

Mathematics

Milby Primary School



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Intent

1. Our Aims

At Milby Primary School, it is recognised and taught that Mathematics helps children to make sense of the world around them through developing their ability to calculate, to reason and to solve problems whilst expressing their reasoning fluently. It enables children to understand and appreciate relationships and patterns in both number and space in their everyday lives.

2. National Curriculum Expectations

The national curriculum for mathematics 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 develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **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.

3. Our Maths Vision

- To develop a positive attitude to maths in which children see it as a subject that can interest and challenge them.
- To develop a “can do” attitude in all of our children, particularly when problem solving and reasoning.
- To broaden childrens knowledge and understanding of how mathematics is used in the wider world.
- To develop mathematical skills and knowledge including quick recall of facts in line with NC recommendations.
- To equip children with the necessary mathematical vocabulary so that they are able to talk about their mathematical understanding with assurance recognising the importance for communication and deep thinking.

4. Our Ethos

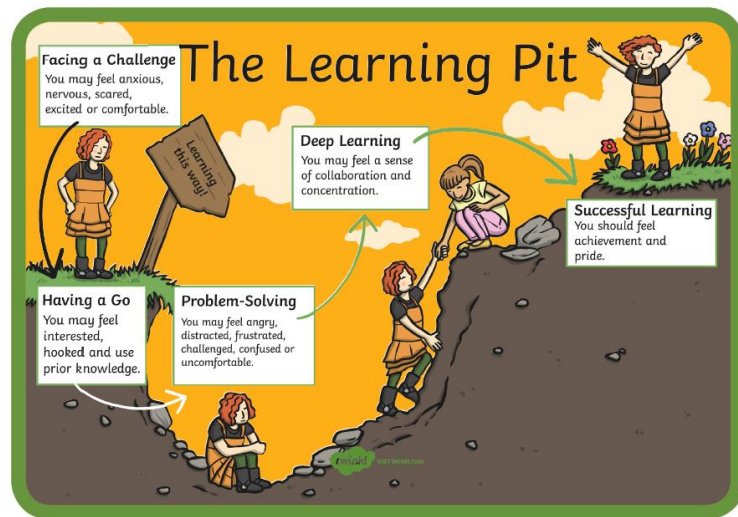
“We want to be **challenged** because we are **curious**, **confident** learners.”

Challenger We need to be in the ‘learning pit’ to learn more.

Curious: We want to know how we got to our answer.

Confident: We always believe that we will achieve.

This Maths ethos underpins our approach to teaching mathematics so that children are exposed to opportunities where they can challenge themselves, are curious about their mathematical process and they are confident about being in the learning ‘pit’



5. *Our Intent*

Here at Milby, maths is taught through a broad and balanced curriculum where children are equipped with the knowledge and skills they will need for their future in an ever-changing world. Children embark on a journey of deep understanding across all areas of mathematics and develop a resilience and growth mindset through their daily learning, ensuring they know more, remember more and can do more. To provide a solid grounding in the basics of mathematics, we follow the statutory requirements of the key stage one and key stage two national curriculum for mathematics; we do this through the use of White Rose resources, supplementing with additional resources (including from NRIC and NCETM) to scaffold and support, or challenge and extend learning. At Milby, we achieve this through daily lessons that will develop the childrens fluency in all areas of maths, provide them with opportunities to reason mathematically and also develop the childrens using and applying skills when solving increasingly complex problems. Fostering positive learning behaviours such as communication and collaboration are vital in encouraging our pupils to access higher-level thinking skills and are therefore given opportunities to explain, reason and justify within lessons. Within maths, the children at Milby develop positive relationships in order to seek support when needed; mistakes are encouraged and seen as opportunities for growth and personal development. At Milby, we passionately believe that every child can achieve in their learning journey and support all children in becoming curious, confident and creative mathematicians.

Implementation

1. Teaching and Learning Style

At Milby Primary School, we strive for all teachers to deliver high quality, effective maths lessons based on secure mathematical pedagogy. The school follows the National Curriculum for mathematics. Links, where appropriate, are made to other subjects. The school uses a variety of teaching to cater for the variety of learning styles of pupils in mathematics lessons. Our principle aim is to develop children's knowledge, skills, reasoning, fluency and understanding in mathematics. We use mainly White Rose Maths to help plan maths lessons and supplement where necessary using resources such as NCETM and NRICH.

We aim to achieve our vision through a daily lesson that includes whole-class and group-direct teaching. During these lessons, we encourage children to ask, as well as answer mathematical reasoning questions. They have the opportunity to use a wide range of resources such as number lines, number squares, numicon, base 10 and small apparatus to support their work. Each class has maths trays which the children take responsibility for getting out each lesson. Fluency sessions are used daily to reinforce mathematical fluency and arithmetic skills.

The White Rose Maths approach that we use is centred on developing an understanding of mathematics by "using concrete objects, pictorial representations and abstract thinking." This allows children, with support of adults, to unpick the thinking behind complex mathematical concepts: something that we feel is important for learners at Milby Primary School so that they are able to solve problems in the future.

Maths Mastery – 5 Big Ideas

Coherence

Lessons are broken down into small connected steps that gradually unfold the concept, providing access for all children and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts.

Representation and Structure

Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation.

Mathematical Thinking

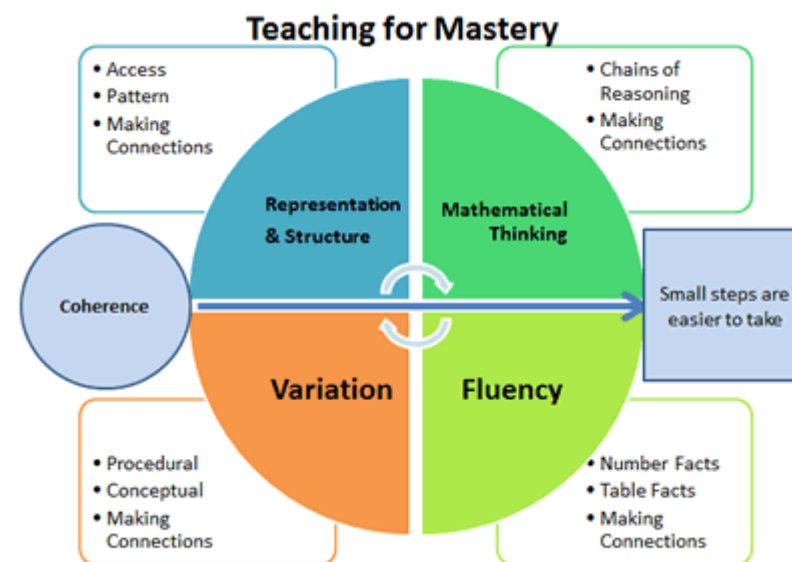
If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others

Fluency

Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics.

Variation

Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure.



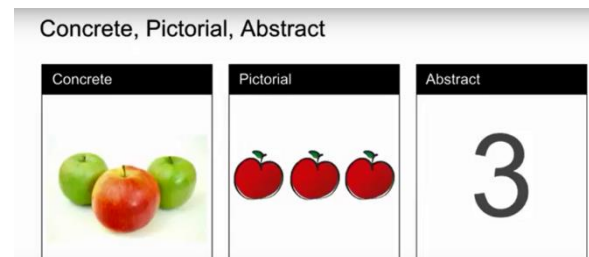
Concrete, Pictorial, Abstract approach

As developed by Bruner, the White Rose Maths approach incorporates the CPA approach so that children have a deep rooted understanding of mathematical concepts.

Concrete – “Doing” stage. This is where children are ‘doing’ with support of concrete resources in order to model problems, to help children visualise what is happening within the problem and the solution. Children need to have opportunities to handle the physical objects themselves.

Pictorial – “Seeing” stage. Children use visual representations to make the mental connection to the concrete objects so that they are able to visualise the problem in order for it to become more accessible. This is starting to build in a more abstract approach so that children are seeing how the physical objects can then be represented using pictures, shapes, diagrams or models.

Abstract – “Symbolic” stage. Children are now using abstract symbols, the written form of maths to model and solve problems.



Fluency

The first part of each lesson has a fluency focus and is linked to the National Curriculum and Big Maths. This is to drive the fluency facts so that they can be applied throughout their mathematical reasoning and problem solving.

The National Curriculum

The national curriculum for mathematics 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 develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- 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.

(Mathematics programmes of study: key stages 1 and 2 National curriculum in England, Sep 2013)

Fluency Definition: What is Fluency in Maths?

Fluency in maths is about developing numbers sense and being able to choose the most appropriate method for the task at hand; to be able to apply a skill to multiple contexts.

The National Curriculum states that pupils should become fluent in the fundamentals of mathematics through varied and frequent practice. While a part of this is about knowing key mathematical facts and recalling them efficiently, fluency means so much more than this as it allows pupils to delve much deeper.

How Does Mathematical Fluency Fit with Reasoning and Problem Solving?

The mastery curriculum for primary schools places problem solving at the heart of mathematics with the main aim that every child can learn to solve sophisticated problems in an unfamiliar context.

To enable them to achieve this, pupils must develop their conceptual understanding, mathematical thinking and use of mathematical language. This is where fluency and reasoning come in.

(Third Space Learning, Rebecca Jakes, March 2020)

“The very processes that teachers care about most—critical thinking processes such as reasoning and problem solving—are intimately intertwined with factual knowledge that is stored in long-term memory (not just found in the environment).

Colin Foster (2019), a reader in Mathematics Education in the Mathematics Education Centre at Loughborough University, says, ‘I think of fluency and mathematical reasoning, not as ends in themselves, but as means to support pupils in the most important goal of all: solving problems.

If you're looking for a one sentence answer to achieving maths mastery through the mastery model of teaching, its quite simple: **teach everything right the first time.**

Where teachers have to rush through to complete the curriculum, tricks or sometimes lies are often used to cover that content quickly (telling children in KS1 that you cannot take 8 away from 6, for example. The suggested course of action here is to tell the student it is possible, and that this will be covered when we look at another type of subtraction). *(Third Space Learning, Neil Almond, March 2020)*

At Milby Primary School, this is vital as telling children facts such as ‘you cant half 3’ means that children still have this misconception moving through the school. You can half 3 but you cant get a whole number answer when you half 3. This will further support childrens number sense.

Fluency targets are given in the National Curriculum. These areas are identified below; children need to be exposed frequently to these targets to ensure that they have the necessary fluency understanding to be subsequently applied across the curriculum. These fluency targets are to be looked upon as ‘non-negotiable’ for children across the school. Children should be achieving these targets so they have the fluency elements they need in order to support their mathematical reasoning and problem solving.

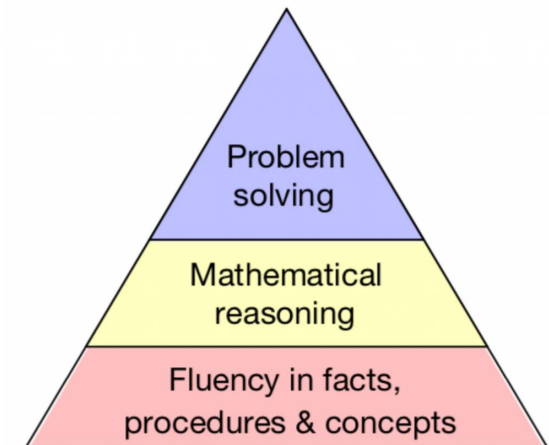
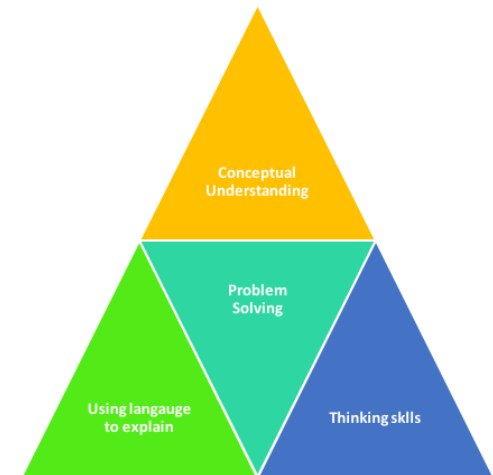
These fluency elements are covered within the curriculum throughout the year and need to be regularly re-visited after being taught.

Number Sense

Number sense is a deep and flexible understanding of numbers and involves the ability to perceive numbers, how they relate to each other and how they can be manipulated. Number sense underpins most other mathematical learning, so it is vital that children develop a strong understanding of numbers in the early years of their education. Research has shown that characteristics for number sense correlates with later mathematical achievement, so all young children can benefit from acquiring a strong sense of number.

Number sense does not only involve the ability to count, compare and perform operations on numbers, but also requires understanding and flexible manipulation of numbers. Number sense can be improved by encouraging children to make links, reason, giving children opportunities to explore numbers in different ways and move between representations.

(Early Number Sense by Jenny Back, 2014, NRICH)



What teaching strategies promote early number sense?

A number of strategies that help to support developing number sense are described by Tsao and Lin (2012). They suggest that children need opportunities to:

1. Work with concrete materials and familiar ideas
2. Compose and recompose different arrangements and representations of number
3. Discuss and share their discoveries and solutions
4. Investigate the realistic uses of number in their everyday world
5. Explore number patterns and relationships
6. Create alternative methods of calculation and estimation
7. Solve realistic problems using a variety of approaches
8. Calculate for a purpose rather than just for the sake of calculating
9. Gather, organise, display and interpret quantitative data
10. Measure and estimate measure for a purpose
11. Explore very large numbers and their representations including using number lines

Further information about these areas can be found [here](#).

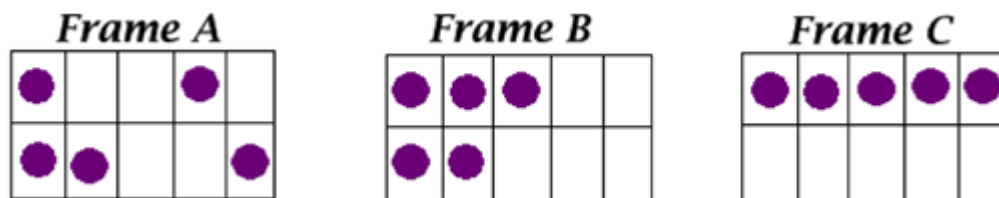
The 'ten-ness' of ten

Once children have developed a basic sense of the numbers up to ten, they need to develop a strong 'sense of ten' as a foundation for both place value and mental calculations. (This is not to say that young children will not also have an awareness of much larger numbers. Indeed, there is no reason why children should not explore larger numbers while working in depth on 'ten-ness'.)

A sense of ten

Ten-frames are two-by-five rectangular frames into which counters are placed to illustrate numbers less than or equal to ten, and are therefore very useful devices for developing number sense within the context of ten. The use of ten-frames was developed by researchers such as Van de Walle (1988) and Bobis (1988). Various arrangements of counters on the ten-frames can be used to prompt different mental images of numbers and different mental strategies for manipulating these numbers, all in association with the numbers' relationships to ten.

For example, look at the three ten-frames below. What numbers are illustrated? What does the particular arrangement of the counters prompt you to think about the numbers? What can you say about each number's relationship to ten?

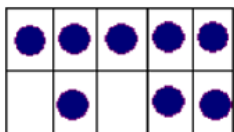


Frame A: There are five counters; perhaps seen as sub-groups of three and two, either by looking at the clusters at either end of the frame, or by looking at the number in the top and bottom rows.

Frame B: Again there are five counters; perhaps seen as three in the top row and two in the bottom, or as four and one, or two and two and one. It is also noticeable that there are five empty boxes remaining, in a similar shape to the full boxes. This prompts the awareness that 'five and five make ten'.

Frame C: This arrangement strongly illustrates the idea that 'five and five make ten'. It also suggests the idea that half of ten is five. This type of thinking would not occur if the five counters were presented without the context of the ten-frame.

Plenty of activities with ten-frames will enable children to think automatically of numbers less than ten in terms of their relationship to ten, and to build a sound knowledge of the basic addition/subtraction facts for ten which are an integral part of mental calculation. For example, a six-year-old child, when shown the following ten-frame, immediately said, "There's eight because two are missing."



This child had a strong sense of ten and its subgroups and was assisted by the frame of reference provided by the ten-frame.

Subitising

Number fluency is supported by the idea of 'subitising'. Children need to subitise in order to perceive numbers.

Subitising is the ability to instantly identify the number in a set of objects without needing to count them all. It develops alongside counting and can be developed by providing opportunities to explore how numbers combine. The perception of number aids children in appreciating the magnitude and order as well as estimation of numbers. Exploring numbers in different representations allows children to appreciate the structure of numbers and how the numbers relate to each other (for example: one more, one less). Subitising and visualising numbers helps develop and retain number facts. An appreciation for numbers as parts which combine to the whole aids in working flexibly with numbers.

The ability to subitise also supports children's number sense and estimation of calculations.

Mastering Number

At Milby, we know that number sense is the heart of all that is done in mathematical learning and a fundamental underpinning factor in understanding wider maths. Therefore, we follow the Mastering Number programme at Reception, Key Stage 1 and Key Stage 2 for all fluency sessions.

Mastering Number at Reception and Key Stage 1

This project aims to secure firm foundations in the development of good number sense for all children from Reception through to Year 1 and Year 2. The aim over time is that children will leave KS1 with fluency in calculation and a confidence and flexibility with number. Attention will be given to key knowledge and understanding needed in Reception classes, and progression through KS1 to support success in the future.

What is involved?

This programme focuses on the key knowledge and understanding needed in Reception classes, and progression through Key Stage 1. Milby receives central training (online and face-to-face) and a wealth of pupil-facing resources. The resources available provide teaching materials for four short sessions each week, aimed at developing children's fluency and flexibility with number. Lead Teachers for each year group also contribute to an online community to share practice and engage in critical reflection.

What are the benefits?

- Pupils will develop and demonstrate good number sense
- Staff will develop a secure understanding of how to build firm mathematical foundations
- Staff will develop intentional teaching strategies focused on developing fluency in calculation and number sense for all children
- Staff will develop understanding and use of appropriate manipulatives to support teaching of mathematical structures

Mastering Number at KS2

What is involved?

Knowledge of multiplication and division and its applications forms the single most important aspect of the Key Stage 2 curriculum, and is the gateway to success at secondary school. This project enables pupils in Years 4 and 5 to develop fluency in multiplication and division facts, and a confidence and flexibility with number that exemplifies good number sense.

Professional development materials are available for teachers to cover five short sessions a week, with staff supporting colleagues in their year groups to use the resources with all Year 4 and 5 classes.

What are the benefits?

- Pupils in Key Stage 2 will develop automaticity in multiplication and division facts through regular practice
- Teachers will develop an understanding of how pupils progress in their knowledge and understanding of multiplicative concepts
- Teachers will work as part of a professional learning community to refine your practice
- Teachers and school leaders will develop Mastering Number at KS2 as part of the curriculum in Years 4 and 5

Reasoning and Problem Solving

“Reasoning in maths is the process of applying logical thinking to a situation to derive the correct problem solving strategy for a given question, and using this method to develop and describe a solution. Put more simply, mathematical reasoning is the bridge between fluency and problem solving.”

Mathematical problem solving is at the heart of our approach and is interwoven into our maths curriculum – it is both how children are able to solve problems then reason and understand how they reached their answer.

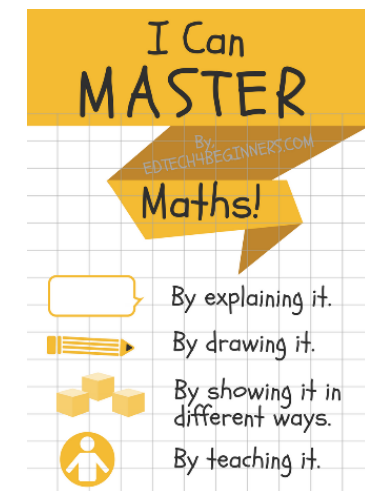
Problem-Solving Skills

Stage 1: Getting started

Stage 2: Working on the problem

Stage 3: Digging deeper

Stage 4: Concluding



Following this process, children will be exposed to problems which will involve using different skills:

- Trial and improvement
- Working systematically (and remember there will be more than one way of doing this: not just the one that is obvious to you!)
- Pattern spotting
- Working backwards
- Reasoning logically
- Visualising
- Conjecturing

Maths Vocabulary

In order to engage in extended dialogue, pupils need to have a rich diet of mathematical vocabulary to draw upon. High quality discussions can help children to understand complex mathematical problems and reason as to how and why they got their answer. Maths vocabulary needs to be taught and used regularly through maths lessons and the wider curriculum. Making connections across the curriculum and to learning in previous years helps children to see the links to other concepts and make connections to prior learning.

“The national curriculum for mathematics reflects the importance of spoken language in pupils’ development across the whole curriculum – cognitively, socially and linguistically. The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof. They must be assisted in making their thinking clear to themselves as well as others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.”

(National Curriculum in England, Department for Education)

Throughout every maths lesson, children need to be exposed to and use mathematical language. At the beginning of a series of maths lessons, the children need to be reminded of and introduced to the vocabulary that is relevant to their learning journey. Children need to be able to articulate the meaning of the vocabulary and use it in their written and verbal responses. Additionally, children need to have the opportunity to verbalise their understanding of the maths skill, through teacher modelling. We need to involve the children in rich discussions, developing their understanding further. Vocabulary that will support the children's learning should be displayed on the maths working wall and used throughout every maths lesson.

Question stems

Question stems can encourage dialogue and further reasoning by probing further into the children's thinking.

Are you sure?

How do you know?

What do you notice?

What is the same/different?

Can you convince me?

Is there another way?

Can you imagine...?

Are you saying...?

Is it always, sometimes or never true?

Why?

Tell me more...

Sentence stems

To support our children in structuring explanations, simple sentence starters can be used. These should be modelled by the teacher initially, requesting additional responses from individuals or pairs and small groups after thinking time is provided.

I think this because...

I agree/disagree because...

I noticed that...

I got a different answer because...

I started by... because...

My strategy was...

It could be because...

My answer is correct because...

I know this is true/false because...

I knew which operation to use because...

I already know that...

I've changed my mind because...

It can't be because...

Because I know... I also know...

The pattern I can see is...

I think it is the odd one out because...

Vocabulary

Vocabulary should be directly referred to on planning for the week, to ensure consistency across both classes.

This is the mathematical vocabulary that each year group should be introducing but it is expected that staff refer back to previous year groups to check they have the foundations of vocabulary before extending it.

EYES

Mathematics: Number	Mathematics: Shape, Space and Measure
Early Learning Goal Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.	Early Learning Goal Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore characteristics of everyday objects and shapes and use mathematical language to describe them.
One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty Add, more than Take away, subtract, less than Count on Count back Double Half Share One more, one less	Small, big Full, empty, half full, half empty, nearly full, nearly empty Heavy, light In front, behind, next to, inside, on top, under Furthest away, closest O'clock Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday 1p, 2p, 5p, 10p, 20p Till, cash point Coin, card, notes Pattern Square, triangle, rectangle, circle Cube, cuboid, pyramid, sphere

Year 1

Number and Place Value	Addition and Subtraction	Multiplication and Division	Measure
Number Zero, one, two, three to twenty, and beyond None Count (on/up/to/from/down) Before, after More, less, many, few, fewer, least, fewest, smallest, greater, lesser Equal to, the same as	Number bonds, number line Add, more, plus, make, sum, total, altogether Inverse Double, near double Half, halve Equals, is the same as (including equals sign) Difference between	Odd, even Count in twos, threes, fives Count in tens (forwards from/backwards from) How many times? Lots of, groups of Once, twice, three times, five times Multiple of, times, multiply, multiply by	Full, half full, empty Weigh, weighs, balances Heavy, heavier, heaviest, light, lighter, lightest Scales Time Days of the week: Monday, Tuesday etc. Seasons: Spring, Summer, Autumn, Winter Day, week, month, year, weekend Birthday, holiday Morning, afternoon, evening, night, midnight

Odd, even Pair Units, ones, tens Ten more/less Digit Numeral Figure(s) Compare (In) order/a different order Size Value Between, halfway between Above, below	How many more to make..?, how many more is...than..?, how much more is..? Subtract, take away, minus How many fewer is...than..?, how much less is..?	Repeated addition Array, row, column Double, halve Share, share equally Group in pairs, threes, etc. Equal groups of Divide, divided by, left, left over	Bedtime, dinnertime, playtime Today, yesterday, tomorrow Before, after, next, last, now, soon, early, late Quick, quicker, quickest, quickly, fast, faster, fastest, slow, slower, slowest, slowly Old, older, oldest, new, newer, newest Takes longer, takes less time Hour, o'clock, half past, clock, watch, hands How long ago?, how long will it be to...?, how long will it take to...?, how often? Always, never, often, sometimes, usually Once, twice First, second, third, etc. Estimate, close to, about the same as, just over, just under Too many, too few, not enough, enough Length, width, height, depth Long, longer, longest, short, shorter, shortest, tall, taller, tallest, high, higher, highest Low, wide, narrow, deep, shallow, thick, thin Far, near, close Metre, ruler, metre stick Money, coin, penny, pence, pound, price, cost, buy, sell, spend, spent, pay, change, dear(er), costs more, costs less, cheaper, costs the same as How much?, how many?
General/Problem Solving	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions
Listen, join in, say, think, imagine, remember Start from, start with, start at Look at, point to Put, place, fit Arrange, rearrange Change, change over Split, separate Carry on, continue, repeat, what comes next? Find, choose, collect, use, make, build Tell me, describe, pick out, talk about, explain, show me Read, write, record, trace, copy, complete, finish, end	Position Over, under, underneath, above, below, top, bottom, side On, in, outside, inside Around, in front, behind Front, back Before, after Beside, next to, Opposite Apart Between, middle, edge, centre Corner Direction Journey Left, right, up, down, forwards, backwards, sideways Across	Group, sort Cube, cuboid, pyramid, sphere, cone, cylinder, circle, triangle, square Shape Flat, curved, straight, round Hollow, solid Corner (point, pointed) Face, side, edge Make, build, draw	Whole Equal parts, four equal parts One half, two halves A quarter, two quarters

Fill, shade, colour, tick, cross, draw, draw a line between, join (up), ring, arrow Count, work out, answer, check same number(s)/ different number(s)/missing number(s) Number facts, number line, number track, number square, number cards Abacus, counters, cubes, blocks, rods, die, dice, dominoes, pegs, peg board Same way, different way, best way, another way In order, in a different order Not all, every, each	Close, far, near Along, through To, from, towards, away from Movement Slide, roll, turn, whole turn, half turn Stretch, bend		
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Year 2

Number and Place Value	Measure	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions	Data/Statistics	General/Problem Solving
Numbers to one hundred	Quarter past/to m/km, g/kg, ml/l	Rotation	Size	Three quarters, one third, a third	Count, tally, sort	Predict
Hundreds	Temperature (degrees)	Clockwise, anticlockwise	Bigger, larger, smaller	Equivalence, equivalent	Vote	Describe the pattern, describe the rule
Partition, recombine		Straight line	Symmetrical, line of symmetry		Graph, block graph, pictogram,	Find, find all, find different
Hundred more/less		Ninety degree turn, right angle	Fold		Represent	Investigate
			Match		Group, set, list, table	
			Mirror line, reflection		Label, title	
			Pattern, repeating pattern		Most popular, most common, least popular, least common	

Year 3

Number and Place Value	Addition and Subtraction	Multiplication and Division	Measure	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions	Data/Statistics
Numbers to one thousand	Column addition and subtraction	Product Multiples of four, eight, fifty and one hundred Scale up	Leap year Twelve-hour/twenty-four- hour clock Roman numerals I to XIII	Greater/less than ninety degrees Orientation (same orientation, different orientation)	Horizontal, vertical, perpendicular and parallel lines	Numerator, denominator Unit fraction, non-unit fraction Compare and order Tenths	Chart, bar chart, frequency table, Carroll diagram, Venn diagram Axis, axes Diagram

Year 4

Number and Place Value	Multiplication and Division	Measure	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions and Decimals	Data/Statistics
Tenths, hundredths Decimal (places) Round (to nearest) Thousand more/less than Negative integers, integers Count through zero Roman numerals (I to C)	Multiplication facts (up to 12x12) Division facts Inverse Derive	Convert	Coordinates Translation Quadrant x-axis, y-axis Perimeter and area	Quadrilaterals Triangles Right angle, acute and obtuse angles	Equivalent decimals and fractions	Continuous data Line graph

Year 5

Number and Place Value	Addition and Subtraction	Multiplication and Division	Measure	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions, Decimals and Percentages
Powers of 10	Efficient written method	Factor pairs	Volume	Reflex angle Dimensions	Regular and irregular Polygons	Proper fractions, improper fractions, mixed numbers

		Composite numbers, prime number, prime factors, square number, cubed number Formal written method	Imperial units, metric units			Percentage Half, quarter, fifth, two fifths, four fifths
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Year 6

Number and Place Value	Addition and Subtraction	Multiplication and Division	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions, Decimals and Percentages	Algebra	Data/Statistics
Numbers to ten million	Order of operations	Order of operations Common factors, common multiples	Four quadrants (for coordinates)	Vertically opposite (angles) Circumference, radius, diameter	Degree of accuracy Simplify Ratio, proportion	Linear number sequence Substitute Variables Symbol Known values	Mean Pie chart Construct

Stem Sentences, Teaching Points and Representations

When planning, staff will refer to the 'NCETM Spine Documents' to support stem sentences using the teaching points and representations.

Spine 1: Number, Addition and Subtraction

<https://www.ncetm.org.uk/teaching-for-mastery/mastery-materials/primary-mastery-professional-development/number-addition-and-subtraction/>

Spine 2: Multiplication and Division

<https://www.ncetm.org.uk/teaching-for-mastery/mastery-materials/primary-mastery-professional-development/multiplication-and-division/>

Spine 3: Fractions

<https://www.ncetm.org.uk/teaching-for-mastery/mastery-materials/primary-mastery-professional-development/fractions/>

Calculations

Formal written methods are taught in line with the National Curriculum. Big Maths and White Rose Maths support staff when teaching the children about different written methods. The Bar Model will be used as part of the explanation process so that children understand why they have chosen the specific operation to complete the problem.

Planning Maths

Maths is planned from a range of resources.

Targets come from the Maths National Curriculum and learning resources are supplemented by NCETM and White Rose Maths. Other resources that are available are: I See Reasoning KS1, LKS2 and UKS2 and I See Problem Solving. As a school, we follow a set scheme (White Rose Maths) but teachers select the learning that is needed for the pupils in their class to achieve the end of year National Curriculum targets for each area.

Planning Starting Points:

[NCETM Progression Tool](#)

[NCETM Spine Documents](#)

[White Rose Small Steps](#)

Whole School, Long Term Overview

	Autumn	Spring	Summer
Year 1	Place value (within 10) Addition and subtraction (within 10) Shape	Place value (within 20) Addition and subtraction (within 20) Place value (within 50) Length and height Mass and volume	Multiplication and division Fractions Position and direction Place value (within 100) Money Time
Year 2	Place value Addition and subtraction Shape	Money Multiplication and division Length and height Mass, capacity and temperature	Fractions Time Statistics Position and Direction
Year 3	Place value Addition and subtraction Multiplication and division (A)	Multiplication and division (B) Length and perimeter Fractions (A) Mass and capacity	Fractions (B) Money Time Shape Statistics
Year 4	Place value Addition and subtraction Area Multiplication and division (A)	Multiplication and division (B) Length and perimeter Fractions Decimals (A)	Decimals (B) Money Time Shape Statistics Position and direction
Year 5	Place value Addition and subtraction Multiplication and division (A) Fractions (A)	Multiplication and division (B) Fractions (B) Decimals and percentages Perimeter and area Statistics	Shape Position and direction Decimals Negative numbers Converting units Volume

Year 6	Place value Addition, subtraction, multiplication, and division Fractions (A) Fractions (B) Converting units	Ratio Algebra Decimals Fractions, decimals and percentages Area, perimeter and volume Statistics	Shape Position and Direction Themed projects, consolidation and problem solving
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Lesson Structure

Learning Intention	Warm Up (Get Ready)	Share (Let's Learn) I do, we do...	Independent Practice (Your Turn) You do...	Reflect
The learning intention is linked to the NC Targets so that children are clear how their learning links to their next steps.	This is an independent challenge for the children. Based on how difficult they find this will help them to decide on where they feel their understanding currently is. It also shows progress in and throughout the lesson.	Let's Learn is an opportunity for the teacher to show a method that the children can use. Maths journals allow them to have a reference to refer back to if they are stuck during independent work. It should be their own notes but can be supported by the teacher. This time allows the teacher to expose the children to the mathematical knowledge in various contexts.	With the help of an adult, all children can access the same learning, unless there is a specific SEND need. Children will be given support and scaffolding where needed to access the same level of learning as their peers. Further challenge and deeper reasoning will be provided for the most able and competent mathematicians to push their learning forward.	The children independently complete the Reflect question (Testbase is a great resource) to show the learning that has occurred in the lesson. Have the children learned that mathematical skill? Can they apply it in a different context? Do they know more and remember more?

Home Learning

Home learning for maths is linked to outcomes and learning objectives that children have covered in lessons. This is achieved through a range of methods across school including using Learn-Its and CLIC sheets from Big Maths and CGP books to cover both fluency and reasoning and problem solving aspect. This is so that children can consolidate their understanding and can complete it independently as they have already been exposed to this in school. This may be supplemented with other activities to practise number fluency.

Impact

Assessment and Intervention

Formative assessment happens each lesson through observing childrens responses in independent learning and to their plenary question. Teachers then make necessary adjustments to the lesson that is planned the following day. Afternoon gap interventions are used to help children 'keep up' rather than 'catch up'. Other interventions are planned to support gaps in learning and help to further challenge the most able learners.

Teachers assess pupils away from the point of teaching using the National Curriculum targets. They also complete summative White Rose assessments (Years 1, 3, 4 and 5) and practice SATs papers (Years 2 and 6) that help to show if the children can apply what they have learned. Data is submitted termly and teachers send their target overview completed with what the children have achieved, a tracker overview of where the children are and need to be based on KS projections and the White Rose/Practice SATs test scores which are analysed by the subject leads. This is a new initiative this year, in which staff are due to be introduced to this form of assessment during the Autumn term 2024.

Target Expectation and Teacher Judgement

Target sheet:

Attainment against targets to be filled out on Maths subject spreadsheets for each term. They are to be filled out as the term progresses and used to assess what children have done and where they need to go next in their learning. Some targets will be identified as focus areas for the class or for a small-group intervention.

Overview Tracker:

At the end of each term, staff then complete a tracker which shows the number of children that are on track for greater depth, working at, working towards and below. The vulnerable groups are also identified and their data analysed. Through pupil progress meetings with SLT, target children are identified based on being off-track for termly progress and/or progress against aspirational key stage targets.

Monitoring

The Maths lead and other members of SLT (Head teacher, Deputy Head teacher, Phase Leaders and SENDCo) complete monitoring to check on the implementation of maths at Milby. Methods used to triangulate judgements are: lesson observations, learning walks, lesson drop-ins, data checks, book looks, pupil voice and staff voice. Monitoring feedback and supporting resources are given to staff then followed-up to ensure action has been taken. As part of the monitoring feedback, leaders give an evaluation that shares the 'bigger picture' of the school so that staff are aware about how their part fits into the whole school target areas. Monitoring is being embedded this year.