying to achieve?**

The National Curriculum for mathematics, and by extension Norwood Primary School, aims to ensure that all pupils:

- *become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems*
- *can reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language*
- *can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions*

The National Curriculum for Mathematics is a Mastery Curriculum and through our beliefs, approaches, provision and implementation we aim to ensure that in addition to the statements above, all pupils:

- *develop positive attitudes towards mathematics, an awareness of the relevance of mathematics in the real world and its necessity for most forms of employment*
- *develop capability, flexibility and confidence in using and applying mathematical knowledge, concepts and skills within the mathematics curriculum and understand the importance of Mathematics in wider curriculum subjects such as Science, ICT, Art and beyond.*
- *develop resilience and wider strategies when solving problems*
- *develop intrinsic creativity and motivation to work both independently and in cooperation with others*
- *develop confidence when talking about mathematics using mathematical language whereby the children can openly discuss different strategies, share their ideas and learn from mistakes collaboratively*

### **Implementation – How is the curriculum being delivered?**

We use a combination of resources to meet the National Curriculum Programme of Study for Mathematics. The primary resource is [White Rose Maths](#), but this is used in conjunction with: the [NCETM Spine Materials](#), [Ready-to-Progress DfE Guidance](#), [Oak National Academy](#), and [Nrich](#).

Our curriculum objectives are divided into strands and year group objectives in line with the National Curriculum expectations:

- Place Value
- Number
- Measurement
- Geometry
- Statistics

Long, medium and short term planning and teaching is supported by the White Rose resources, which are designed by expert teachers, but adapted and complemented by teachers at Norwood

Primary School with the resources above as necessary. Additionally, White Rose long term planning identifies how the National Curriculum objectives are sequenced to be taught, provides links to prior learning and formative assessments. Each Strand is revisited and developed each year to consolidate and build the knowledge, skills and understanding reflected in the National Curriculum Programmes of Study across all Key Stages.

Within lessons, learning for all pupils is designed to follow a Mastery Curriculum which aims to:

- intrinsically engage and motivate
- move the class as one – supporting all children to reach age appropriate learning using differentiation and intervention to close gaps.
- use a CPA (Concrete, Pictorial, Abstract – see appendix A) approach with a wide range of practical resources and visual representations used and built upon across all Key Stages
- incorporate 'Procedural and Conceptual Variation' (See appendix B) to lead to 'routine and non-routine' problem solving. (See appendix C)
- provide opportunities to use 'Maths Talk' (see appendix D) to develop 'Number Sense.' (see appendix E)
- provide opportunities to develop 'Chains of Reasoning.' (see appendix F)
- explicitly teach the '8 Problem Solving Strategies' (such as tabulation, bar modelling, comparison etc – see appendix G) in age appropriate stages increasing the complexity of the challenge accordingly to build on prior learning/teaching.
- utilise a wide range of 'Teaching Techniques' (See appendix H) such as 'Goal Free Problems,' 'Same Structure Different Depth' and 'Low Threshold High Ceiling.'

A Curriculum Map is available on the school's website so that parents/carers are able to support their child's learning at home. (Yet to be added to website)

### **Impact - What difference is the curriculum making?**

Our Mathematics curriculum teaches essential life skills for modern children. It will help them to become active participants in their world and prepare them for navigating it independently and responsibly as they mature.

Mathematics will promote the pupil's spiritual, moral, social and cultural development by ensuring they understand that their moral code applies to their engagement with others through collaborative sharing of ideas and learning.

Mathematics will promote British Values by ensuring children understand the importance of and practice mutual respect.

Mathematics will help pupils develop a Growth Mindset by demonstrating that problems are solvable by unpicking them logically using the strategies they have been taught.

## **White Rose Maths**

The ethos and approach of this resource is

- Authored by primary mathematics specialists
- In-built CPD for teachers: learn as you plan
- A full scheme of work, easily adaptable to your teaching needs
- Flash backs to prior learning
- End of Block assessment tools to identify and close gaps
- Clear progression of skills and learning throughout, EYFS, KS1 & KS2
- Relevant reasoning and problem solving opportunities

Further information can be found at [White Rose Maths](#).

## **Arithmetic**

Arithmetic is taught discretely through our Number and Lightning program in addition to White Rose Maths. Year group specific arithmetic skills and methods (outlined in the Calculation Policy - being written currently) are taught from Y1 to Y6 and assessed weekly with children (where appropriate) tracking their progress within each of the subcategories of Number and Place Value, Addition, Subtraction, Multiplication, Division, Fractions, Decimals and Percentages. Teachers identify and track individual and cohort areas of weakness to explicitly teach to close gaps in knowledge, skills and understanding within this part of the Mathematics Curriculum.

## **Assessment**

Norwood School uses a wide range of formative (teachers in class) and summative assessment (White Rose end of Block Assessments and PiXL Assessments Y1 to Y6) strategies throughout the year as detailed on the assessment timetable. The summative PiXL assessments are entered onto 'Mark Entry Spreadsheets' and uploaded to PiXL, who then return question level analysis for our school and comparison data for 'Family Schools', which individual teachers and SLT use in combination with other historic data to identify trends, design PD and set attainment targets. These targets are regularly reviewed through in depth pupil progress meetings.

## **Legislation and guidance**

This policy reflects the requirements of the [National Curriculum programmes of study](#), which all Maintained schools in England must teach.

It also reflects requirements for inclusion and equality as set out in the [Special Educational Needs and Disability Code of Practice 2014](#) and [Equality Act 2010](#), and refers to curriculum-related expectations of governing boards set out in the Department for Education's [Governance Handbook](#).

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In addition, this policy acknowledges the requirements for promoting the learning and development of children set out in the [Early Years Foundation Stage \(EYFS\) statutory framework](#).

## **Roles and responsibilities**

### **The governing body**

The governing body will monitor the effectiveness of this policy and hold the headteacher to account for its implementation.

### **The governing board will also ensure that:**

- *A robust framework is in place for setting curriculum priorities and aspirational targets*
- *Enough teaching time is provided for pupils to cover the National Curriculum and other statutory requirements*
- *Provision is made for pupils with different abilities and needs, including children with special educational needs (SEN)*
- *The school implements the relevant statutory assessment arrangements*
- *It participates actively in decision-making about the breadth and balance of the curriculum*
- *It fulfils its role in processes to disapply pupils from all or part of the National Curriculum, where appropriate, and in any subsequent appeals*

### **Headteacher**

The headteacher is responsible for ensuring that this policy is adhered to, and that:

- *All required elements of the curriculum, and those subjects which the school chooses to offer, have aims and objectives which reflect the aims of the school and indicate how the needs of individual pupils will be met*
  - *The amount of time provided for teaching the required elements of the curriculum is adequate and is reviewed by the governing board*
  - *Where appropriate, the individual needs of some pupils are met by permanent or temporary disapplication from all or part of the National Curriculum*
  - *They manage requests to withdraw children from curriculum subjects, where appropriate*
  - *The school's procedures for assessment meet all legal requirements*
  - *The governing board is fully involved in decision-making processes that relate to the breadth and balance of the curriculum*
  - *The governing board is advised on whole-school targets in order to make informed decisions*
- Proper provision is in place for pupils with different abilities and needs, including children with SEN*

### **Subject Leader**

The subject leader is responsible for leading and managing their subject. They will ensure that:

- *They create a Subject Leader Action Plan, which forms part of the School Improvement Plan. The Subject Leader Action Plan outlines the key actions and success criteria for each academic year.*

- *The Subject Leader Action Plan is shared with governors once a year so that they have the opportunity to scrutinise subject leaders.*
- *The attainment and progress of the pupils across the school is analysed at least three times a year and feedback to governors is given once a year.*
- *Staff are confident in teaching their subject across the school. They will offer support, guidance and arrange training when needed.*
- *Resources to support teaching, learning and assessment are in place for their subject. They will need to manage their allocated budget so that the actions set out in the Subject Leader Action Plan and School Improvement Plan can be met.*

## **Other staff**

Other staff will ensure that the school curriculum is implemented in accordance with this policy.

## **Inclusion**

Teachers set high expectations for all pupils. They will use appropriate assessment to set ambitious goals and plan challenging work for all groups, including:

- *More able pupils*
- *Pupils with low prior attainment*
- *Pupils from disadvantaged backgrounds Pupils with SEN*
- *Pupils with English as an additional language (EAL)*

Teachers will plan lessons so that pupils with SEN and/or disabilities can study every National Curriculum subject, wherever possible, and ensure that there are no barriers to every pupil achieving.

Teachers will also take account of the needs of pupils whose first language is not English. Lessons will be planned so that teaching opportunities help pupils to develop their English, and to support pupils to take part in all subjects.

Further information can be found in our statement of equality information and objectives, and in our SEN policy and information report.

## **Monitoring arrangements**

Governors monitor coverage of National Curriculum subjects and compliance with other statutory requirements through:

- *Meeting with subject leaders*
- *Monitoring books*
- *Interviewing pupils*
- *Scrutinising parent, staff and pupil surveys*
- *Visiting the school to monitor the quality of teaching and audit the books*
- *Attending the School Improvement Evening where all subject leaders share their subject action plans*

Subject leaders monitor the way their subject is taught throughout the school by:

- *Scrutinising planning & books*
- *Conducting learning walks*
- *Observing lessons*
- *Professional dialogue with staff*
- *Interviewing the pupils*
- *Ensuring that staff are trained*

Subject leaders monitor the way their subject is taught throughout the school by also have responsibility for monitoring the way in which resources are stored and managed.



## **Appendix A – CPA Approach**

The Concrete Pictorial Abstract (CPA) approach is a system of learning that uses physical and visual aids to build a child's understanding of abstract topics.

Pupils are introduced to a new mathematical concept through the use of **concrete** resources (e.g. fruit, Dienes blocks etc). When they are comfortable solving problems with physical aids, they are given problems with pictures – usually **pictorial representations** of the concrete objects they were using.

Then they are asked to solve problems where they only have the **abstract** i.e. numbers or other symbols. Building these steps across a lesson can help pupils better understand the relationship between numbers and the real world, and therefore helps secure their understanding of the mathematical concept they are learning.

C – Concrete - **Must** be physical, hands on, real resources linked to the area of maths you are addressing.

P – Pictorial - Strong links **must** be made to previous, concrete task and is a visual way of recording what has just been experienced/learned. Might be a diagram, but any drawn/pictorial representation is valid.

A – Abstract - Builds on pictorial representations and allows solving of real-life, routine and non-routine single and multi-step problems. Strong links **must** be made to the concrete and pictorial.

[CPA explained simply!](#)

## **Appendix B – Variation**

Variation is not the same as variety!

Variety is a 'Pick and mix' approach where there are numerous isolated questions to complete - Most practice exercises contain variety. *Variety can be useful e.g. when assessing understanding or using a skills or procedure in different contents.*

Variation is a considered and deliberate choice of WHAT to vary from question to question to draw attention to specific details or features. *Variation is critical to gaining a deep understanding of what is happening and therefore is more likely to be retained.*

*"Variation - If a child sees the same concept represented in a number of carefully planned ways it brings the focus of their attention to that important idea or concept. The variation of one aspect,*

*with other aspects kept the same, helps children spot patterns, structures and relationships that could otherwise be lost in the complexities of the usual 'variety' in practice."*

*Askew, M. (2011) Transforming Primary Mathematics, Routledge*

Variation can be split further into Conceptual Variation and Procedural Variation.

Conceptual Variation: is variation of the graphical representation of the concept. *(how it looks)*

Procedural Variation: is dynamic; where I move between one calculation and the next there is a connection. *(Use what you have just done to help you with what to do next)*

## **Appendix C– Routine and Non-Routine Problem Solving**

Routine Problem Solving:

- Straight forward question with only one answer. (closed)
- A question presented in a clear and easy to understand way requiring an application of a skill.

Non-Routine Problem Solving:

- Question with more than one solution (open ended).
- A question presented in an unusual way requiring mathematical reasoning in addition to the application of a skill.

## **Appendix D – Maths Talk**

These are planned, explorative conversations that require children to reason mathematically, explain, evaluate, make new connections and modify their approaches to numbers and calculations in particular but can be applied to other areas of maths.

## **Appendix E – Number Sense**

This is the ability to see numbers and calculations in many different ways to facilitate an efficient and accurate approach.

For example, the calculation  $18 \times 5$  could be completed in the following ways (this list is not exhaustive):

Counting 18 5's     $(10 \times 5) + (8 \times 5)$      $9 \times 10$      $(20 \times 5) - (2 \times 5)$      $9 \times 5 \times 2$

## **Appendix F – Chains of Reasoning**

A chain of reasoning is a series of connected explanations whereby each explanation cannot be made without first explaining the previous one.

**...reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language

National Curriculum: mathematics programme of study (July 2014)

**Mathematical reasoning** involves thinking through mathematical problems logically in order to arrive at solutions. It also involves being able to identify what is important and unimportant in solving a problem and to explain or justify a solution

NCETM

**The essence of reasoning is ‘because, or ‘if... then... .’ But in order to make sense, what is offered as the ‘because’ has to be more certain than what is being justified (the answer).**

Mason, J. 2001 Opening address to QCA conference: Questions about Mathematical reasoning and proofs in schools

## **Appendix F – 8 Problem Solving Strategies**

These are the main methods/approaches that are required for effective problem solving and are often used in combination – they must be explicitly taught.

- Step-by-Step
- Using the inverse and working backwards
- Make a Table
- Comparing
- Label Everything
- Draw a Bar Model
- Trial and Improvement
- Draw a Picture or Diagram

## **Appendix G – Reasoning and Problem Solving Teaching Techniques**

**Goal Free problems** – giving Sats style questions but removing the question from the task and asking children to work out whatever they can from the rest of the information – they will often find the answer to the original question.

**SSDD** – Same structure different depth. These puzzles keep the overall conceptual look but the information given or the maths involved varies from question to question.

**Odd One Out** – Giving the children 4 images or numbers and asking them to find the odd one out. Any mathematically correct statement is acceptable.

**Sometimes, Always, Never** – Giving the children mathematical statements for them to explore and decide if the statement is true.

**If...then...because** – these are sentence stems for explaining how you know something to be true or for generating new facts.

**Low Threshold, High Ceiling** – Part of becoming a resilient mathematician is learning to recognise what it feels like to be stuck, and what strategies can be useful in getting yourself unstuck. A Low Threshold High Ceiling task means everyone can get started, and everyone can get stuck. The threshold (starting point) needs to be mathematically accessible for all the students in the group, that is, everyone needs to have the prior mathematical knowledge required to start working on the problem. Low Threshold High Ceiling tasks are designed to have lots of built-in extension opportunities, so that there are harder questions to be asked and more challenging problems to solve. This means that all learners can potentially reach a point where they don't immediately know what to do next, and they can start to develop their resilience and learn fruitful strategies for making progress when they feel as if they've come up against a brick wall. (Nrich is filled with HTLC tasks)

**Purposeful Practice** – this is a task that you might give to children who have mastered a skill but you wish them to practice it without the need for completing 6 or 7 dry calculations. In the example below you wish children to practice adding fractions with different denominators and this open ended task forces them to do that whilst having real purpose.

### Make Me Whole

Here is a set of six fractions – choose some of the fractions and add them together. You can use as many as you like but only once in a calculation. How close can you get to a total of 1?

$\frac{1}{6}$	$\frac{1}{25}$	$\frac{3}{5}$	$\frac{3}{20}$	$\frac{5}{8}$	$\frac{4}{15}$
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## Complete the Set – this is using Venn diagrams to challenge thinking

