Maths Policy

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Mathematics

Introduction

'**Mathematics is a creative and highly inter-connected discipline 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 for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.**'

(National Curriculum, 2014)

Intent

At Wraysbury Primary School we want to ignite a sense of curiosity of maths in our children and ensure that they enjoy the subject. Our intent in maths is to ensure that the children become fluent in the fundamentals, can reason mathematically and can solve problems by applying their learning to varied situations with confidence.

We plan and deliver lessons that are creative and engaging and we want our learners to make rich connections across mathematical ideas and concepts, in order to develop competence in mathematics. We want our learners to be confident and able to apply their mathematical knowledge to other aspects of our curriculum, especially in subjects such as Science. We want learners to understand the importance of understanding mathematics and how it is essential to everyday life, critical to science, technology and engineering and the way it supports us in our classrooms, our home-lives and in the workplace. We use mistakes and misconceptions as an essential part of learning and provide challenges through rich and varied problems. We encourage children to use approaches, which work for them, by equipping them with a range of efficient strategies and ensuring an understanding of them.

Our medium and long term plans and sequencing of lessons follow predominately the White Rose mastery approach (Reception through Year 6) and the Ready to progress criteria developed by NCETM where the goal is to deepen understanding so that each lessons builds upon the last. White Rose takes a Mastery Approach, the belief that all pupils are capable of understanding and doing Maths. A Mastery Curriculum where new concepts are built upon and connections are made. Achieving Mastery, encouraging children to know why and being able to use knowledge appropriately, flexibly and creatively and to apply it to unfamiliar situations. Mathematical concepts and skills are broken up across the key stages. A concept is taught and will be revisited the following year, but in greater depth in order to build upon prior knowledge. We start with number (place value, addition/subtraction, multiplication/division [KS2]) which is consolidated first before moving on to measurement, statistics and geometry. This is important as the children will them be able to use their number skills and then apply it to the other mathematical disciplines.

Staff are aware and sensitive to the needs of all pupils. We ensure that all pupils have access to the curriculum and utilise a wide range of maths manipulatives that are demonstrated in the White Rose approach. Based on the mastery approach, pupils who are sound with their fluency deepen their understanding with reasoning and problem solving. Pupils who are struggling to grasp a concept will have support. Each pupil is catered to with differentiated learning within the scope of each lesson.

KEY STAGE 1 See White Rose PROGRESSION MAP

Knowledge	Skills
By the end of KS1, pupils will be able to: **Number** • count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward • recognise the place value of each digit in a two-digit number (tens, ones) • identify, represent and estimate numbers using different representations, including thenumber line • read and write numbers to at least 100 in numerals and in words • use place value and number facts to solve problems. **Addition and Subtraction** add and subtract numbers using concreteobjects, pictorial representations, and mentally, including: • a two-digit number and ones • a two-digit number and tens • two two-digit numbers • adding three one-digit numbers • show that addition of two numbers can bedone in any order (commutative) and subtraction of one number from another cannot • recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing numberproblems. **Multiplication and Division** • recall and use multiplication and division factsfor the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • calculate mathematical statements for multiplication and division within the multiplication tables and write them using themultiplication (×), division (÷) and equals (=) signs • show that multiplication of two numbers canbe done in any order (commutative) and division of one number by another cannot **Fractions** • recognise, find, name and write fractions of a length, shape, set of objects or quantity • write simple fractions and recognise the equivalence	• Pupils to have developed fluency skills, enabling them to manipulate simple number mentally, physically, practically and begin to use these skills when problem solving. • compare and order numbers from 0 up to 100; use <, > and = signs solve problems with addition and subtraction: • using concrete objects and pictorial representations, including those involving numbers, quantities and measures • applying their increasing knowledge of mental and written methods • recall and use addition and subtraction facts to 20 fluently, and derive and use related factsup to 100 • solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Measurement • choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels • recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value • tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times • know the number of minutes in an hour and the number of hours in a day. **Geometry (Shape)** • identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line • identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces • identify 2-D shapes on the surface of 3- D shapes, [for example, a circle on a cylinder and a triangle on a pyramid] **Geometry (Position and Direction)** • order and arrange combinations of mathematical objects in patterns and sequences • use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three quarter turns (clockwise and anticlockwise). **Statistics** • interpret and construct simple pictograms, tally charts, block diagrams and simple tables • ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity • ask and answer questions about totalling and comparing categorical data.	• compare and order lengths, mass, volume/capacity and record the results using >, < and = • find different combinations of coins that equal the same amounts of money • solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change • compare and sequence intervals of time • compare and sort common 2-D and 3-D shapes and everyday objects. • interpret and construct simple pictograms, tally charts, block diagrams and simple tables • ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity • ask and answer questions about totalling and comparing categorical data.

KEY STAGE 2 See White Rose Progression Map

Knowledge	Skills
By the end of KS2, pupils will be able to: **Number and Place Value** • read, write, order and compare numbers up to 10,000,000 and determine the value of eachdigit • round any whole number to a requireddegree of accuracy • use negative numbers in context, and calculate intervals across zero	• Pupils to have embedded fluency skills, enabling them to manipulate number mentally,physically and using appropriate methods, and apply this to real life contexts. • solve number and practical problems that involve all of the above.
Four Operations • multiply multi-digit numbers up to 4 digits bya two-digit whole number using the formal written method of long multiplication • divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for thecontext • divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpretingremainders according to the context • perform mental calculations, including with mixed operations and large numbers • identify common factors, common multiples and prime numbers	• use their knowledge of the order of operations to carry out calculations involvingthe four operations • solve addition and subtraction multistep problems in contexts, deciding which operations and methods to use and why • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of aproblem, an appropriate degree of accuracy.
Fractions • use common factors to simplify fractions; usecommon multiples to express fractions in the same denomination • compare and order fractions, including fractions > 1 • add and subtract fractions with different denominators and mixed numbers, using theconcept of equivalent fractions • multiply simple pairs of proper fractions, writing the answer in its simplest form • divide proper fractions by whole numbers • associate a fraction with division and calculate decimal fraction equivalents [forexample, 0.375] for a simple fraction • identify the value of each digit in numbers given to three decimal places and multiply anddivide numbers by 10, 100 and 1,000 giving • answers up to three decimal places • multiply one-digit numbers with up to twodecimal places by whole numbers	

Ratio and Proportion • solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts • solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison • solve problems involving similar shapes where the scale factor is known or can be found • solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.	• solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts • solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison • solve problems involving similar shapes where the scale factor is known or can be found • solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.
Algebra • use simple formulae • generate and describe linear number sequences • express missing number problems algebraically • find pairs of numbers that satisfy an equation with two unknowns • enumerate possibilities of combinations of two variables.	
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 three decimal places • convert between miles and kilometres recognise that shapes with the same areas can have different perimeters and vice versa • recognise when it is possible to use formulae for area and volume of shapes	• solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate • calculate the area of parallelograms and triangles • calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units [for example, mm3 and km3].
Geometry (Shape) • draw 2-D shapes using given dimensions and angles • recognise, describe and build simple 3- D shapes, including making nets • illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius • recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.	• compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons

Geometry (Position and Direction) • describe positions on the full coordinate grid (all four quadrants) • draw and translate simple shapes on the coordinate plane, and reflect them in the axes. **Statistics** • interpret and construct pie charts and line graphs and use these to solve problems • calculate and interpret the mean as an average.	• interpret and construct pie charts and line graphs and use these to solve problems • calculate and interpret the mean as an average.

Implementation

Teaching across the school is a gradual progression. It is widely appreciated that a child's mathematical understanding is greatly influenced during their early years of life. We strive to ensure that children's first experiences of mathematics within school are both positive and practical. In EYFS, maths is taught primarily through play-based activities, working with concrete manipulatives, with little emphasis on formal written recordings. These recordings take the form of photographs, observations and problem-solving through play mark making and talking.

The principal focus of mathematics teaching in Key Stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. In KS1 there is still a large emphasis on concrete manipulatives, connections to everyday life, repetition and consolidation of basic number skills that can be applied to calculations. They then progress to using pictorial representations of the object, and ultimately, abstract symbols. Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at Key Stage 1.

In KS2 we ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. Calculations are secured. We ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers and there is an emphasis on reasoning and problem solving to deepen understanding. Fluency, reasoning and problem solving are usually seen within a lesson. Times tables are consolidated to the 12 times table by Year 4 who prepare for the MTC. Some manipulatives are still used for place value, decimals, weight, shape (2D and 3D). Maths tools like times table grids, 100s square and place value chart are also used.

Across the school, manipulatives are used during many lessons, introductory question(s) that links to the previous lesson before beginning the next step, discussions about problems and strategies, differentiated work, purposeful questioning, linking to real life, etc

The principal focus of mathematics teaching in Upper Key Stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers, again using the CPA approach. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.

By the end of Year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages. Pupils should read, spell and pronounce mathematical vocabulary correctly.

Maths is taught in mixed ability classes across KS1 and KS2.

Calculation Policy
This calculation policy is used to support children to develop a deep understanding of number and calculation. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations.

Concrete representation— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.
Pictorial representation – a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations , such as a diagram or picture of the
problem.
Abstract representation—a pupil is now capable of representing problems by using mathematical notation, for example 12 x 2 = 24.

It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations.

Impact
Progression is mapped out through the school using long term planning, which shows what topics are covered across each year group. Books show progress for each child over time and in lessons by: having work that is pitched at the right level, it gets increasingly challenging, there is verbal or written feedback recorded to address misconceptions. At the end of KS1 and KS2 students will have a love of maths. Pupils will able to have discussions and "think mathematically" and use skills such as reasoning, conjecturing, generalising and working systematically. Utilising Cultural Capital, our children learn maths as something that is fundamentally useful and can link it to real life situations (keeping track of time, financial matters, graphs depicting geographical/historical/scientific information [e.g. climate change], patterns in art, etc.).
The maths curriculum is monitored and evaluated across the school by:

- Lesson observations
- "Book looks"
- Questionnaires
- Pupil Progress meetings
- Target Tracker

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.

Homework
In Year 1, Maths is set through their topic. In Year 2 Maths homework is set most weeks. It is our aim to use maths homework as a learning tool to support classroom teaching so methods are often shown on the homework to help the parents.

In Key Stage 2, teachers set homework using Times Tables Rock Stars. Children are set homework depending on which time tables they are learning. The children are encouraged to go on and play daily in addition to the homework set.

Time Allocation

Maths lessons take place on a daily basis, lasting approximately 45 minutes in Key Stage 1 and 60 minutes in Key Stage 2. In key Stage 2 maths can be taught as a double lesson depending on timetabling arrangements.

Maths Calculations Policy
There is a separate Calculations Policy, which covers how the four main operations (addition, subtraction, multiplication, division) are taught progressively from Reception to Year 6. Each class teacher will be familiar with this policy and teach these operations in accordance with it, to ensure continuity throughout the school and each phase.

Recording
Children are taught to record their work in a well organised form. They are encouraged to develop their own methods of recording the results of using and applying maths, to show their individual thought processes. Similarly, they are encouraged to adopt methods of recording which are appropriate to the activities being undertaken.

Work is recorded in books of squared paper or on file paper according to the age, ability of the child and the appropriate recording method for the task or investigation.

Classroom Management
The organisation within the classroom enables children to:

- Work independently to develop their own strategies
- Work in small groups to share experiences and value the ideas of others
- Work in guided maths groups with the teacher or TA
- Take part in whole class discussion and activities
- Have free access to resources at all times
- Be encouraged to develop autonomy by enabling them to develop individual problem solving strategies.

Each class is encouraged to have an informative maths display which children can refer to – this can include 2D and 3D shape properties, number lines, fractions of shapes, mathematical language etc.

Short term planning
The weekly planning grid identifies the objectives to be taught, , the activities to be undertaken ŧThere should be no more than three levels of differentiation in any tasks to be set and each task should be closely related to the learning intentions.

The weekly plan will also show AFL and plans are encouraged to be changed/altered on a daily basis. Each lesson planned includes a whole class oral / mental starter, a main activity, followed by a plenary. However, when appropriate, this structure is flexible

The Headteacher and Maths Subject Leader has access to these plans on a regular basis to monitor continuity and progression within phases and across the whole school.

Assessment, Record Keeping, Monitoring of Progress and Target Setting
In Key Stage 1 and 2 formative assessment is undertaken by teachers on a daily basis, through direct observation, photographs, marking of children's work and though discussion in the plenary session. Continual assessment by the teacher will guide planning and teaching.

Target Tracker ~~sheets~~ will be used throughout the school from Year 1 to monitor children's progress, to assist planning and to inform the class teacher of a child's mid-term and end-of-year results.

Assessment

Teachers use a variety of summative assessments to assess the children over the year to show that knowledge and skills have been embedded. These may be White Rose end of term assessments, prove it questions, targeted questions etc. An end of year a judgement is made based on the KPIs.

Year 2 and Year 6 will also use the National Standardised Tests in the summer term.

It is the role of the Maths Subject Leader to ensure that the teachers are completing Target Tracker, while also ensuring that children's books are marked in line with the policy. Observations and feedback to teaching staff will occur.

The child's achievements in maths forms part of the annual report to parents.

In Foundation Stage teachers monitor children's progress using the EYFS curriculum through continual observations. Teachers highlight the Early Learning Goals they achieve throughout the year.

Pupil Progress meetings
Targets are set and evaluated by teachers, Phase leaders and Headteacher for all children in the Autumn, Spring and Summer Terms.

Equal Opportunities and Special Educational Needs
The teaching and learning within maths will take account of the whole school policy for Equal Opportunities, alongside references to the cultural diversity of mathematics.
Ongoing awareness must be given to culture and gender issues through:

- Grouping during maths lessons
- Awareness of obvious bias in some printed materials and resources
- Reducing negative stereotypes whenever possible.

The mathematics provision should ensure that all children, regardless of ability, should meet with success and reach their potential.

The Use of ICT and the Calculator
Where appropriate, ICT (Information and Communication Technology) resources are used to develop understanding and knowledge of mathematics, e.g. exploring patterns on a spreadsheet or devising a sequence of instructions to manoeuvre 'Roamer' or the 'WinLogo' turtle, or interactive programs on the website.

All classrooms are equipped with a Clevertouch screen which further enhances the teaching and learning of pupils. Teachers use the Clevertouch screen to both design their own lessons using the inbuilt technology and use the wide range of software packages installed on our networks. Children are in turn further inspired in the learning of maths by having the opportunity to interact with the whiteboard during lessons.

Our Computer Suite also allows for every child to have access to an individual computer. Teachers have the opportunity to plan cross-curricular lessons which will often include mathematics learning.

Role of the Subject leader
Duties include:

- Promoting a positive attitude towards maths by offering help, advice, support, encouragement, expertise and ideas to colleagues
- Maintaining effective resources throughout the school through knowledge of the new National Curriculum
- Keeping staff informed of developments within maths
- Representing the school at meetings to discuss maths and attending courses to maintain and develop personal subject knowledge
- Ensuring continuity and progression of maths through monitoring and liaison

- Liaising and feeding back to the Maths Subject Governor.
- Observing teaching staff to ensure that the maths policies are being followed and to see that the Target Tracker grids are being completed accurately. In addition, the children's books will be monitored to ensure that they are being marked appropriately and are in line with the policy.

Health and Safety
Aspects of health and safety are given priority in planning and delivering maths. Children are taught to use and store mathematics resources appropriately.

Evaluation
This policy is an ongoing working document and will be reviewed regularly to take account of new legislation, new thinking in mathematics education and to update the published material and resources currently in use.