



Mathematics @ Chacewater School

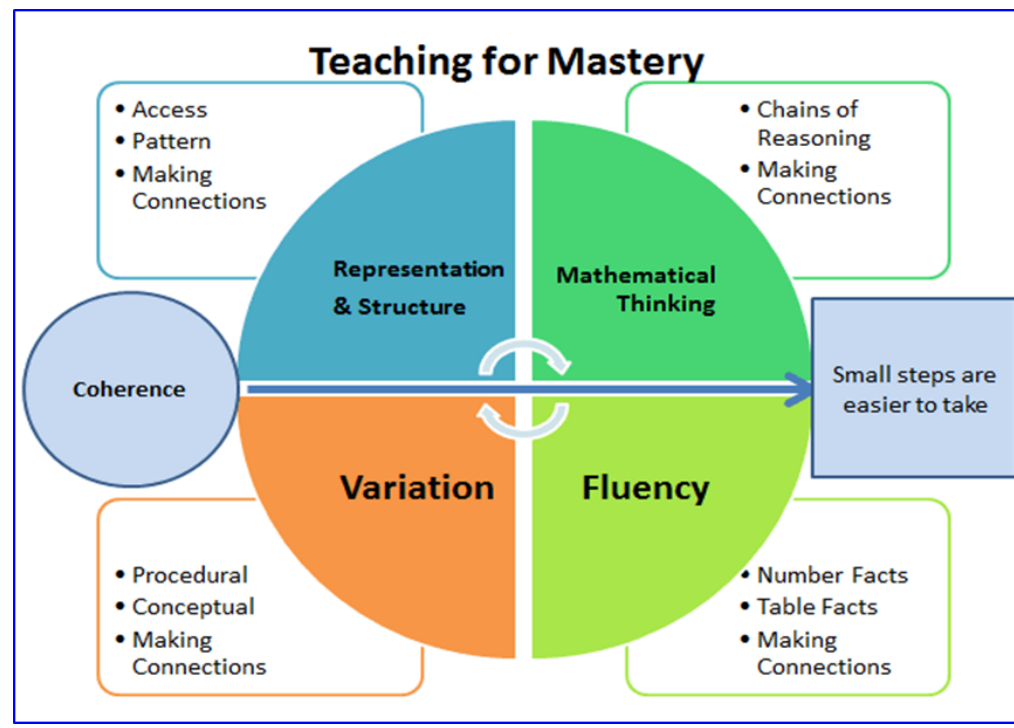
Intent	<p>The national curriculum for mathematics aims to ensure that all pupils:</p> <ul style="list-style-type: none"> •become fluent in the fundamentals of mathematics •reason mathematically by following a line of enquiry, conjecture relationships and generalisations, and develop an argument, justification or proof using mathematical language •can solve problems by applying their mathematics to a variety of routine and non routine problems. <p>At Chacewater we want all of our children to enjoy mathematics, whilst ensuring that everyone is supported to be able to succeed in the subject and acquire the mathematical skills and knowledge that they need for later life. By lacing calculation, reasoning and problem solving into a series of lessons, we ensure that secure links are made and that prior knowledge is being tested and challenged throughout.</p> <p>Our aspiration is for every child to see themselves as a mathematician - demonstrating a confident attitude towards tackling problems both in and out of the classroom and understanding the importance of maths in the wider world.</p>
Implementation	<p>At Chacewater we follow a mastery led model for the teaching of mathematics. Sequences of learning are built in small sequential steps within our pedagogical approach of ‘Teach, Challenge, Learn, Understand’. This ‘Maths @ Chacewater’ document intends to make clear what each of these stage could look like and how these should be closely related and linked to the five big ideas of fluency, variation, representation & structure, mathematical thinking and coherence.</p> <p>Maths is taught daily in the school in all classes, with our sequence of learning being pulled from White Rose maths, which gives a consistent and coherence across the school. However, our expectation is that this is not used as a scheme and only used to help aid the planning process by teachers. Blocks of learning are taught using a linear approach, allowing children to ‘linger longer’ on core concepts and to develop a depth of understanding within their year group’s objectives.</p>

	<p>A wide range of trusted resources are used to support learning including, Kangaroo Maths, NCETM spine and ready to progress materials, I See Reasoning, I See Problem Solving, Time table Rockstars, Numbots and Testbase.</p> <p>Carefully planned variation builds fluency and understanding of underlying mathematical concepts. Time outside of the maths lesson is dedicated to the revisiting and retrieval of key declarative knowledge and rapid, fluid interventions are put in place to support those children that need it. Each year group focuses on Key Instant Recall Facts (KIRFs) that should be known by the end of each half term - there is a daily focus on these.</p> <p>Planning utilises the idea of small step progression and these are shared with the children so that they can understand the mathematical journey and how it builds. 'S' planning is utilised to help teachers think about the learning progression for their own class over a week or two week block and learning slides further support this. Ongoing assessment is crucial and is used to adjust and inform planned next steps.</p> <p>Both concrete resources (manipulatives) and pictorial representations are routinely used to support all children, including children with SEND. These are also referenced in our calculation guidance.</p>
Impact	<p>Teachers will continuously formatively assess children's understanding and use this to adjust and inform the next steps in the teaching sequence. This is supported by utilising a range of reasoning and problem-solving activities i.e. Test Base to check children's ability to use and apply the mathematics taught.</p> <p>There is a regular cycle of assessment in place, which includes termly NFER tests in key stage 2 and termly teacher assessment across the school.</p> <p>Wider impact is measured through a triangulated approach. Exploring attitude and confidence with mathematics through pupil conferencing in conjunction with exploring evidence in books. The journey of the mathematics the children are learning should be clear and the children should be able to confidently articulate this.</p>

'L E A P' Into Maths at Chacewater

<u>L</u>ocal	Where possible we look to link learning to our own school's contextual background. This includes taking note of children's starting points and prior learning. With this in mind, although we use White Rose to help support and guide our sequence of learning, this is not used as a scheme and the expectation is that lessons and sequences are adapted to meet the needs of our children. We use 'S' planning to support this approach.
<u>E</u>ngaging	<p>It is important that mathematics is engaging for all of our children and to support this we ensure that there are a range of learning activities and resources to support. This includes consistent use of representations and structures.</p> <p>We aim to engage children in the learning by encouraging them to frequently explore, reason and problem solve. This is supported by high quality resources such as the 'I See Reasoning' resources. NRICH, NCETM spine and ready to progress materials.</p> <p>Across the school we use a range of interactive resources and learning activities so that learning is not just worksheet based. This includes frequent opportunities for discussion (supported with STEM sentences) and interactive resources such as TTRS and Numbots.</p> <p>WE ALWAYS LOOK TO REWARD AND CELEBRATE EVERY SUCCESS IN MATHS.</p>
<u>A</u>spiring & Ambitious	<p>Our aim to take all children through the same mathematical journey. The use of low threshold and high ceiling activities supports this, as well as rapid interventions, including same day interventions and pre-teach.</p> <p>The 'challenge' aspect of our pedagogical approach allows us to look for opportunities to add a 'twist' or 'confuse' aspect into learning to really promote a depth of understanding!</p>
<u>P</u>owerful & purposeful	In line with other aspects of our curriculum regular review and opportunities to practise retrieval are important to ensure that learning is retained, is powerful and purposeful. To facilitate this, previous areas of learning are regularly revisited outside of the maths lesson to ensure that key areas remain fresh in the children's memory i.e. written calculations. This includes the use of morning boards and resources such as Flashback 4. Reasoning and Problem Solving should be weaved through all aspects of maths to ensure that all children are given the opportunity to be able to apply their mathematical knowledge.

At Chacewater we follow a mastery led model for the teaching of mathematics. Sequences of learning are built in small sequential steps within our pedagogical approach of 'Teach, Challenge, Learn, Understand'. This 'Maths @ Chacewater' document intends to make clear what each of these stage could look like and how these should be closely related and linked to the five big ideas **fluency**, **variation**, **representation & structure**, **mathematical thinking** and **coherence**.




Our aim is that children work broadly at the same pace, focusing on increasing a depth of understanding rather than a focus on progressing beyond ARE. Rapid interventions should be in place for children that need to consolidate their understanding before moving on.

TEACH


The National Curriculum states that children should become fluent in the fundamentals of mathematics through varied and frequent practice, and this is the main aim of our 'Teach' phase. While a part of this is about knowing key mathematical facts and recalling them efficiently, the ability to be fluent in maths gives pupils the resilience and understanding to delve deeper into all areas of mathematical learning. Regular development will allow them to build a stronger number sense and choose the most appropriate method for the task at hand. This will enable them to be better equipped to grapple with many variations of mathematical concepts and problems.



- Concrete resources are routinely used to support learning. These are used by all children and help children to understand the underlying structure of the maths being taught. Key resources include **PV counters, dienes (base 10), PV grids, numicon and hundred squares.**
- Side by side modelling of the concrete, pictorial and abstract is crucial at this stage.



Concrete




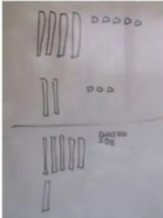
Pictorial

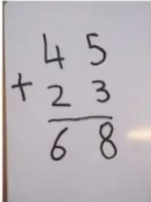
$3 + 2 = 5$

Abstract

$45 + 23$







LEARN

At this stage children should be given an opportunity to build learning and the use of carefully structured questions should be in place, including:

- use of variation to help scaffold and draw links in learning. Deliberate choice of question and thinking about what we want to draw attention to.
- choice of the most efficient calculation strategy i.e. mental or written
- pattern seeking
- continued support with concrete and pictorial, moving to the abstract.

Variation – drawing attention to relationships.

$$\begin{array}{l} 120 - 90 \\ 122 - 92 \\ 119 - 89 \\ 235 - 180 \\ 237 - 182 \\ 502 - 397 \end{array}$$

$$\begin{array}{l} 430 - 30 = \\ 430 - 40 = \\ 430 - 50 = \\ 520 - 30 = \\ 520 - 31 = \\ 520 - 29 = \end{array}$$

$$\begin{array}{l} 3 + 6 = \\ 30 + 60 = \\ 300 + 600 = \end{array}$$

$$\frac{1}{4} \text{ of } 12 = ?$$

$$\frac{1}{4} \text{ of } 120 = ?$$

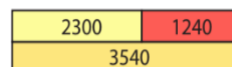
$$\frac{1}{4} \text{ of } 1200 = ?$$

$$\frac{3}{4} \text{ of } 12 = ?$$

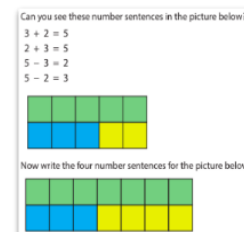
$$\frac{3}{4} \text{ of } 1200 = ?$$

Exploring mathematics - identifying structure.

Write down the four relationships you can see in the bar model.



$$\begin{array}{l} \square + \square = \square \\ \square + \square = \square \\ \square - \square = \square \\ \square - \square = \square \end{array}$$



What addition is represented?



$$\square + \square + \square = \square$$

Use the pattern to complete the number sentences.



CHALLENGE

In order to ensure deep understanding, challenge elements will be incorporated in to the teaching sequence. The challenge could be a 'twist' or a 'confuse' question within the lesson or an activity within the books. Such activities allow the children to demonstrate their knowledge in a different way and thus provides depth of understanding. These can be written or through verbal discussion and applies to all year groups. Reasoning and Problem Solving should flow through all of our maths lessons and not reserved purely as extension activities. In all cases it is crucial that there is explicit teaching and modelling of how to tackle such problems.

Examples below include opportunities to develop efficiency, conjecture and solve missing digit problems.

Always, sometimes, never

If you multiply an even number by 5 the answer is a multiple of 10.

E.g. you times the 5 by 2 and divide the even number by 2 it will always be whole number x10 which is always a multiple of 10.

Square numbers cannot be prime numbers.

☒ always
☒ sometimes
☒ never

Explain your choice.

$1 \times 1 = 1$ (1 factor)
 $2 \times 2 = 4$ (3 factors)
 $3 \times 3 = 9$ (3 factors)
 $4 \times 4 = 16$ (5 factors)
 $5 \times 5 = 25$ (3 factors)
 $6 \times 6 = 36$ (5 factors)

No square numbers can be a prime number because they always have themselves and the number to create the prime number (square root).

A quadrilateral cannot have three right angles. Convince me.

A quadrilateral cannot have 3 right angles because that I would make it have 5 sides or higher.

A quadrilateral = 360° interior

Square 4 right angles
Rectangle 4 right angles
Parallelogram 0 right angles
Rhombus 0 right angles
Trapezium 0 right angles
Irregular pentagon 3 right angles

*3 right angles = 270°
 $360^\circ - 270^\circ = 90^\circ$ = a right angle.*

10 less	Number	10 more

Captain Conjecture says 'The number in the place value grid is the largest 3-digit number you can make using all 10 counters:'

100s	10s	1s

Do you agree?

Explain your reasoning.

Diving for Depth

3 x 4 = 12

Show it

Explain it

Division is the opposite to times so I could swap the numbers - it still makes 12.

Draw it

Prove it

$3 \times 4 = 12$
 $4 \times 3 = 12$
 $12 \div 3 = 4$
 $12 \div 4 = 3$

Which is the odd one out and why?

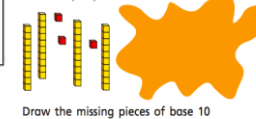
16, 64, 27, 8, 32

8 is the odd one out because it's a one-digit number and the other ones are 2-digit numbers.

27 is the odd one out because it's a multiple of 9 and 3 but all the other 4 are multiples of 8. Also 27 is an odd number and the other ones aren't.

$8 \times 2 = 16$
 $8 \times 4 = 32$
 $8 \times 8 = 64$
 $8 \times 1 = 8$
 $9 \times 3 = 27$

Eva has made 100 using base 10. She has spilt paint on it.



Draw the missing pieces of base 10

Work out the missing digits.

a)


	Th	H	T	O
	3	7		9
+			8	
	6	9	2	5

UNDERSTAND

It is crucial that all children have the opportunity to apply their mathematical knowledge in a variety of different contexts and can actively problem solve. This includes being able to solve single and multi-step problems, relevant to age and stage. We use Testbase as resources to find a range of different problems and the expectation is that children are explicitly taught how to solve these. Such problems may at times draw in other areas of previous learning to aid the problem solving process.

There are **20** balloons.

7 balloons fly away.



How many balloons are left?

balloons

Find 3 different possible answers:


I buy sandwich(es) and drink(s).
I pay with a **£5** note. I get change.

I buy sandwich(es) and drink(s).
I pay with a **£5** note. I get change.

I buy sandwich(es) and drink(s).
I pay with a **£5** note. I get change.


Sandwich: £1.80
Drink: 30p

Look at these coins:



What is the largest amount you can make using **three** of these coins?

p




A shopkeeper has **20** fish and **5** fish bowls.

He puts the same number of fish in each bowl.

How many fish go in each bowl?

fish

1 Kirsty, Seb, and Mina made toffee apples to sell at the school fair.
They made **80** toffee apples altogether.



Kirsty sold **12** toffee apples.
Seb sold **25** toffee apples.
Mina sold **17** toffee apples.

How many toffee apples were left?


Show
your
method

The list below shows the years in which the Cricket World Cup was held since 1992:

1992, 1996, 1999, 2003, 2007, 2011, 2015

Adam says,

The Cricket World Cup has been held every four years since 1992.



Adam is **not** correct.



Explain how you know.

Only a fraction of each line is shown. The rest is hidden behind the blue screen.
Which whole line is the longer?

Explain your reasoning.

First: $\frac{1}{2}$

Second: $\frac{1}{3}$

A close-up photograph of a pile of yellow dominoes. The dominoes are scattered, showing various faces with black pips and lines. Some faces show 1, 2, 3, 4, 5, or 6 pips, while others show the standard domino markings (lines and dots). The background is a plain, light-colored surface.

Megan has read $\frac{3}{5}$ of her book.
She has 90 pages left to read.
How many pages long is her book?

Sequence of Learning - Reception

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Autumn	Getting to Know You			Just Like Me!			It's Me 1 2 3!			Light and Dark			Consolidation	
Spring	Alive in 5!			Growing 6, 7, 8			Building 9 and 10			Consolidation				
Summer	To 20 and Beyond			First Then Now			Find My Pattern			On The Move				

Sequence of Learning - Year 1

	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 (within 10)					Number Addition and subtraction (within 10)					Geometry Shape	Consolidation
Spring	Number Place value (within 20)			Number Addition and subtraction (within 20)			Number Place value (within 50)		Measurement Length and height		Measurement Mass and volume	
Summer	Number Multiplication and division			Number Fractions		Geometry Position and direction	Number Place value (within 100)		Measurement Money	Measurement Time		Consolidation

Sequence of Learning - Year 2

	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				Geometry Shape			
Spring	Measurement Money	Number Multiplication and division						Measurement Length and height	Measurement Mass, capacity and temperature			
Summer	Statistics	Number Fractions			Geometry Position and direction		Problem solving		Measurement Time			

Sequence of Learning - Year 3

	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 A				
Spring	Number Multiplication and division B			Measurement Length and perimeter			Number Fractions A		Measurement Mass and capacity			
Summer	Number Fractions B	Measurement Money		Measurement Time			Geometry Shape		Statistics		Consolidation	

Sequence of Learning - Year 4

	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			Measurement Area	Number Multiplication and division A			Consolidation
Spring	Number Multiplication and division B			Measurement Length and perimeter		Number Fractions				Number Decimals A		
Summer	Number Decimals B	Measurement Money		Measurement Time		Consolidation	Geometry Shape		Statistics	Geometry Position and direction		

Sequence of Learning - Year 5

	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 A			Number Fractions A			
Spring	Number Multiplication and division B			Number Fractions B		Number Decimals and percentages			Measurement Perimeter and area		Statistics	
Summer	Geometry Shape			Geometry Position and direction		Number Decimals			Number Negative numbers	Measurement Converting units		Measurement Volume

Sequence of Learning - Year 6










	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number Place value		Number Addition, subtraction, multiplication and division					Number Fractions A		Number Fractions B		Measurement Converting units
Spring	Ratio		Algebra		Number Decimals		Number Fractions, decimals and percentages		Measurement Area, perimeter and volume		Statistics	
Summer	Geometry Shape			Geometry Position and direction	Themed projects, consolidation and problem solving							

Key Instant Recall Facts (KIRFs) at Chacewater

The table below outlines KIRFs that should be learnt with regular daily practice, in addition to the normal maths lesson. Often this may be part of the routine first thing in the morning. **Times Tables Expectations in red and there should be daily practice ongoing of these.**

	R	Y1	Y2	Y3	Y4	Y5	Y6
Autumn 1	Know and say the numbers from 0 to 5 and back from 5 to 0.	Know all number bonds for 5.	Know all number bonds for 10 and 20.	Know all the number bonds for each number to 20 e.g. $13+6 = 19$	Know all number bonds for 100.	Know all decimals that total 1 or 10 (decimal place) e.g. $0.3 + 0.7 = 1$ and $6.2 + 3.8 = 10$.	Know all previous learnt number bonds (including decimals)
Autumn 2	Know and say the numbers from 0 to 10 and back from 10 to 0.	Know all number bonds for 10.	Know multiplication and division facts for 2x table.	Know multiplication and division facts for 2x, 4x and 8x table.	Know multiplication and division facts for 7x table.	Consolidate all multiplication and division facts for all tables.	Derive multiplication and division facts using decimal numbers e.g. $8 \times 7 = 56$ so $8 \times 0.7 = 5.6$.
Spring 1	Know how to partition numbers to 5 into two groups.	Know all number bonds for 20.	Know multiplication and division facts for 10x table.	Know doubles and halves of all whole numbers to 20. e.g. 12 doubled is 24 and 12 halved is 6.	Know all pairs of multiples of 50 with a total of 1000 e.g. $350 + 650 = 1000$.	Know the doubles and halves of all two digit numbers.	Know the doubles and halves of all two digit decimals.
Spring 2	Know how to partition numbers to 10 into two groups.	Know all doubles and halves of even number to 20.	Know the halves of 1,3,5,7,9 e.g. half of 3 is $1\frac{1}{2}$	Know all number bonds for 100 using multiples of 5.	Know the decimal equivalents of the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{1}{10}$ and $\frac{9}{10}$.	Know the prime numbers up to 100.	Know all the square numbers to 12×12 .
Summer 1	Be able to read and write numbers to 20.	Know all addition and subtraction facts for all numbers between 0 and 10.	Know all addition and subtraction facts for multiples of 10 to 100.	Know all multiplication and division facts for the 3,6 and 9 times tables.	Know multiplication and division fact for 11x and 12x table.	Know all pairs of factors of numbers up to 100.	Know the square roots of all numbers to 15×15 .
Summer 2	Be able to add and subtract single digit numbers by counting on or back.	Count forwards and backwards in steps of 2,5 and 10.	Know multiplication and division facts for 5x table.	Know all multiplication and division facts for 2x,5x and 10x table. (instant recall)	Know all number bonds for £1 using decimal notation.	Know the decimal and percentage equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{1}{10}$ and $\frac{9}{10}$.	Find a percentage of an amount and reduce by a percentage.

Times tables: the 21 facts^{*}

<div>1</div> <div>$1 \times 1 = 1$ $1 \times 2 = 2$ $1 \times 3 = 3$ $1 \times 4 = 4$ $1 \times 5 = 5$ $1 \times 6 = 6$ $1 \times 7 = 7$ $1 \times 8 = 8$ $1 \times 9 = 9$</div> <div></div>	<div>2</div> <div>$2 \times 2 = 4$ $2 \times 3 = 6$ $2 \times 4 = 8$ $2 \times 5 = 10$ $2 \times 6 = 12$ $2 \times 7 = 14$ $2 \times 8 = 16$ $2 \times 9 = 18$</div> <div></div>	<div>3</div> <div>$3 \times 3 = 9$ $3 \times 4 = 12$ $3 \times 5 = 15$ $3 \times 6 = 18$ $3 \times 7 = 21$ $3 \times 8 = 24$ $3 \times 9 = 27$</div> <div></div>	<div>4</div> <div>$4 \times 4 = 16$ $4 \times 5 = 20$ $4 \times 6 = 24$ $4 \times 7 = 28$ $4 \times 8 = 32$ $4 \times 9 = 36$</div> <div></div>	<div>5</div> <div>$5 \times 5 = 25$ $5 \times 6 = 30$ $5 \times 7 = 35$ $5 \times 8 = 40$ $5 \times 9 = 45$</div> <div></div>
<div>6</div> <div>$6 \times 6 = 36$ $6 \times 7 = 42$ $6 \times 8 = 48$ $6 \times 9 = 54$</div> <div></div>	<div>7</div> <div>$7 \times 7 = 49$ $7 \times 8 = 56$ $7 \times 9 = 63$</div> <div></div>	<div>8</div> <div>$8 \times 8 = 64$ $8 \times 9 = 72$</div> <div></div>	<div>9</div> <div>$9 \times 9 = 81$</div> <div></div>	

Examples of S Planning – identifying small steps progression.

