The Federation of Oxford Road Community School & Wilson Primary School

the road to inspiring minds

Calculation Policy

White Rose MATHS

NCETM NATIONAL CENTRE FOR EXCELLENCE IN THE TEACHING OF MATHEMATICS

This policy has been created using resources from White Rose Maths Hub, NCETM and the Mobius Maths Hub. It is a working document to be used alongside the federation's maths overviews and resources from the aforementioned materials.

Vision

As a federation we recognise the important role of mathematics throughout each child's every day and future life. Maths enables students to understand relationships and patterns in both number and space in the world around them. It is essential for everyday life, critical to science, technology and engineering and necessary for financial literacy and most forms of employment. Our aim is to give each child the self-confidence and resilience to reach their full potential by ensuring that they have the tools to calculate fluently, reason logically, problem solve and think in abstract ways. We aim to prepare our students for any career or life path they choose.

This policy has been created with this vision in mind for the purpose of supporting teachers, leadership and parents to create a systematic and effective approach to maths across the federation. We have carefully selected the manipulatives, representations and methods used across the year groups with the aim of ensuring consistency and progression in our approach to calculation and enable a smooth transition between year groups and key stages within the Early Years Framework & National Curriculum. Vocabulary and mental calculation underpin the policy to embed mathematical fluency across the year groups. Manipulatives, representations and written methods are used to support the understanding of students and 'reveal' the maths behind the calculations.

During their time at our school, students will be encouraged to see mathematics as both a written and spoken language. Teachers will support and guide students through the following important stages:

- developing the use of a range of representations, and a mixture of words and symbols to represent numerical activities
- using standard symbols and conventions
- use of jottings to aid a mental strategy
- efficient use of written procedures

Focus

This policy concentrates on the introduction of standard symbols, transition through concrete, pictorial and abstract/numerical representations and the links between mental and written methods. It is important that students do not abandon jottings and mental methods once written procedures are introduced. Therefore, students will always be encouraged to look at a calculation/problem and then decide which is the best method to choose – pictures, mental calculation with or without jottings or structured recording.

Precision of mathematical Vocabulary:

The correct terminology should be used when referring to the value of digits to support the students understanding of place value. Eg. 68 + 47 should be read 'sixty add forty' not 'six add four' when using a column method. We refer to ones (1s) not units and identify strategies correctly, e.g. partition, exchange, regroup etc.

Aims

Students should be able to choose an efficient method, mental, written or calculator appropriate to the given task. By the end of year 6, students working at age related and above will have been taught and be secure with a compact standard method for each operation.

Problem solving, reasoning and mastery

The mastery approach is embedded throughout this policy and maths teaching in the federation, with support from the NCETM and Mobius Maths Hub. There will be purposeful, built in teaching of problem solving and reasoning in each unit of maths teaching. These will be carefully planned to allow students to create connections between different elements of their maths learning and embed or deepen their understanding of the fundamental knowledge. Students will access a range of activities throughout a sequence of lessons to challenge their skills, including problems solving and reasoning, and there will be explicit teaching points to work on these skills as well. Careful planning will provide specifically targeted questions, with the focus of building reasoning skills to rehearse calculation strategies, before applying that fluency in a context and opportunities for mastery to deepen their understanding.

Use of Resources

Where appropriate, students will have access to a range of concrete and pictorial resources to enable clear understanding of concepts and manipulation of number including white boards and maths templates or maths writing frames, e.g. place value grids, number lines, which they will use to rehearse skills alongside teacher modelling. Students will be trained and supported in using the resources, which will be available in all lessons to develop this understanding of numbers and their value. E.g. dienes, numicon, and counters. Attached to this policy are appendices which outline a range of resources used across year groups in the teaching of maths, including digital resources, which can be used to support within lessons.

Mathematics in EYFS

Successful early mathematicians need an extensive range of experiences and knowledge of number in the world around them in order to build the necessary network of cognitive connections between the four types of experience of mathematics: concrete experiences, symbols, language and pictures.

For example, when a 3-year-old counts out loud as they climb the steps or when they stamp along a line of paving stones, they are connecting the language of number with a concrete and physical experience. Later they will be able to connect this experience and language with the picture of a number strip. When the 4-year-old plays a simple board game they are connecting a number symbol on a die with the name of the numeral and the concrete experience of moving their counter forward that number of places along the board. And so, through these connections, understanding of number is being developed. A wide range of experiences which build what we refer to as 'number sense' develops gradually over time as a result of exploring numbers, visualising them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms. Children in their early years must first develop a strong sense of the numbers to ten.

Number sense is the ability to understand numbers and the relationships between numbers. Number sense includes skills and knowledge like:

1. 'subitising'- the ability to recognise whole (and parts) of amounts without counting
2. 'stable order' – knowing that numbers always come in a set order (for example, 2 comes before 3)
3. 'cardinality' – knowing that the last number counted is the number of objects
4. 'magnitude' – recognising that higher numbers reflect larger quantities
5. 'ordinality'- recognising 1st, 2nd, 3rd

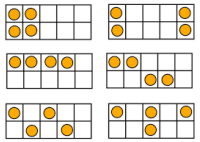
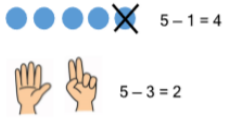
Subitising is a key skill in building number sense and the concept of composition (the five-ness of five for example: five is made up of five ones, a group of two and a group of three, two groups of one and a group of three) that needs to be developed throughout children's early experiences. Adults promoting observation of images and objects, initially just using 1-3, in everyday language. For example: "I can see three petals and one stem", "I can see a group of two shells and another group of one", "I've noticed lots of leaves and I see them in groups, what can you see?". By adults asking the questions: What can you see, how do you see it, what do you notice? and continually modelling example responses, this hones the children's ability to see the numbers and begin to build the concept of composition which is vital for later mathematical workings. Subitising to six will be generally expected by the end of Reception. This promotes the ability to be able to hold numbers in mind while performing multiple step calculations.

As children's number sense develops, they will begin to understand counting principles. These skills are all necessary for later calculations of any form:

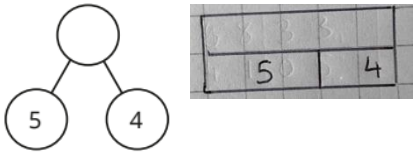
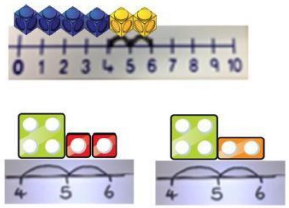
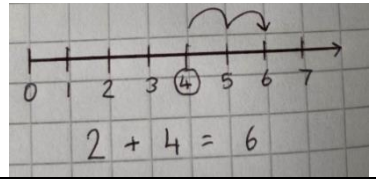
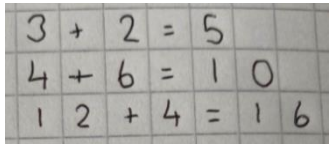
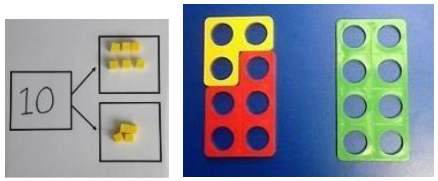
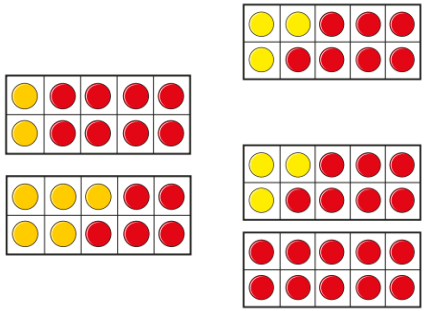
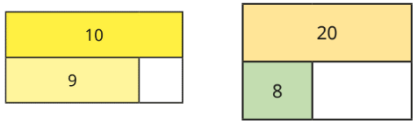
1. One-to-one correspondence – when children touch or point to each object individually as they count and match a number to each object that is being counted.
2. The need for stable order – children will gradually find out that numbers need to be said in the same order.
3. Abstraction – children may begin by counting objects like cars 'in the here and now', in front of them, but they will also realise that many things can be counted, as they can count claps or jumps too.
4. Order irrelevance – when counting a group of objects in a random layout, it doesn't matter where you start. Whether you start at the top, bottom, middle, or edges, the result is the same as long as each item is counted once.
5. Cardinality – understanding that the last number counted indicates how many things are in the set.

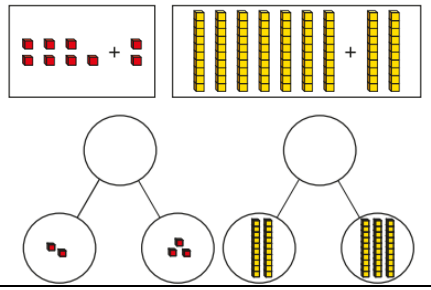
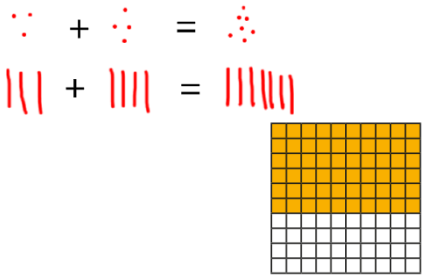
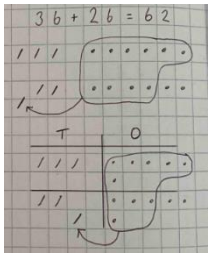
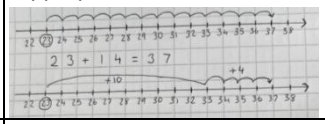
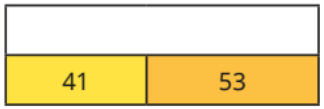
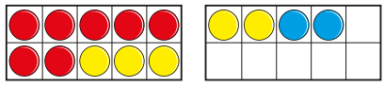
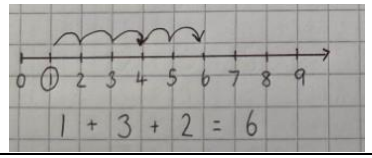
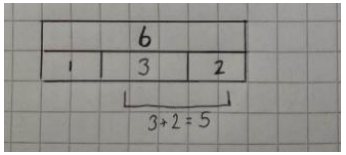
Opportunities which provide children in their Early Years to develop Number Sense and counting principles come from their environment, interactions with adults and their peers and access to toys and resources. They are not limited to this list of examples:

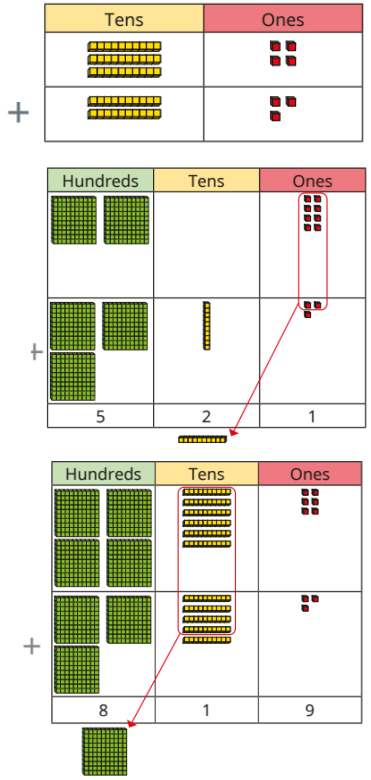
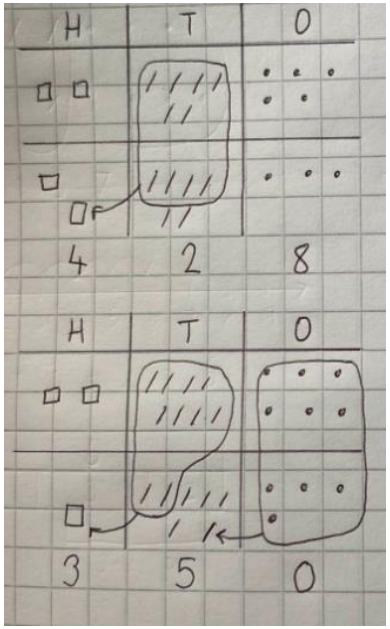
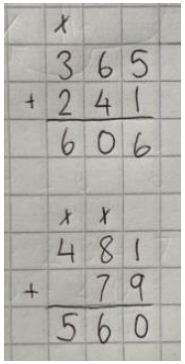
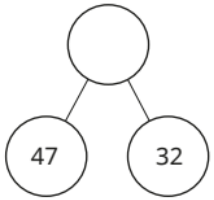
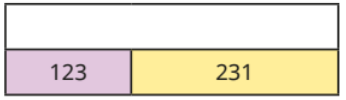
- Sing number rhymes as you go about the day, e.g. 'One, Two, Buckle My Shoe'. Sing counting songs and rhymes which help to develop children's understanding of number, such as 'Two Little Dickie Birds'.
- Move with young children to the rhythm patterns in familiar songs and rhymes and encourage them to join in tapping and clapping along to simple rhythms and moving to beat (1:1 correspondence).
- Use number words in meaningful contexts, e.g. 'Here is your other mitten. Now we have two'.
- Talk to young children about 'lots' and 'few' as they play. Talk about young children's choices and, where appropriate, demonstrate how counting helps us to find out how many. Talk about the maths in everyday situations, e.g. doing up a coat, one hole for each button.
- Play games which relate to number order, addition and subtraction, such as hopscotch and skittles and target games.
- Use number language, e.g. 'one', 'two', 'three', 'lots', 'fewer', 'hundreds', 'how many?' and 'count' in a variety of situations.
- Support children's developing understanding of abstraction by counting things that are not objects, such as hops, jumps, clicks or claps.
- Model counting of objects in a random layout, showing the result is always the same as long as each object is only counted once
- Model and encourage use of mathematical language e.g. asking questions such as 'How many saucepans will fit on the shelf?'
- Help children to understand that one thing can be shared by number of pieces, e.g. a pizza or a cake.
- As you read number stories or rhymes, ask e.g. 'When one more frog jumps in, how many will there be in the pool altogether?'
- Use pictures and objects to illustrate counting songs, rhymes and number stories.
- Encourage children to use mark-making to support their thinking about numbers and simple problems.
- Talk with children about the strategies they are using, e.g. to work out a solution to a simple problem by using fingers or counting aloud.
- Encourage use of mathematical language, e.g. number names to ten: 'Have you got enough to give me three?'
- Ensure that children are involved in making displays of number, e.g. making their own pictograms of lunch choices. Develop this as a 3D representation using bricks and discuss the most popular choices.
- Add numerals to areas of learning and development, e.g. in addition to silhouettes in the learning environment
- Make books about numbers that have meaning for the child such as favourite numbers, birth dates or telephone numbers.
- Use rhymes, songs and stories involving counting on and counting back in ones, twos, fives and tens.
- Emphasise the empty set and introduce the concept of nothing or zero.
- Show interest in how children solve problems and value their different solutions.
- Discuss with children how problems relate to others they have met, and their different solutions.
- Talk about the methods children use to answer a problem they have posed, e.g. 'Get one more, and then we will both have two.'
- Encourage children to make up their own story problems for other children to solve.
- Encourage children to extend problems, e.g. "Suppose there were three people to share the bricks between instead of two".
- Use mathematical vocabulary and demonstrate methods of recording, using standard notation where appropriate.
- Give children learning English as additional language opportunities to work in their home language to ensure accurate understanding of concepts.
- Children will be taught to see numbers represented in lots of ways, through lots of real and practical examples eg tally on a score chart, votes on a ten frame
- Children will explore concepts through new and familiar stories
- Voting between two or three options (book choices, opinions of soup we tasted) for real life experiences to connect learning with
- Ten frames are used for self-registration and in daily routines and attention drawn to different number patterns, five-wise patterns in ten frames and pair patterns in Numicon. Ten frames also introduce place value by being able to visualise a full ten-frame and two of the next for example.

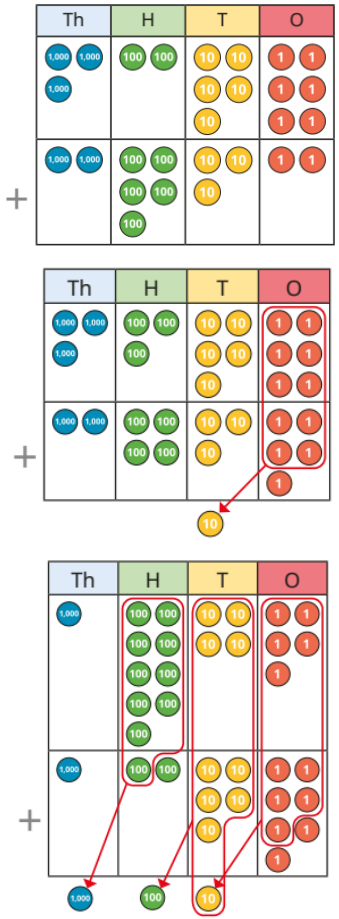
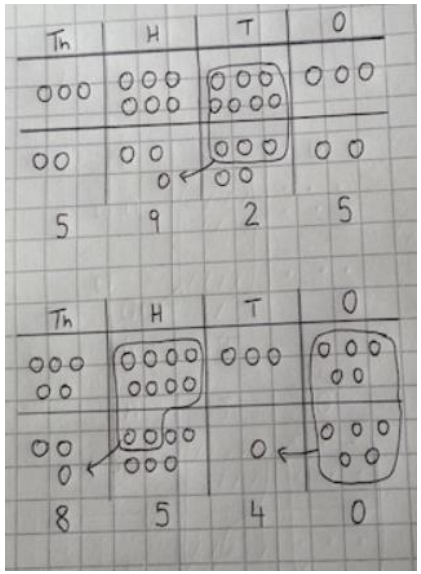
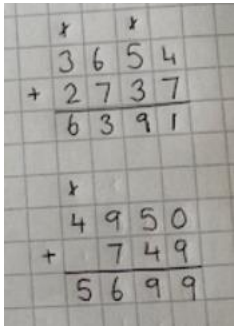
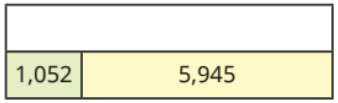
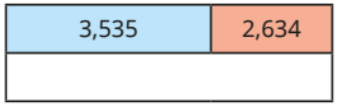
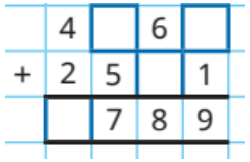
	EYFS Development Matters Framework	Vocabulary and stem sentences
Number sense • Count objects, actions and sounds • Subitise • Link numerals and value • Count beyond 10 • Compare numbers • Understand 1 more/less	**Subitising:** Knowing how many objects there are without counting (perceptually to 5 and conceptually over 6) **Cardinality:** Knowing the last number counted is how many there are **Ordinality:** Capacity to place numbers in sequence **Counting:** Say number names in ascending or descending order **Comparison:** Knowing that numbers are worth more or less than each other  	There are __ altogether __ has more than __ __ has fewer than __ __ is more than __ __ is less than __ Numbers, more, less, bigger, smaller
Addition and subtraction • Explore composition of numbers to 10 • Automatically recall number bonds for numbers 0-5 and some to 10	**Composition:** Knowing that numbers are made up of other numbers Understand what more means and be able to say what one more is. Begin to combine groups of objects. Solve simple problems using fingers and objects. Read number sentences in a variety of ways, constructing them verbally or by using physical objects Understand what less means and be able to say what one less is. Begin to use objects to relate subtraction to taking away and what is left. Solve simple problems using fingers and objects. Read number sentences in a variety of ways, constructing them verbally or by using physical objects  	1 and another 1 is 2 1 and 1 and 1 makes 3 5 is 1 more than 4 5 is 1 less than 6 5 and 1 more makes 6 altogether 5 and 2 more makes 7 altogether __ is made of __ and __ __ more makes __ Add, more, plus, makes, total, altogether, score, double, one more, two more, then more, count on Take away, leave, subtract, minus, equals, count back, one less, two less, left over, fewer
Multiplication and division *NOT EXPLICITLY TAUGHT – introduced to concept through sharing and grouping in play*	**Composition:** Knowing that numbers are made up of other numbers Multiplication introduced through use pictorial and physical representations to count in repeated groups of the same size. Begin to read number sentences aloud in different ways. Given multiplication in real life contexts (e.g. how many fingers on two hands, how many sides on three triangles) Division introduced through halving or sharing in real life contexts. Use pictorial or physical representations to share/group into equal groups. Given division in real like contexts (e.g. I have 10 sweets, I want to share them with my friend, how many will we have each) 	There are __ groups of __. There are __ altogether. There are __ altogether. I share them between __ groups. There are __ in each group. Lots of, groups of, times, repeated addition, double, combine, twos, fives, tens Half, share, equally, one each, two each, pairs, equal parts

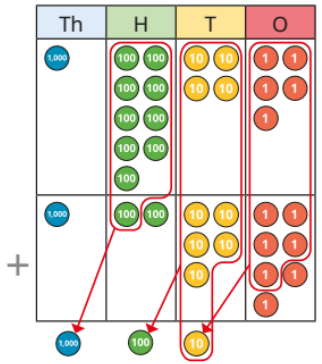
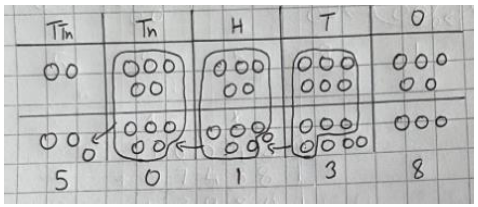
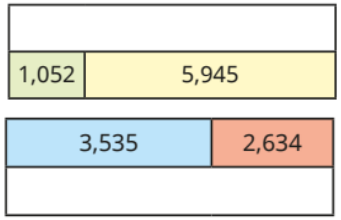
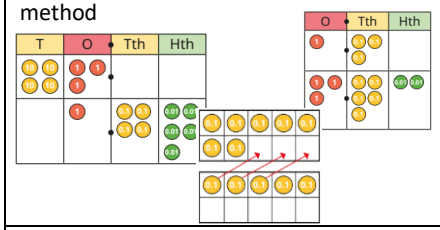
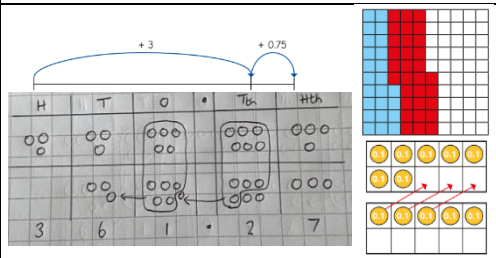
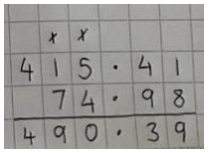
Addition

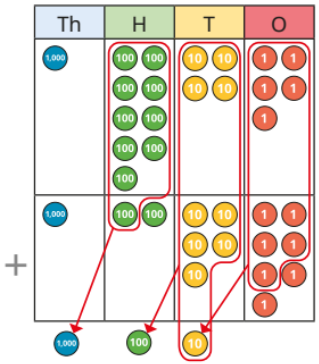
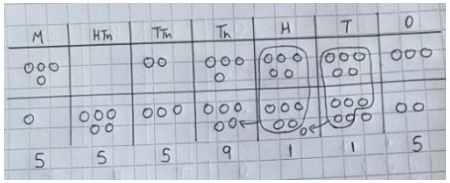
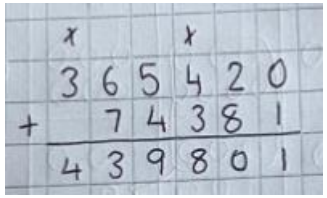
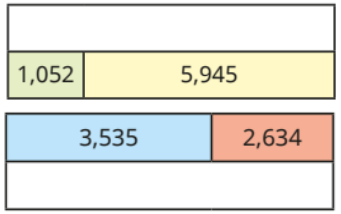
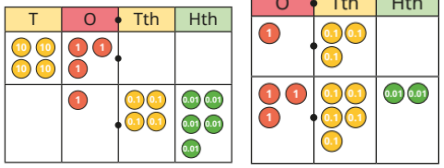
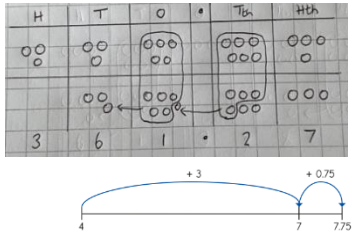
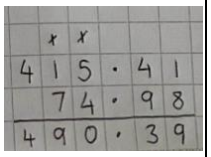
Year 1 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs • represent and use number bonds and related subtraction facts within 20 • add and subtract one-digit and two-digit numbers to 20, including 0 • solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 =? – 9	Combining two parts to make a whole: Use **manipulatives** to add two numbers together as a group, in a bar, on a tens frame or a part-whole model 	Combining two parts to make a whole: Use **pictures** to add two numbers together as a group, in a bar, on a tens frame or a part-whole model 	Part-whole models/bar models with numbers Number sentences – combining two parts to make a whole 	__ is a part. __ is a part. The whole is __. __ + __ = __.
	Counting on from the bigger number 	Number lines – start on the larger number and jump on 	Number sentences – putting bigger number in head and counting on 	__ add __ is equal to __. __ is equal to __ + __.
	Represent and use number bonds and related subtraction facts to 10, then 20 		Number sentences. Using known facts/number bonds. 	There are __ red counters and __ yellow counters. There are __ counters altogether. This means that __ and __ are a bond to __. __ and __are a number bond to __. So __ and __ are a number bond to __.
	• **Dienes** • Unifix cubes • Two-colour counters • Tens frames • Numicon • Bead strings • Real-life objects (teddies, toys etc.)	• **Dienes** • Number lines • Number tracks • Tens frames • Part-whole models	• Mathematical signs + - = • One-step problems • Missing number problems • Bar models	Vocabulary: Add, plus, more, bigger greater, part, whole, ones, tens, number bonds, equals, counting on

Year 2 NC Objectives	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary and Stem Sentences**
• 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 facts up to 100 • add and subtract numbers using concrete objects, pictorial representations, and mentally, including: ○ a two-digit number and 1s ○ a two-digit number and 10s ○ 2 two-digit numbers ○ adding 3 one-digit numbers • show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot • recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems	Using number bonds to 20 to derive related facts up to 100 – adding multiples of 10 	Using known facts 	Number sentences 1 + 4 = _____ 10 + 40 = _____ **Highlight that addition is commutative**	__ ones + __ ones = __ ones, so __ tens + __ tens = __ tens. This means that __ + __ = __. If __ ones + __ ones = 10, then __ tens + __ tens = 100
	Adding and subtracting numbers: two-digit and 1s, two-digit and 10s, two two-digit 	Number lines – counting on, jumping in tens/ones Dienes – adding ones, exchanging if needed, adding tens. Use place value columns when appropriate to secure understanding  	Number sentences. Using known facts to perform mental calculations when no exchanges are needed. 	__ ones + __ ones = __ ones. There are __ ones so I do/do not need to make an exchange. __ tens + __ tens = __ tens. __ + __ = __ __ ones = 10
	Adding and subtracting numbers: adding 3 one-digit numbers 	Number lines/dienes. Adding 2 of the numbers, then adding third. Using number bonds. 		__ ones + __ ones = __ ones. So __ ones + __ ones + __ ones = __ ones. __ and __ are a bond to __. So __ + __ + __ = __
	• **Dienes** • Unifix cubes • Two-colour counters • Tens frames • Bead strings	• **Dienes** • Number lines • Number tracks • Tens frames • Part-whole models • Hundred squares	• Mathematical signs + - = • One-step problems • Missing number problems • Bar models	Vocabulary: Add, plus, more, bigger greater, part, whole, ones, tens, number bonds, equals, related facts, counting on, exchange, commutative, inverse, regrouping, combine, place value

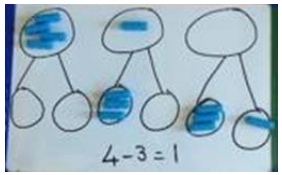
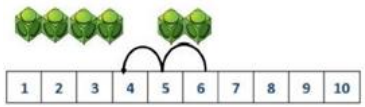
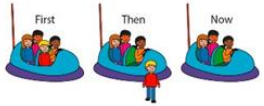
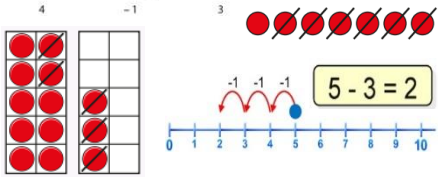
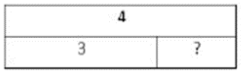
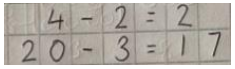
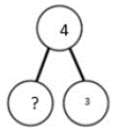
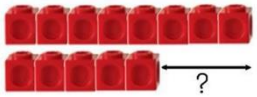
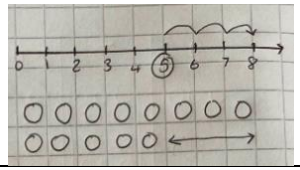
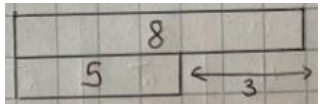
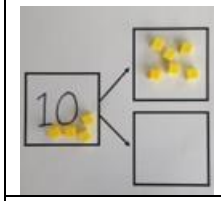
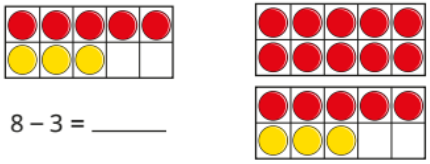
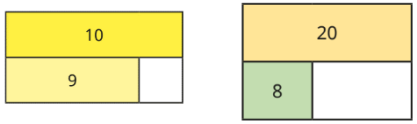
Year 3 NC Objectives	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary and Stem Sentences**
• add and subtract numbers mentally, including: ○ a three-digit number and 1s ○ a three-digit number and 10s ○ a three-digit number and 100s • add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction • estimate the answer to a calculation and use inverse operations to check answers • solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction	Add numbers with up to 3 digits, using formal written methods of columnar addition 		Column addition. Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you add the regrouped number to the top of the column to the left. Students need to be constantly reminded of the value of the digits when moving to abstract.   	__ ones + __ ones = __ ones. If I have __ ones, I can exchange them for __ ten and __ ones. __ tens + __ tens = __ tens. __ hundreds + __ hundreds = __ hundreds. __ + __ = __ __ ones can be exchanged for __ tens. __ tens can be exchanged for __ hundreds. In column addition, we start from the place value column that has the __ value. I can partition the number into __, __ and __ and add the parts separately. The digit __ is in the __ column. It represents __
	• **Dienes**	• **Dienes** • Part-whole models • Hundred squares	• Mathematical signs + - = • One-step problems • Two-step problems • Missing number problems • Bar models	<u>Vocabulary:</u> Add, plus, more, bigger greater, part, whole, ones, tens, hundreds, number bonds, equals, related facts, counting on, exchange, commutative, inverse, regrouping, combine, place value

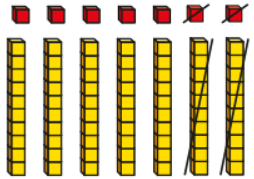
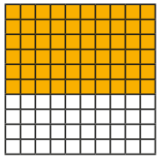
Year 4 NC Objectives	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary and Stem Sentences**
• add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate • estimate and use inverse operations to check answers to a calculation • solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	Add numbers with up to 4 digits using the formal written methods of columnar addition 		Column addition. Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you add the regrouped number to the top of the column to the left. Students need to be constantly reminded of the value of the digits when moving to abstract.    	__ ones + __ ones = __ ones. If I have __ ones, I can exchange them for __ ten and __ ones. __ tens + __ tens = __ tens. __ hundreds + __ hundreds = __ hundreds. __ thousands + __ thousands = __ thousands __ + __ = __ __ ones can be exchanged for __ tens. __ tens can be exchanged for __ hundreds. __ hundreds can be exchanged for __ thousands. In column addition, we start from the place value column that has the __ value. I can partition the number into __, __, __ and __ and add the parts separately. The digit __ is in the __ column. It represents __
	• **Place value counters** • Dienes (to support transition over to PV counters)	• **Place value counters** • Dienes (to support transition over to PV counters)	• Mathematical signs + - = • One-step problems • Two-step problems • Missing number problems • Bar models	<u>Vocabulary:</u> Add, plus, more, bigger greater, part, whole, ones, tens, hundreds, thousands, number bonds, equals, related facts, counting on, exchange, commutative, inverse, regrouping, combine, place value

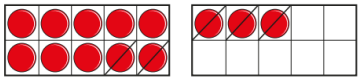
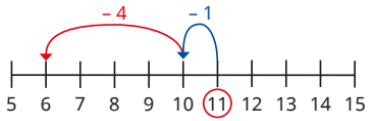
Year 5 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers • use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • solve problems involving number up to 3 decimal places	Add whole numbers with more than 4 digits, including using formal written methods 		Column addition. Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you add the regrouped number to the top of the column to the left. Students need to be constantly reminded of the value of the digits when moving to abstract. 	__ ones + __ ones = __ ones. If I have __ ones, I can exchange them for __ ten and __ ones. __ tens + __ tens = __ tens. __ hundreds + __ hundreds = __ hundreds. __ thousands + __ thousands = __ thousands (etc.) __ + __ = __ __ ones can be exchanged for __ tens. __ tens can be exchanged for __ hundreds. __ hundreds can be exchanged for __ thousands. __ thousands can be exchanged for __ ten thousands. (etc.) In column addition, we start from the place value column that has the __ value. I can partition the number into __, __, __ and __ and add the parts separately. The digit __ is in the __ column. It represents __
	Adding decimals using a formal written method 		 	__ tenths = __ hundredths __ ones +__ ones = __ ones, so __ tenths + __ tenths = __ tenths
	• **Place value counters – introduce decimal counters** • Tens frames (for decimals)	• **Place value counters** • Number lines • Hundred squares/tens frames (for decimals)	• Mathematical signs + - = • One-step problems • Two-step problems • Multi-step problems • Missing number problems • Bar models	Vocabulary: Add, plus, more, bigger greater, part, whole, ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions, tenths, hundredths, number bonds, equals, related facts, counting on, exchange, commutative, inverse, regrouping, combine, place value

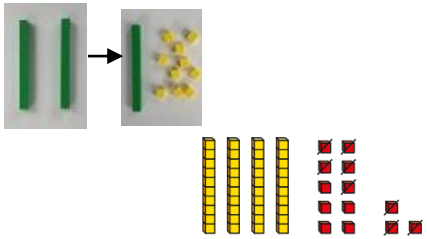
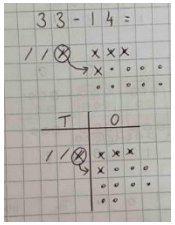
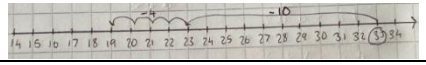
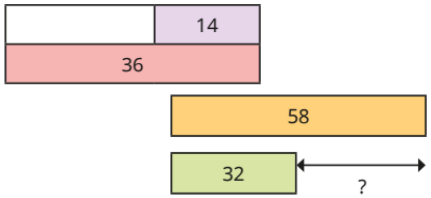
Year 6 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• perform mental calculations, including with mixed operations and large numbers • use their knowledge of the order of operations to carry out calculations involving the 4 operations • solve addition and subtraction multi-step 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 a problem, an appropriate degree of accuracy	Add whole numbers with more than 4 digits, including using formal written methods 		Column addition. Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you add the regrouped number to the top of the column to the left. Students need to be constantly reminded of the value of the digits when moving to abstract.  	__ ones + __ ones = __ ones. If I have __ ones, I can exchange them for __ ten and __ ones. __ tens + __ tens = __ tens. __ hundreds + __ hundreds = __ hundreds. __ thousands + __ thousands = __ thousands (etc.) __ + __ = __ __ ones can be exchanged for __ tens. __ tens can be exchanged for __ hundreds. __ hundreds can be exchanged for __ thousands. __ thousands can be exchanged for __ ten thousands. (etc.) In column addition, we start from the place value column that has the __ value. I can partition the number into __, __, __ and __ and add the parts separately. The digit __ is in the __ column. It represents __
	Adding decimals using a formal written method 		 	__ tenths = __ hundredths __ ones +__ ones = __ ones, so __ tenths + __ tenths = __ tenths
	• **Place value counters**	• **Place value counters** • Number lines	• Mathematical signs + - = • One-step problems • Two-step problems • Multi-step problems • Missing number problems • Bar models	Vocabulary: Add, plus, more, bigger greater, part, whole, ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions, ten millions, tenths, hundredths, number bonds, equals, related facts, counting on, exchange, commutative, inverse, regrouping, combine, place value

Subtraction

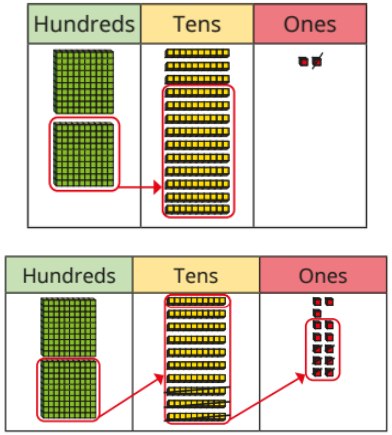
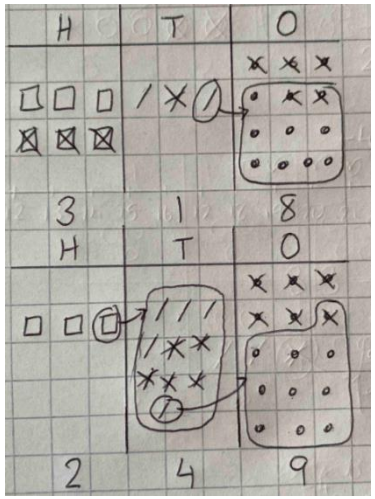
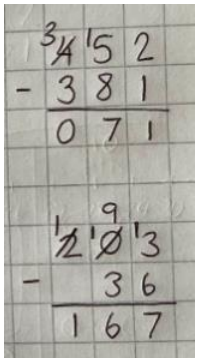
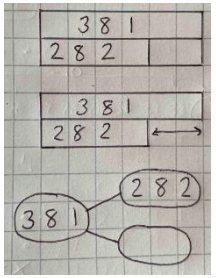
Year 1 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs • represent and use number bonds and related subtraction facts within 20 • add and subtract one-digit and two-digit numbers to 20, including 0 • solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 =? – 9	Use physical objects, counters , cubes etc to show how objects can be taken away. Move objects away from the group, counting backwards.  	Crossing our pictorial representations to show subtraction. Number lines – start on the first number and count backwards Use first, then, now to demonstrate how subtraction number sentences work  	Part-whole models/bar models with numbers. Number sentences – putting first number in head and counting back    **Highlight link between addition and subtraction – fact families. Use part-whole/bar models to show connection.**	First there were __. Then __ were taken away. Now there are __. __ is the whole. __ is a part. The other part is __. __ - __ = __. If I know that __ + __ = __, then I also know that __ - __ = __
	Finding the difference – compare objects and amounts 	Draw objects in bars, start link to comparative bars. Count on using a number line to find the difference. 	Comparative bar models 	The difference between __ and __ is __. __ -__ = __
	Represent and use number bonds and related subtraction facts to 10, then 20 		Number sentences. Using known facts/number bonds – related facts. 	If the whole is __ and __ is a part, then the other part is __. __ and __are a number bond to __. So __ - __ = __.
	• **Dienes** • Unifix cubes • Two-colour counters • Tens frames • Numicon • Bead strings • Real-life objects (teddies, toys etc.)	• **Dienes** • First, then, now stories • Number lines • Number tracks • Tens frames • Part-whole models	• Mathematical signs + - = • One-step problems • Missing number problems • Bar models	Vocabulary: Subtract, take away, less, smaller, less, part, whole, ones, tens, number bonds, equals, counting back, compare, difference

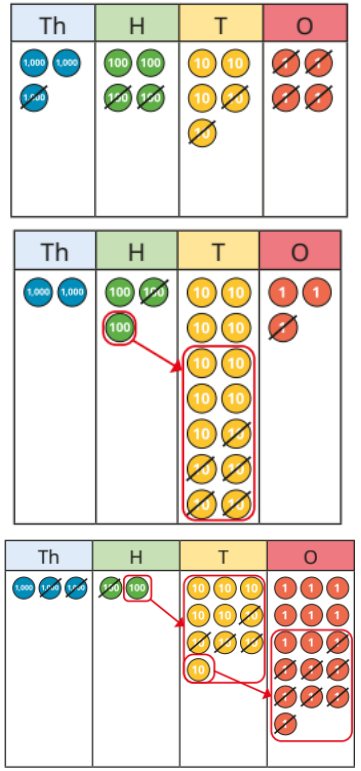
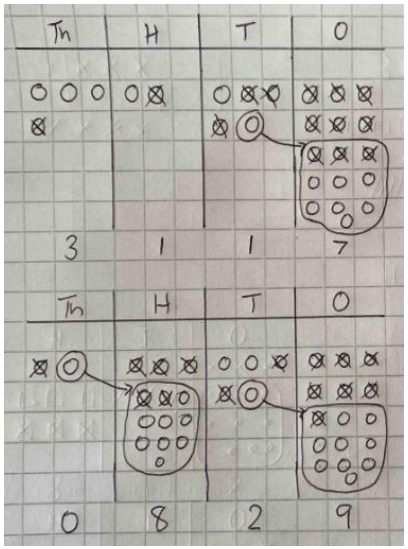
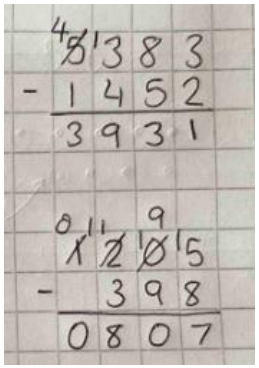
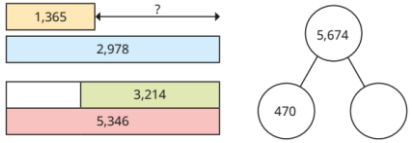
<table>
<tr><th><u>Year 2 NC Objectives</u></th><th><u>Concrete</u></th><th><u>Pictorial</u></th><th><u>Abstract</u></th><th><u>Vocabulary and Stem Sentences</u></th></tr>
<tr><td rowspan="4">• solve problems with addition and subtraction:
○ using concrete objects and pictorial representations, including 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 facts up to 100
• add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
○ a two-digit number and 1s
○ a two-digit number and 10s
○ 2 two-digit numbers
○ adding 3 one-digit numbers
• show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot
• recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems</td><td>Using number bonds to 20 to derive related facts up to 100 – subtracting multiples of 10
  </td><td>Using known facts
  </td><td>Number sentences
9 – _____ = 2
90 – _____ = 20
Highlight that addition is commutative but subtraction is not, however the parts can be interchanged. Introduce inverse</td><td>__ ones - __ ones = __ ones, so __ tens - __ tens = __ tens. This means that __ - __ = __.

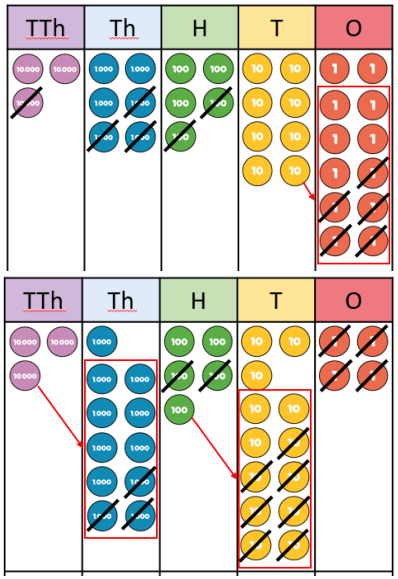
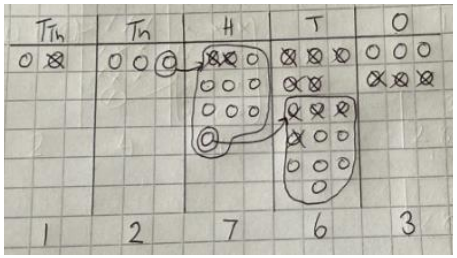
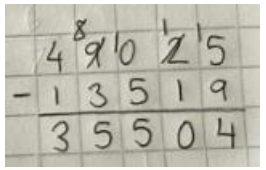
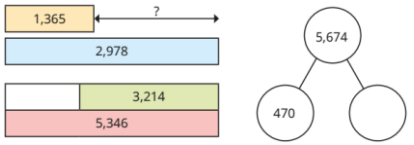
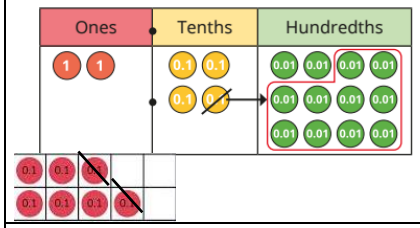
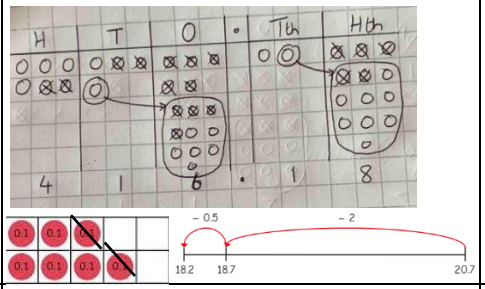
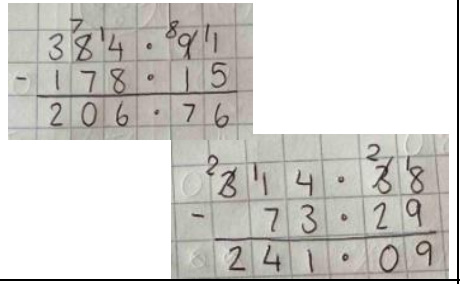
If __ ones - __ ones = 10, then __ tens + __ tens = 100</td></tr>
<tr><td>Subtract across 10
  </td><td>  </td><td>Using number bonds to aid with mental calculation.

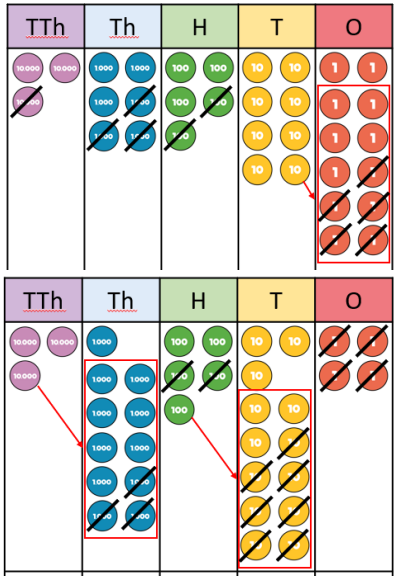
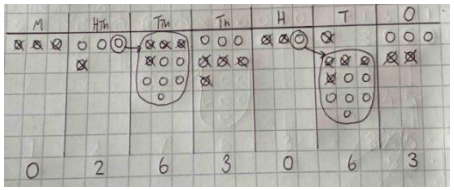
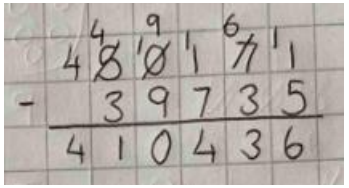
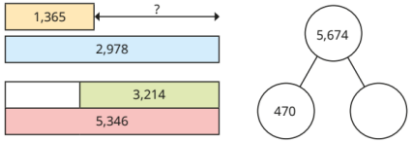
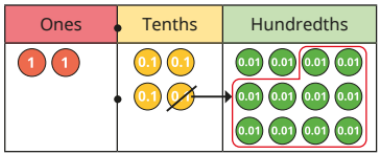
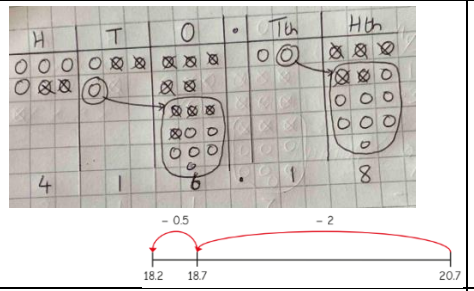
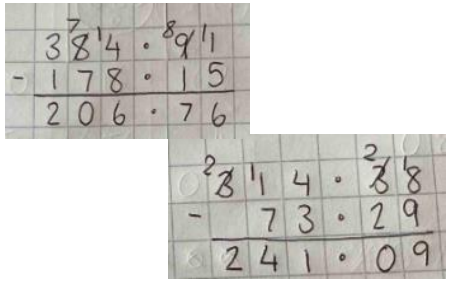
11-5=
I need to subtract 1 to get to 10. I can partition 5 into 4 and 1. I need to subtract 4 more.</td><td>I need to subtract __ to get to 10. I can partition __ into __ and __. I need to subtract __ more. __ less than __ is __.</td></tr>
<tr><td>Adding and subtracting numbers: two-digit and 1s, two-digit and 10s, two two-digit
Regrouping a 10 into 10 ones
  </td><td>Number lines – counting back, jumping in tens/ones
Dienes – subtracting ones, exchanging if needed, subtracting tens. Use place value columns when appropriate to secure understanding
Link back to first, now, then stories from Year 1
 
  </td><td>Number sentences. Using known facts to perform mental calculations when no exchanges are needed.
  </td><td>__ ones - __ ones = __ ones. There are __ ones so I do/do not need to make an exchange. __ tens - __ tens = __ tens.
__ - __ = __

__ ones = 10</td></tr>
<tr><td>• Dienes
• Unifix cubes
• Two-colour counters
• Tens frames
• Bead strings</td><td>• Dienes
• Number lines
• Number tracks
• Tens frames
• Part-whole models
• Hundred squares</td><td>• Mathematical signs + - =
• One-step problems
• Missing number problems
• Bar models</td><td><u>Vocabulary:</u>
Subtract, take away, less, smaller, less, part, whole, ones, tens, number bonds, equals, counting back, compare, difference, exchange, commutative, inverse, regrouping, place value</td></tr>
</table>

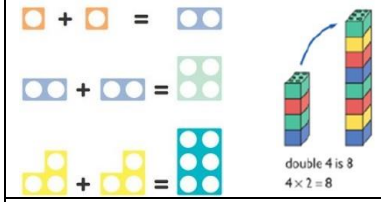
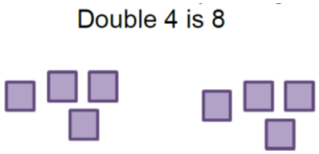
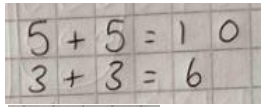
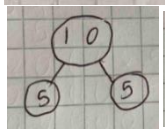
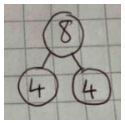
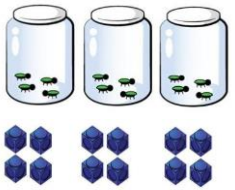
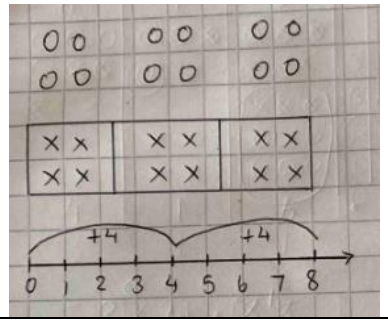
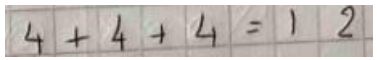
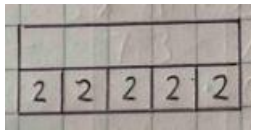
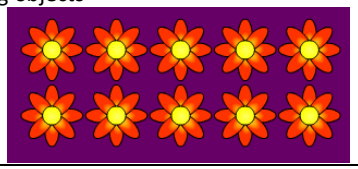
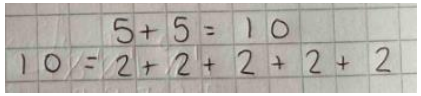
Year 3 NC Objectives	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary and Stem Sentences**
• add and subtract numbers mentally, including: ○ a three-digit number and 1s ○ a three-digit number and 10s ○ a three-digit number and 100s • add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction • estimate the answer to a calculation and use inverse operations to check answers • solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction	Subtract numbers with up to 3 digits, using formal written methods of columnar subtraction 		Column subtraction Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you decrease the column to the left by one by crossing out rewriting above, and putting 1 next to current column (small number) Students need to be constantly reminded of the value of the digits when moving to abstract.   **Highlight relationship between addition and subtraction and using the inverse.**	__ ones - __ ones = __ ones. I will exchange 1 __ to make 10 __. __ tens - __ tens = __ tens. __ hundreds - __ hundreds = __ hundreds. __ - __ = __ __ ten can be exchanged for __ ones. __ hundreds can be exchanged for __ tens. In column subtraction, we start from the place value column that has the __ value. I can partition the number into __, __ and __ and subtract the parts separately. The digit __ is in the __ column. It represents __
	• **Dienes**	• **Dienes** • Part-whole models • Hundred squares	• Mathematical signs + - = • One-step problems • Two-step problems • Missing number problems • Bar models	<u>Vocabulary:</u> Subtract, take away, less, smaller, less, part, whole, ones, tens, hundreds, number bonds, equals, counting back, compare, difference, exchange, commutative, inverse, regrouping, place value

Year 4 NC Objectives	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary and Stem Sentences**
• add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate • estimate and use inverse operations to check answers to a calculation • solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction 		Column subtraction Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you decrease the column to the left by one by crossing out rewriting above, and putting 1 next to current column (small number) Students need to be constantly reminded of the value of the digits when moving to abstract.  	__ ones - __ ones = __ ones. I will exchange 1 __ to make 10 __. __ tens - __ tens = __ tens. __ hundreds - __ hundreds = __ hundreds. __ thousands - __ thousands = __ thousands __ - __ = __ __ ten can be exchanged for __ ones. __ hundreds can be exchanged for __ tens. __ thousands can be exchanged for __ hundreds. In column subtraction, we start from the place value column that has the __ value. I can partition the number into __, __ and __ and subtract the parts separately. The digit __ is in the __ column. It represents __
	• **Place value counters** • Dienes (to support transition over to PV counters)	• **Place value counters** • Dienes (to support transition over to PV counters)	• Mathematical signs + - = • One-step problems • Two-step problems • Missing number problems • Bar models	Vocabulary: Subtract, take away, less, smaller, less, part, whole, ones, tens, hundreds, thousands, number bonds, equals, counting back, compare, difference, exchange, commutative, inverse, regrouping, place value

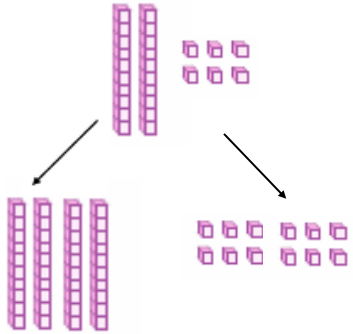
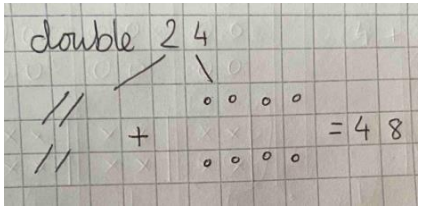
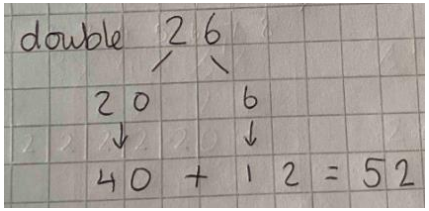
Year 5 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers • use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • solve problems involving number up to 3 decimal places	Subtract whole numbers with more than 4 digits, including using formal written methods 		Column subtraction Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you decrease the column to the left by one by crossing out rewriting above, and putting 1 next to current column (small number) Students need to be constantly reminded of the value of the digits when moving to abstract.  	__ ones - __ ones = __ ones. I will exchange 1 __ to make 10 __. __ tens - __ tens = __ tens. __ hundreds - __ hundreds = __ hundreds. __ thousands - __ thousands = __ thousands (etc) __ - __ = __ __ ten can be exchanged for __ ones. __ hundreds can be exchanged for __ tens. __ thousands can be exchanged for __ hundreds (etc) In column subtraction, we start from the place value column that has the __ value. I can partition the number into __, __ and __ and subtract the parts separately. The digit __ is in the __ column. It represents __
	Subtracting decimals using a formal written method 			__ tenths = __ hundredths __ ones -__ ones = __ ones, so __ tenths - __ tenths = __
	• **Place value counters – introduce decimal counters** • Tens frames (for decimals)	• **Place value counters** • Number lines • Hundred squares/tens frames (for decimals)	• Mathematical signs + - = • One-step problems • Two-step problems • Multi-step problems • Missing number problems • Bar models	Vocabulary: Subtract, take away, less, smaller, less, part, whole, ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions, tenths, hundredths, number bonds, equals, counting back, compare, difference, exchange, commutative, inverse, regrouping, place value

Year 6 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• perform mental calculations, including with mixed operations and large numbers • use their knowledge of the order of operations to carry out calculations involving the 4 operations • solve addition and subtraction multi-step 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 a problem, an appropriate degree of accuracy	Subtract whole numbers with more than 4 digits, including using formal written methods 		Column subtraction Ensure that when you are writing out the formal written method, all the place value columns are in line and that when you are regrouping columns you decrease the column to the left by one by crossing out rewriting above, and putting 1 next to current column (small number) Students need to be constantly reminded of the value of the digits when moving to abstract.  	__ ones - __ ones = __ ones. I will exchange 1 __ to make 10 __. __ tens - __ tens = __ tens. __ hundreds - __ hundreds = __ hundreds. __ thousands - __ thousands = __ thousands (etc) __ - __ = __ __ ten can be exchanged for __ ones. __ hundreds can be exchanged for __ tens. __ thousands can be exchanged for __ hundreds (etc) In column subtraction, we start from the place value column that has the __ value. I can partition the number into __, __ and __ and subtract the parts separately. The digit __ is in the __ column. It represents __
	Subtracting decimals using a formal written method 			__ tenths = __ hundredths __ ones -__ ones = __ ones, so __ tenths - __ tenths = __ ten
	• **Place value counters – introduce decimal counters**	• **Place value counters** • Number lines	• Mathematical signs + - = • One-step problems • Two-step problems • Multi-step problems • Missing number problems • Bar models	Vocabulary: Subtract, take away, less, smaller, less, part, whole, ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions, tenths, hundredths, number bonds, equals, counting back, compare, difference, exchange, commutative, inverse, regrouping, place value

Multiplication

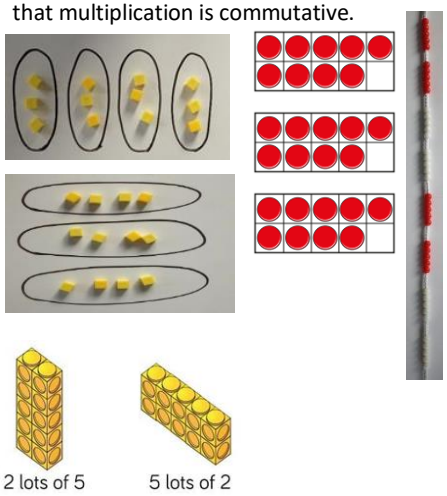
Year 1 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher	Doubling – using manipulatives to demonstrate doubling 	Draw representations to show doubling 	Number sentences to show doubles    **Apply to near doubles**	__ + __ = __, so double __ is __ __ doubled is __ __ is the double of __
	Counting in multiples - repeated addition Writing repeated addition alongside repeated groups of objects Making equal groups using a variety of manipulatives  	Draw pictorial representations alongside repeated addition/bar models Jumps on number lines 	Write addition sentences to describe objects and pictures Bar models  	There are __ groups. There are __ in each group. There are __ in total. __ + __ + __ = I know that the groups are equal/not equal because __ To make the groups equal I could __
	Understanding arrays – creating arrays using objects 	Drawing arrays in different orientations 	Using arrays to identify number sentence and different orientations 	There are __ rows. There are __ in each row. There are __ in total.
	• **Dienes** • Unifix cubes • Two-colour counters • Tens frames • Numicon • Bead strings • Arrays • Real-life objects (teddies, toys etc.)	• **Dienes** • Number lines • Number tracks • Tens frames • Part-whole models • Arrays	• Number sentences • Bar models	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated addition, double

<table>
<tr><th><u>Year 2</u> NC Objectives</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th><th>Vocabulary and Stem Sentences</th></tr>
<tr>
<td rowspan="3">• recall and use multiplication and division facts for 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 the multiplication (×), division (÷) and equals (=) signs
• show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot
• solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

2, 5 and 10 times table</td>
<td>Doubling – using partitioning to double larger numbers
  </td>
<td> 
</td>
<td> 

Link to 2x table</td>
<td>Double __ is __

Double __ is __, so double __ is __

I can partition __ into __ tens and __ ones. __ tens doubles is __. __ ones doubles is __. __ + __ = __</td>
</tr>
<tr>
<td>Understanding of multiplication.
Counting in multiples – repeated addition.
Introduce mathematical symbols. Recognise that multiplication is commutative.
 
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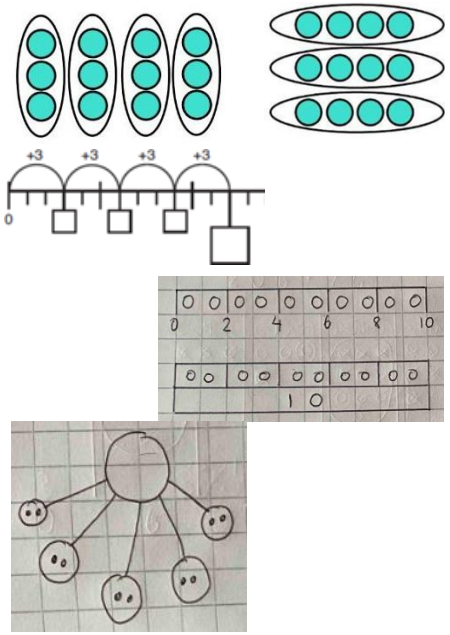
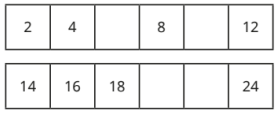
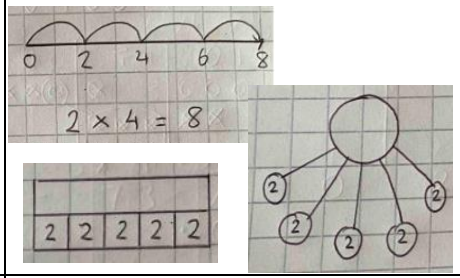
<td> 
</td>
<td>Using arrays to create number sentences
Completing number tracks. Bar models

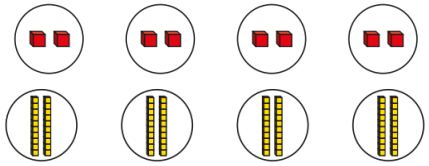
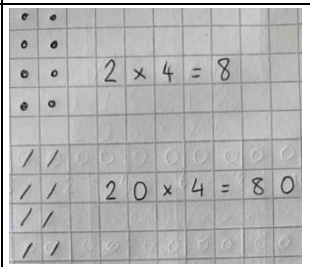
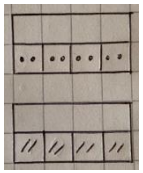
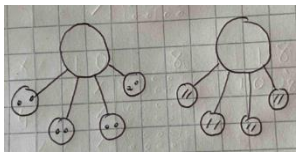
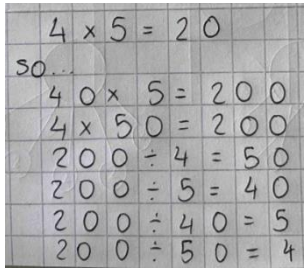
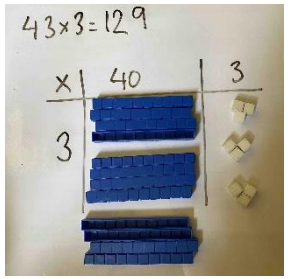
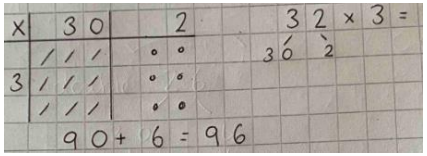
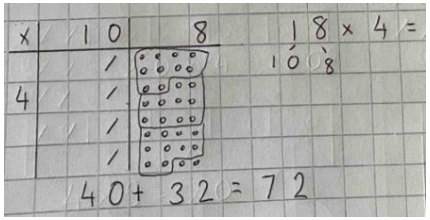
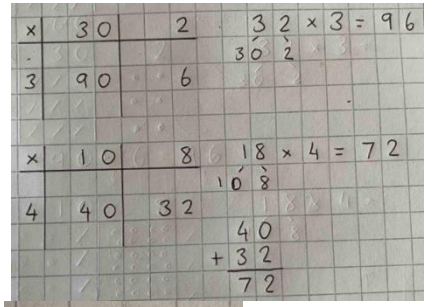
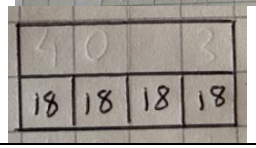
5 + 5 + 5 = 15
3 + 3 + 3 + 3 + 3 = 15
5 x 3 = 15
3 x 5 = 15
 

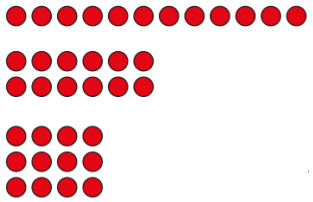
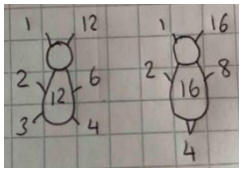
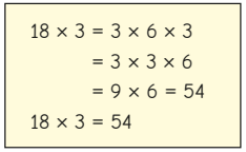
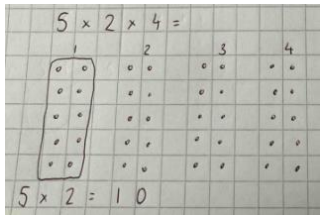
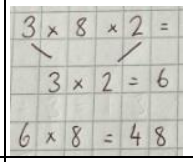
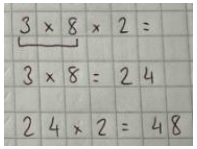
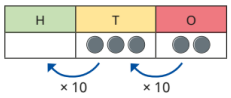
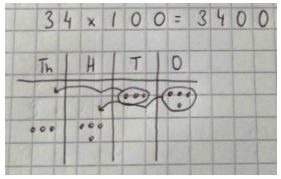
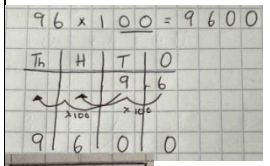
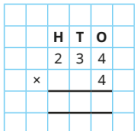
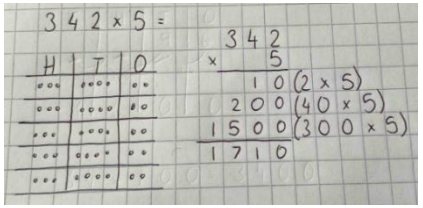
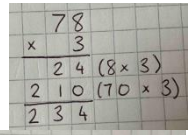
 
</td>
<td>There are __ equal groups.
There are __ in each group.
There are __ altogether.

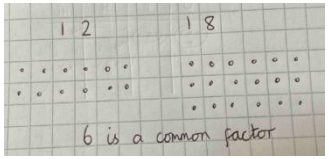
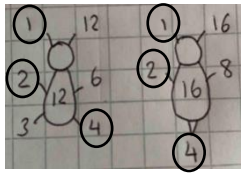
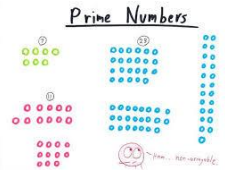
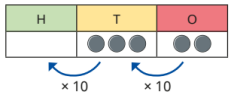
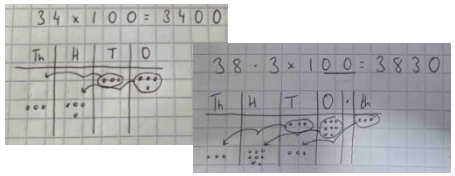
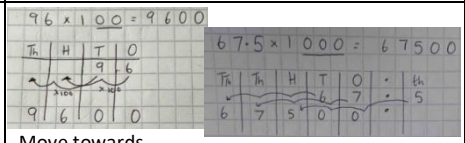
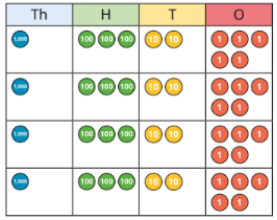
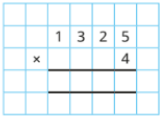
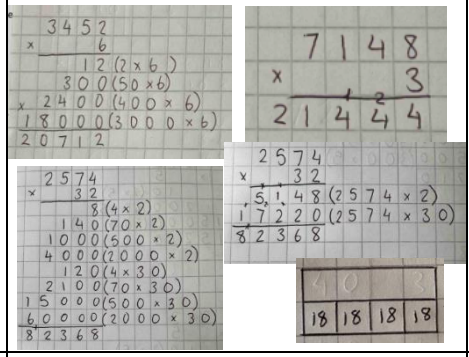
__ + __ + __ = __
__ x __ = __

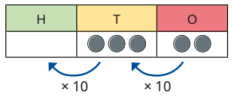
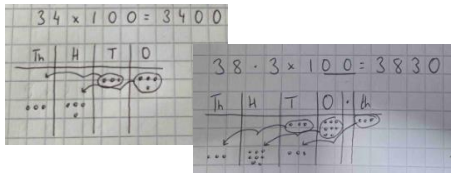
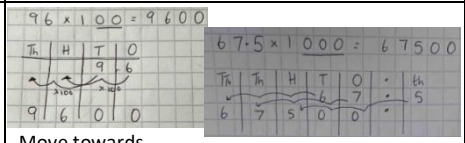
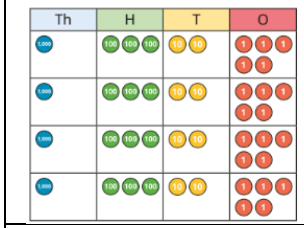
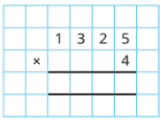
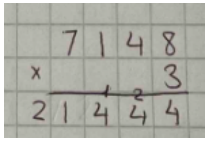
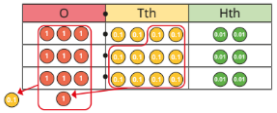
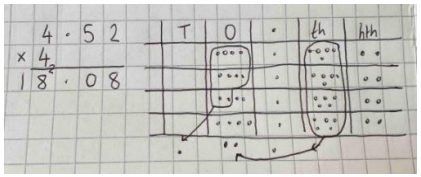
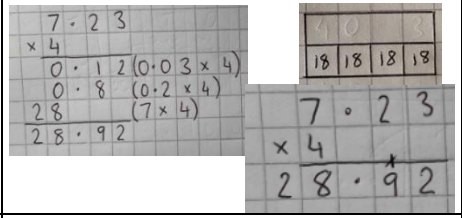
__ x 2 is the same as __ lots of 2

I know that __ x2 = __, so I can add/subtract 2 to work out __ x2</td>
</tr>
<tr>
<td>• Dienes
• Unifix cubes
• Two-colour counters
• Tens frames
• Bead strings
• Arrays</td>
<td>• Dienes
• Number lines
• Number tracks
• Tens frames
• Part-whole models
• Arrays</td>
<td>• Mathematical signs x ÷ =
• One-step problems
• Missing number problems
• Bar models
• Part-whole models</td>
<td><u>Vocabulary:</u>
Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated addition, double, multiplication, commutative</td>
</tr>
</table>

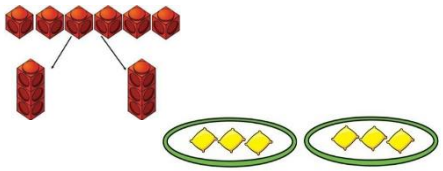
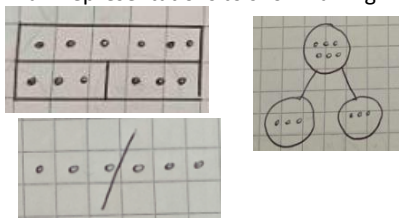
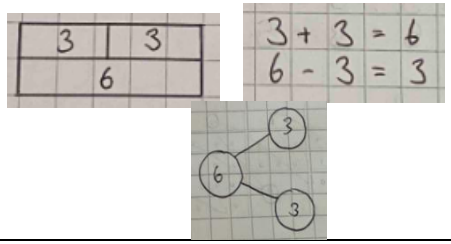
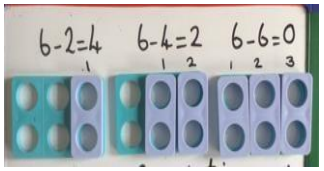
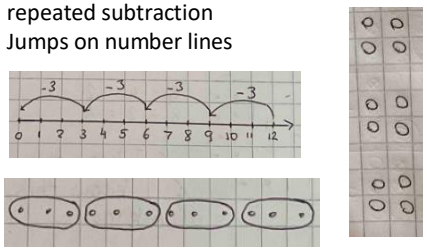
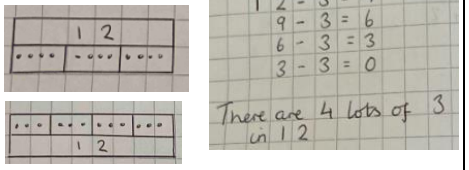
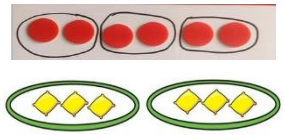
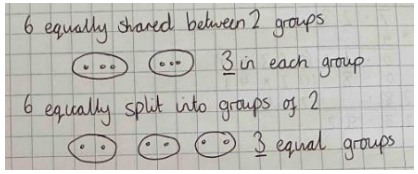
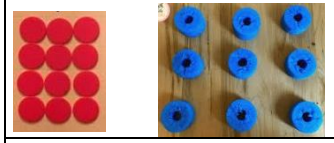
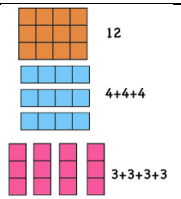
Year 3 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods • solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects **3, 4 and 8 times table**	Related calculations – using multiples of 10 	  	Related facts – move towards mental calculation through the demonstrating the pattern. As multiplication is commutative, we also know other calculations.  **Teach alongside division related facts.**	__ x __ ones is equal to __ ones, so __ x __ tens is equal to __ I know __ x __ = __, so I also know that __ x __ = __ __ multiplied by 10 is equal to __
	Grid method – partition 2-digit and multiply by 1-digit, using knowledge of related calculations 	 	Partitioned number at the top, multiplier down the side. Use column addition to support. Use times tables they have learnt and know.  	__ partitioned into tens and ones is __ tens and __ ones __ x __ ones = __ __ x __ tens = __ __ + __ = __
	• **Dienes**	• **Dienes** • Part-whole models • Bar models	• Mathematical signs x ÷ = • One-step problems • Scaling problems • Correspondence problems • Missing number problems • Bar models	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated addition, double, multiplication, commutative, inverse, grid method, tens, ones

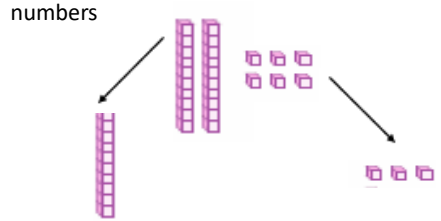
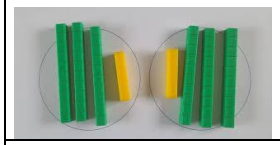
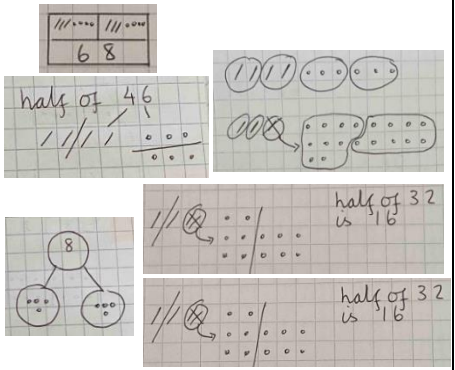
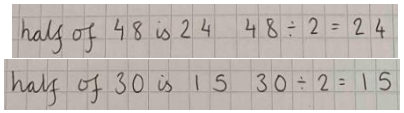
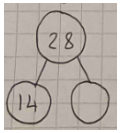
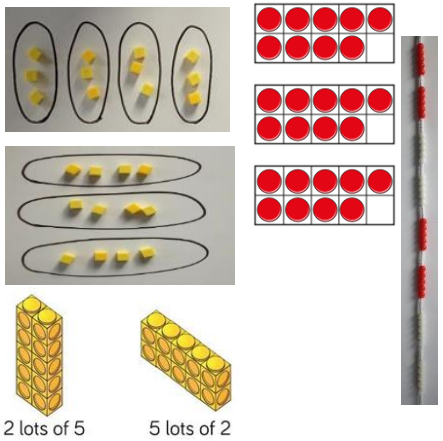
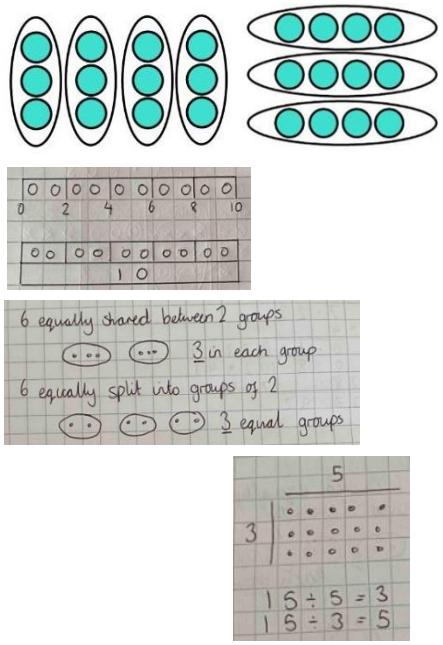
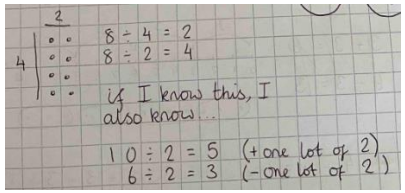
Year 4 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• recall multiplication and division facts for multiplication tables up to 12 × 12 • use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers • recognise and use factor pairs and commutativity in mental calculations • multiply two-digit and three-digit numbers by a one-digit number using formal written layout • solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects **6, 7, 9, 11 and 12 times table**	Factors Using arrays in different formations to find factor pairs 	Factor bugs Antennae are always 1 and the number. If a square number, use a stinger Work around bug in a systematic way to ensure no numbers are missed – once start repeating numbers on the right, you know you are finished Link into number sentences and equivalent calculations (use arrays to continue to support)  		__ = __ x __, so __ and __ are a factor pair of __ __ has __ factors altogether I can use the factor pairs of __ to find an equivalent calculation because __
	Multiplying 3 numbers Use counters to make sets of arrays 3 x 5 x 4 = 		Multiply 2 of the numbers, using known times tables, then multiply by third Demonstrate commutativity - does not matter what numbers are multiplied first  	I am going to work out __ x __ first because __ If __ x __ = __, then __ x __ x __ = __
	Multiplying by 10 and 100 Emphasise movement on place value grid and link to number and place value 		 Move towards calculating mentally without drawing PV grid 	__ x 10 = __, so __ x 100 = __ When multiplying by 10/100, the digits move __ columns to the left
	Column multiplication - expanded Use PV counters on a PV grid alongside column multiplication to demonstrate what is happening in each step 		 Emphasise use of place holder 0 and link to multiplying by 10/100. Brackets used to support, not necessary once method is mastered	__ ones x __ = __ ones __ tens x __ = __ tens __ hundreds x __ = __ hundreds
	• **Place value counters** • Dienes (to support transition over to PV counters)	• **Place value counters** • Dienes (to support transition over to PV counters)	• Mathematical signs + - = • One-step problems • Two-step problems • Correspondence problems • Missing number problems • Bar models	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, factor, repeated addition, double, multiplication, commutative, inverse, grid method, tens, ones, hundreds, factor pairs

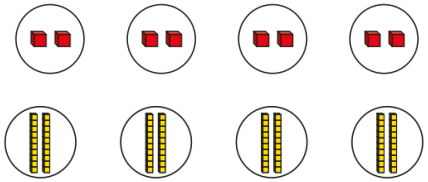
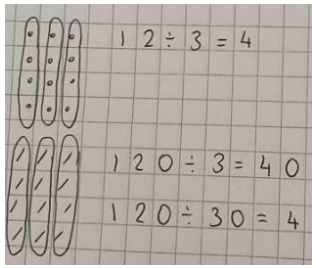
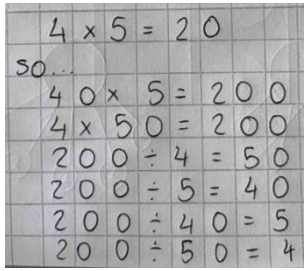
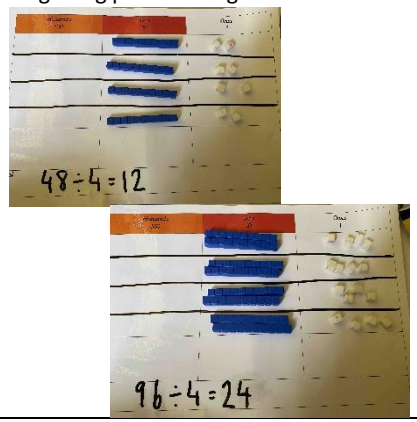
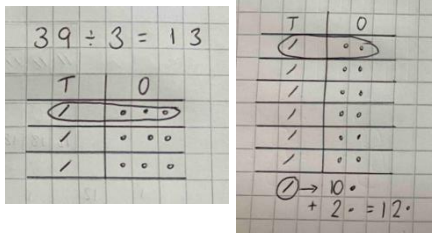
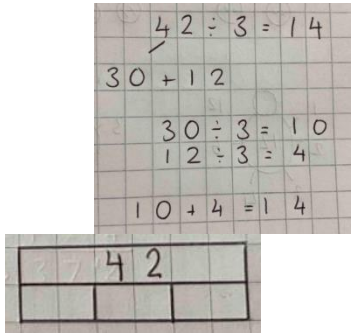
Year 5 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers • know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • establish whether a number up to 100 is prime and recall prime numbers up to 19 • multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers • multiply and divide numbers mentally, drawing upon known facts • multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000 • recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) • solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes • solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates	Finding factors and identifying common factors Using arrays to show common factors 12 and 16 – one common factor is 4	Using factor bugs to find factors and identify common factors between 2 numbers (use arrays to continue to support)  		__ = __ x __, so __ and __ are a factor pair of __ __ is a multiple of __, so __ is a factor of __
	Prime, square and cube numbers Use counters/dienes/cubes to highlight what a cube/square/prime number is using arrays Link to factor bugs 		Being able to list and identify prime, cube and square numbers, using definitions and characteristics as reasons why Understanding indicie notation and use it in the correct way	The only factors of __ are 1 and itself, so __ is prime. __ is a square number because __ x __ = __ __ cubed means __ x __ x __
	Multiply by 10, 100 and 1000 Emphasise movement on place value grid and link to number and place value 		 Move towards calculating mentally without drawing PV grid	When multiplying by 10/100/1000, the digits move __ columns to the left.
	Column multiplication – expanded to move into compact/long multiplication Use PV counters on a PV grid alongside column multiplication to demonstrate what is happening in each step Use PV counters (concrete and pictorial) to continue to support students with mental calculations as needed, especially when multiplying tens and hundreds  		Expanded column to begin, move into compact/long multiplication when ready 	First I multiply __ by __ ones Then I multiply __ by __ tens Finally I add together __ and __
	• **Place value counters** • Dienes (to support transition over to PV counters)	• **Place value counters** • Dienes (to support transition over to PV counters)	• Mathematical signs + - = • One-step problems • Two-step problems • Correspondence problems • Missing number problems • Bar models	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, factor, common factors, repeated addition, double, multiplication, commutative, inverse, grid method, tens, ones, hundreds, thousands, tenths, hundredths

Year 6 NC Objectives	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary and Stem Sentences**
• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • 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 involving the 4 operations • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy • identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places • multiply one-digit numbers with up to 2 decimal places by whole numbers	Multiply by 10, 100 and 1000 Emphasise movement on place value grid and link to number and place value 		 Move towards calculating mentally without drawing PV grid	When multiplying by 10/100/1000, the digits move __ columns to the left.
	Column multiplication – compact/long multiplication Use PV counters on a PV grid alongside column multiplication to demonstrate what is happening in each step Use PV counters (concrete and pictorial) to continue to support students with mental calculations as needed, especially when multiplying tens and hundreds  		 	First I multiply __ by __ ones Then I multiply __ by __ tens Finally I add together __ and __
	Multiplying decimals Use PV counters on a PV grid alongside column multiplication to demonstrate what is happening in each step 		Line integer up with ones column to highlight place value of the digit 	I know that __ x __ = __, so I also know that __ x __ = __
	• **Place value counters**	• **Place value counters**	• Mathematical signs + - = • One-step problems • Two-step problems • Correspondence problems • Missing number problems • Bar models	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, factor, common factors, repeated addition, double, multiplication, commutative, inverse, grid method, tens, ones, hundreds, thousands, hundred thousands, tenths, hundredths, thousandths

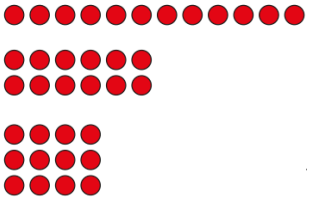
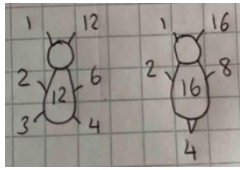
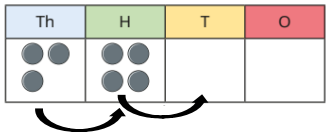
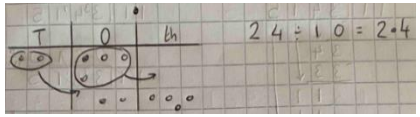
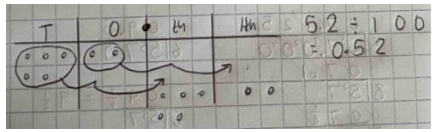
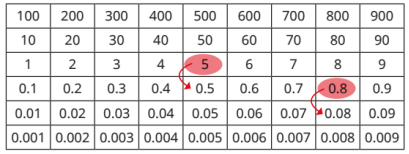
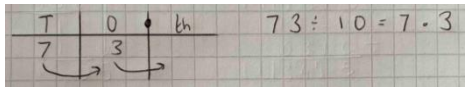
Division

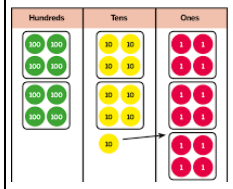
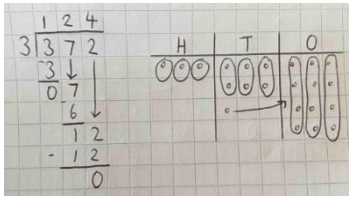
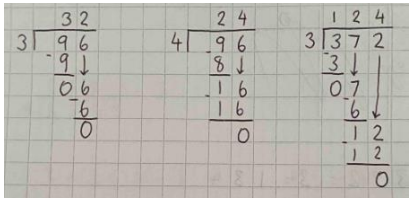
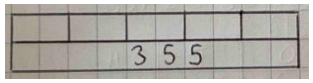
Year 1 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher	Halving – using manipulatives to demonstrate halving (sharing into 2 groups) 	Draw representations to show halving 	Number sentences to show halves 	__ + __ = __, so half of __ is __ __ halved is __ __ is half of __
	Counting backwards in multiples - repeated subtraction Writing repeated subtraction alongside repeated groups of objects 	Draw pictorial representations alongside repeated subtraction Jumps on number lines 	Write repeated subtraction sentences to describe objects and pictures Bar models 	__ - __ - __ =
	Sharing/grouping into equal groups using a variety of manipulatives 	Drawing different pictorial representations to represent number sentences/situations Begin to understand that sharing and grouping will provide the same answer 		There are __ in total. There are __ groups. There are __ in each group. I know that the groups are equal/not equal because __ To make the groups equal I could __
	Understanding arrays – creating arrays using objects 	Drawing arrays in different orientations Link to number sentences 		There are __ in total. There are __ rows. There are __ in each row.
	• **Dienes** • Unifix cubes • Two-colour counters • Tens frames • Numicon • Bead strings • Real-life objects (teddies, toys etc.)	• **Dienes** • Number lines • Number tracks • Tens frames • Part-whole models • Arrays	• Number sentences • Bar models	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, repeated subtraction, half, share, divide, part

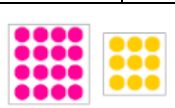
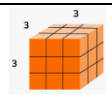
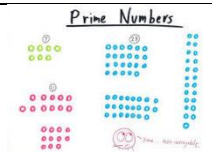
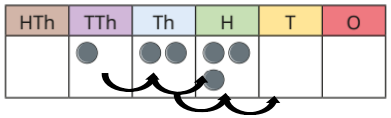
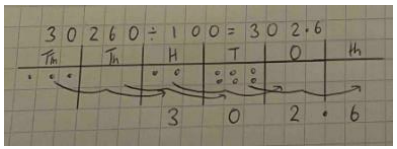
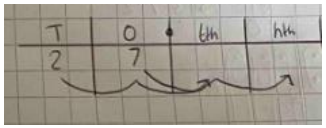
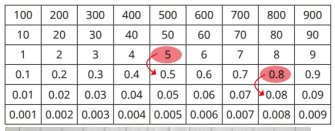
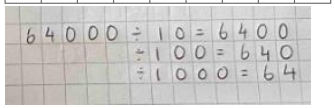
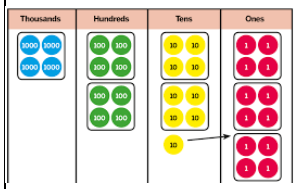
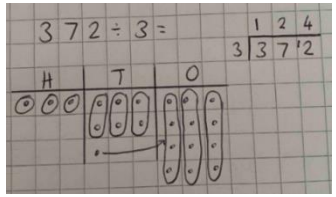
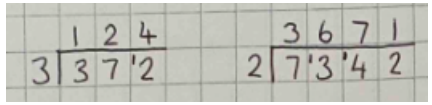
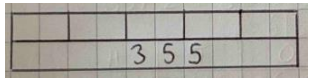
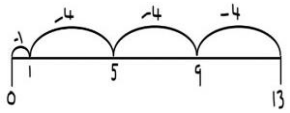
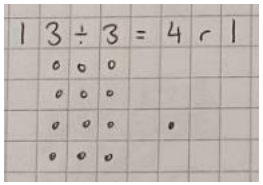
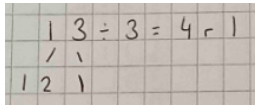
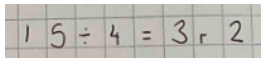
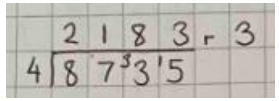
Year 2 NC Objectives	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary and Stem Sentences**
• recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs • show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot • solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts **2, 5 and 10 times table**	Halving – using partitioning to halve larger numbers  		 **Link to 2x table** 	Half of __ is __ Half of __ is __, so half of __ is __ I can partition __ into __ tens and __ ones. __ tens halved is __. __ ones halved is __. __ + __ = __
	Understanding of division. Sharing and grouping in multiples Demonstrate that sharing and grouping will provide the same answer Counting backwards in multiples – repeated subtraction. Introduce mathematical symbols. Recognise that division is not commutative. 		Using arrays to identify number sentence and different orientations Bar models Applying knowledge of times tables to know different facts 	There are __ altogether. There are __ equal groups. There are __ in each group. __ ÷ __ = __ __ - __ - __ = __, so __ ÷ __ = __ __ ÷ 2 is the same as __ groups of 2/ __ shared into 2 groups I know that __ ÷ 2 = __, so I can add/subtract 2 to work out __ ÷ 2
	• **Dienes** • Unifix cubes • Two-colour counters • Tens frames • Bead strings	• **Dienes** • Number lines • Number tracks • Tens frames • Part-whole models • Arrays	• Mathematical signs x ÷ = • One-step problems • Missing number problems • Bar models • Part-whole models	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated subtraction, half, share, divide, part, tens, ones

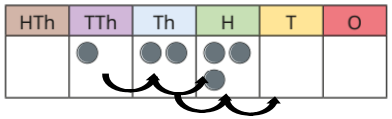
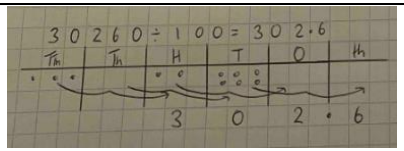
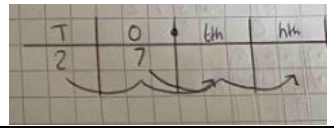
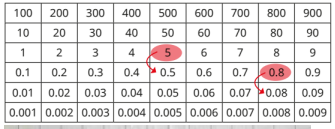
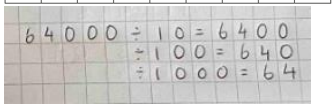
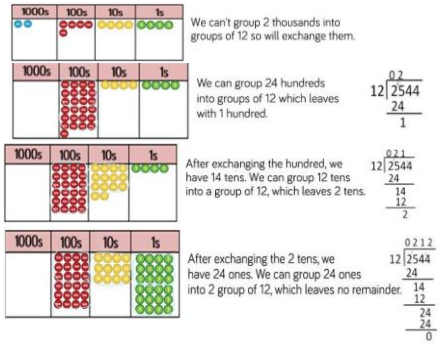
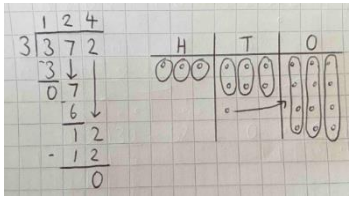
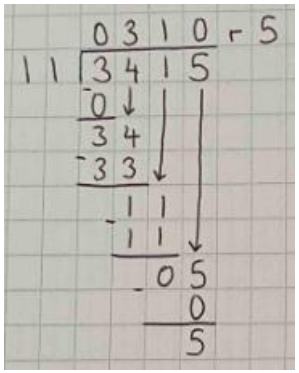
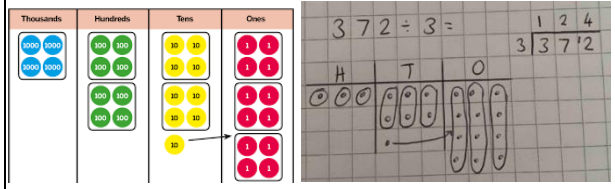
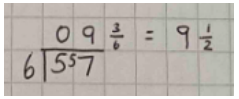
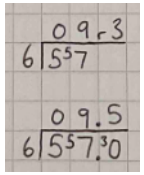
Year 3 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods • solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects **3, 4 and 8 times table**	Related calculations – using multiples of 10 		Related facts – move towards mental calculation through the demonstrating the pattern. As multiplication is commutative, we also know other calculations.  **Teach alongside multiplication related facts.**	__ ÷ __ ones is equal to __ ones, so __ ÷ __ tens is equal to __ I know __ ÷ __ = __, so I also know that __ ÷ __ = __ __ multiplied by 10 is equal to __
	Sharing using place value grids and dienes 	Using dienes to share, exchanging where needed 	Starting to work our mentally or using partitioning using known times tables and related calculations 	__ partitioned into tens and ones is __ tens and __ ones. __ tens ÷__ = __ __ ones ÷ __ = __ __ + __ = __ __ ÷ __ =
	• **Dienes**	• **Dienes** • Part-whole models • Bar models	• Mathematical signs x ÷ = • One-step problems • Missing number problems • Bar models • Partitioning	<u>Vocabulary:</u> Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated subtraction, half, share, divide, part, tens, ones, exchange, partition

<table>
<tr><th>Year 4 NC Objectives</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th><th>Vocabulary and Stem Sentences</th></tr>
<tr>
<td rowspan="3">
• recall multiplication and division facts for multiplication tables up to 12 × 12
• use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers
• recognise and use factor pairs and commutativity in mental calculations
• solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects
• find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths

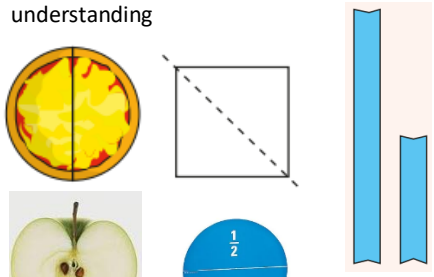
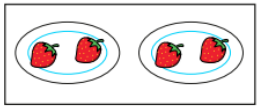
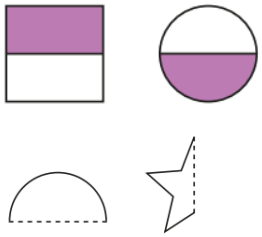
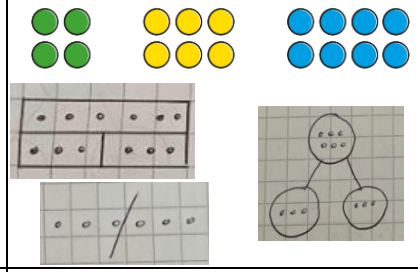
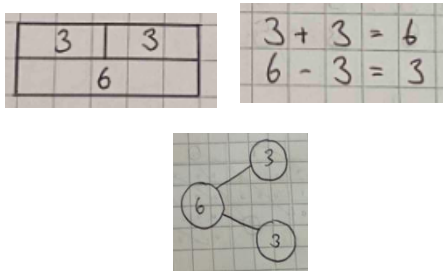
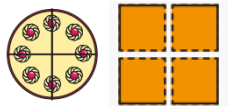
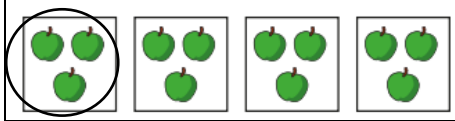
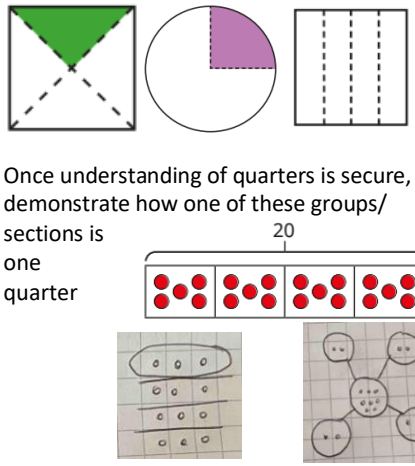
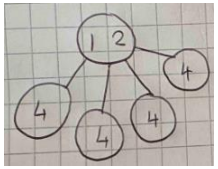
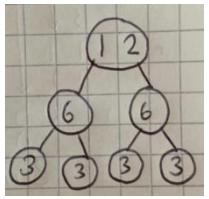
6, 7, 9, 11 and 12 times table
</td>
<td>Using factors for division
Using knowledge of factors to aid with calculations.
Linking to times tables – refer back to often throughout to embed mental calculation</td>
<td>  </td>
<td>  </td>
<td>__ = __ x __, so __ ÷ __ = __</td>
</tr>
<tr>
<td>Dividing by 10 and 100
Emphasise movement on place value grid and link to number and place value
 
Link to decimals</td>
<td> 
  </td>
<td> 
 
Move towards calculating mentally without drawing PV grid</td>
<td>__ ÷ 10 = __, so __ ÷ 100 = __

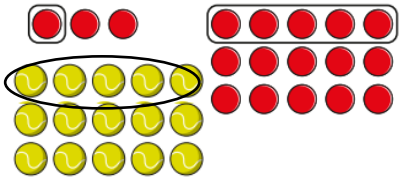
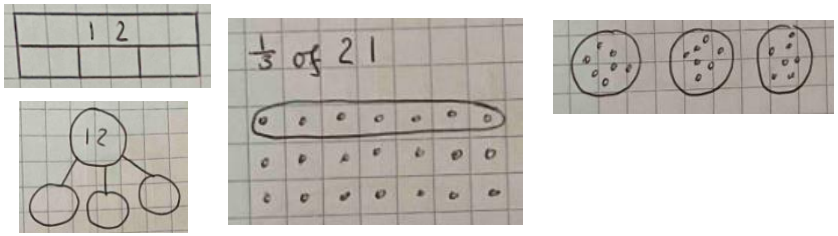
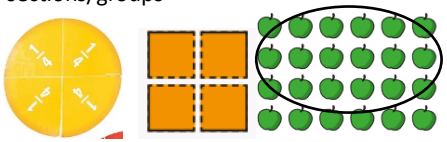
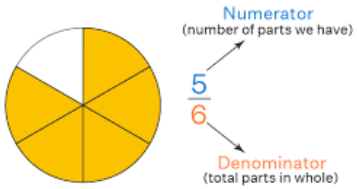
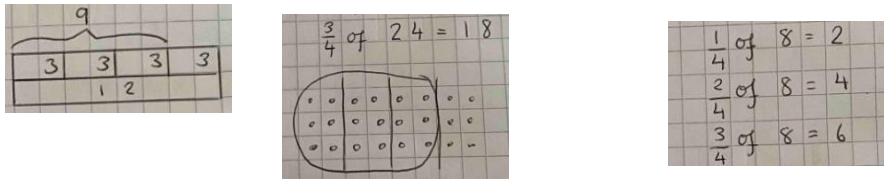
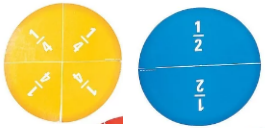
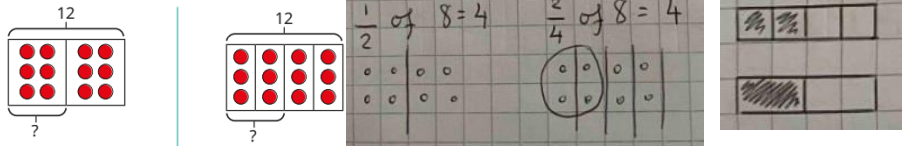
When dividing by 10/100, the digits move __ columns to the right</td>
</tr>
<tr>
<td>Long Division – DMSB
Use place value counters alongside written method to demonstrate each step
  </td>
<td>  </td>
<td> 
  </td>
<td>__ hundreds divided by __ is __
__ tens cannot be divided exactly by __. The closest multiple of __ is __. __ divided by __ is __. There are __ tens left over.
__ tens are exchanged for __ ones
__ ones + __ ones = __ ones
__ ones divided by __ is __
__ divided by __ is __</td>
</tr>
<tr>
<td></td>
<td>• Place value counters
• Dienes (to support transition over to PV counters)</td>
<td>• Place value counters
• Dienes (to support transition over to PV counters)</td>
<td>• Mathematical signs x ÷ =
• One-step problems
• Two-step problems
• Missing number problems
• Bar models
• Gattengo chart</td>
<td><u>Vocabulary:</u>
Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated subtraction, half, share, divide, part, hundreds, tens, ones, exchange, partition, tenths, hundredths</td>
</tr>
</table>

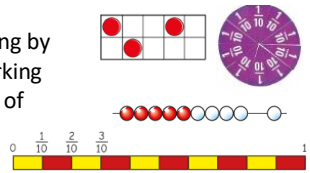
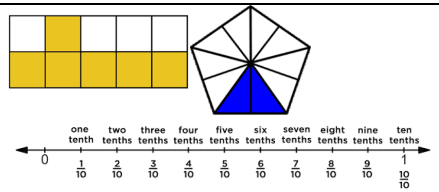
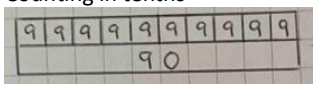
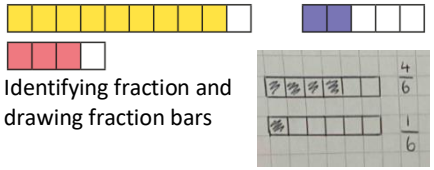
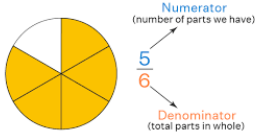
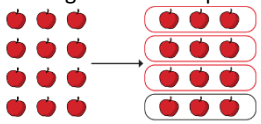
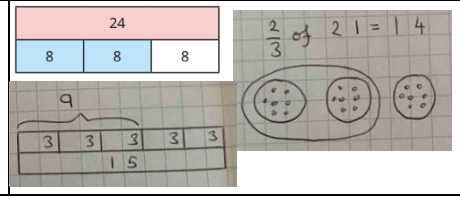
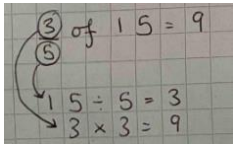
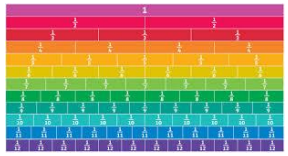
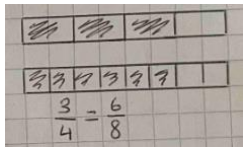
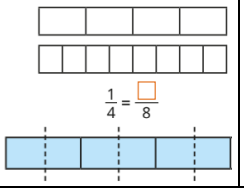
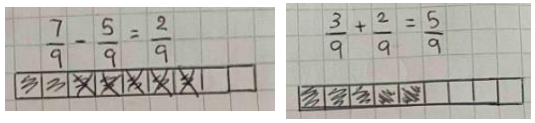
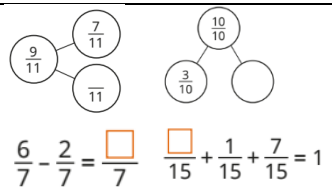
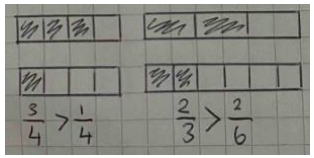
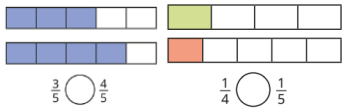
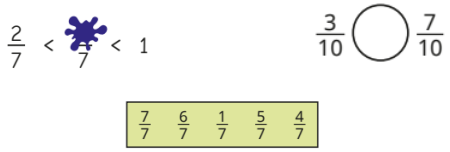
Year 5 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers • know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • establish whether a number up to 100 is prime and recall prime numbers up to 19 • multiply and divide numbers mentally, drawing upon known facts • divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context • multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000 • recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³) • solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes • solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates	Using knowledge of factors, square and cube numbers to aid with division When calculating divisions, use knowledge to aid with mental calculation. Utilise knowledge of numbers and times table to efficiently calculate, reducing working memory load. Refer back to often throughout to embed mental calculation   			__ = __ x __, so __ ÷ __ = __ __ is a prime number, so cannot be divided exactly by __. There will be a remainder.
	Divide by 10, 100 and 1000  **Emphasise movement on place value grid and link to number and place value** **Link to decimals**	 	  Move towards mentally calculating without place value chart	When multiplying by 10/100/1000, the digits move __ columns to the left.
	Short division  Use counters alongside written method to demonstrate each step		 	__ hundreds divided by __ is __ with a remainder of __ Exchange the remainder, then __ tens divided by __ is __ __ ones divided by __ is __ __ divided by __ is __
	Remainders Introduce concept of remainders using smaller calculations they are confident with – link to times tables. Use manipulatives to demonstrate that remainders are 'left over' Understanding of what the greatest remainder possible is – e.g. if dividing by 5, the greatest possible remainder is 4 	 	  **Once understanding of remainders secured, apply to formal written method** **Link to decimals** 	__ ones divided by __ is __ ones remainder __ When dividing by __, the greatest possible remainder is __
	• **Place value counters** • Dienes/lollypop sticks to introduce remainders	• **Place value counters** • Number lines •	• Mathematical signs x ÷ = • One-step problems • Two-step problems • Missing number problems • Bar models • Gattengo chart	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated subtraction, half, share, divide, part, thousands, hundreds, tens, ones, exchange, partition, tenths, hundredths, remainder

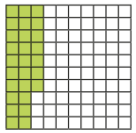
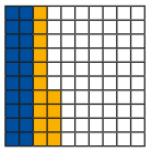
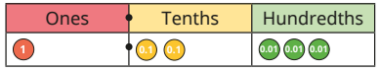
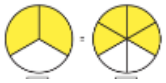
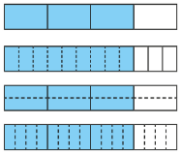
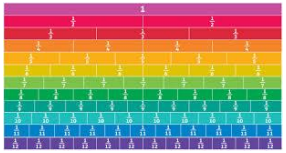
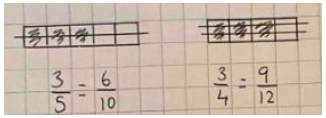
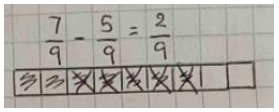
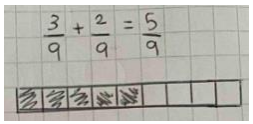
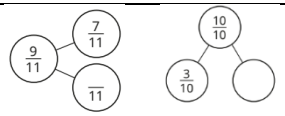
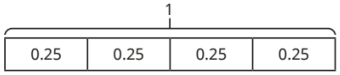
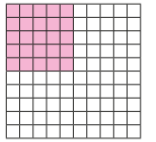
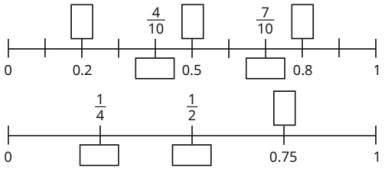
Year 6 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders 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 involving the 4 operations • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy • identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places • use written division methods in cases where the answer has up to 2 decimal places	Dividing by 10, 100 and 1000  **Emphasise movement on place value grid and link to number and place value** **Link to decimals**	 	 	When multiplying by 10/100/1000, the digits move __ columns to the left
	Long division - DMSB Use counters alongside written method to demonstrate what is happening in each step  		__ hundreds divided by __ is __ with a remainder of __ The remainder is exchanged into __ tens __ tens divided by __ is __ with no remainder. __ ones divided by __ is __ with a remainder of __ __ divided by __ is __ remainder __
	Short division  Use counters alongside written method to demonstrate each step		__ hundreds divided by __ is __ with a remainder of __ Exchange the remainder, then __ tens divided by __ is __ __ ones divided by __ is __ __ divided by __ is __
	Interpret remainders Understand how to represent remainders in whole number remainders, fractions and decimals. In word problems, identify the context and whether what to do with remainder. *Ignore it – problem is asking for full groups (How many __ can be made?)* *Round it – problem needs everything included (How many __ will they need?)* *Report it – question asks for remainder (How many __ will not fit?)* *Use it – remainder can be divided into smaller parts e.g. money, measurements (How much money will they get?)*	 	The remainder is __. It can also be recorded as a decimal of __ and a fraction of __
	• **Place value counters**	• **Place value counters** • Number lines	• Mathematical signs x ÷ = • One-step problems • Two-step problems • Missing number problems • Bar models • Gattengo chart	Vocabulary: Equal groups, arrays, total, altogether, odd, even, lots of, groups of, multiple, repeated subtraction, half, share, divide, part, thousands, hundreds, tens, ones, exchange, partition, tenths, hundredths, remainder

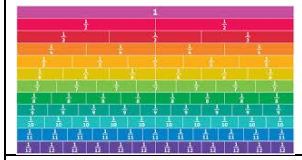
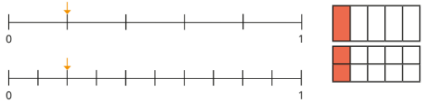
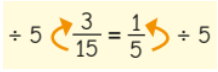
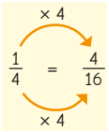
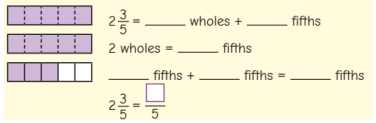
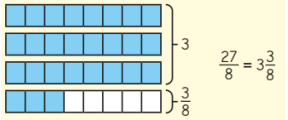
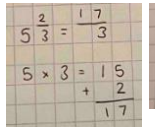
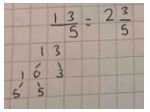
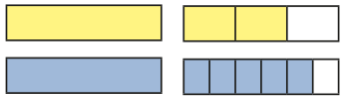
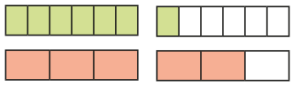
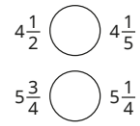
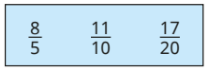
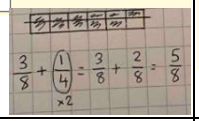
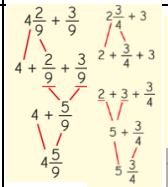
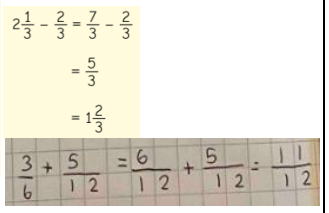
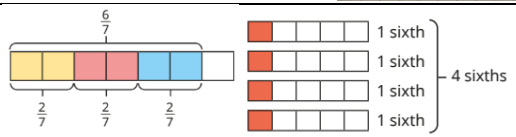
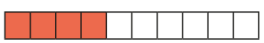
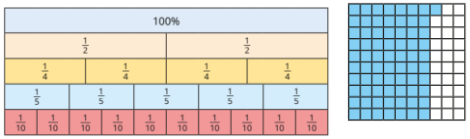
Fractions

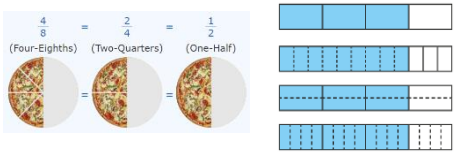
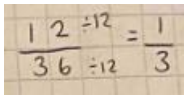
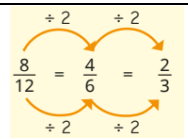
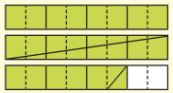
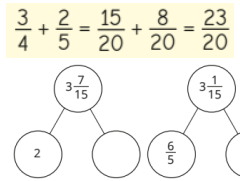
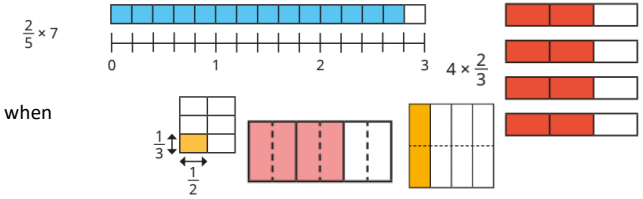
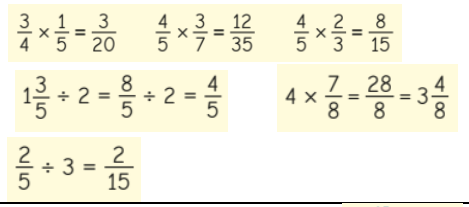
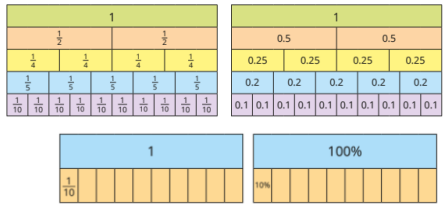
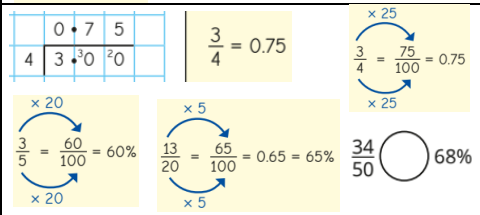
Year 1 NC Objectives COMPLETED IN YEAR 2	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity • recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity	Halves Using different manipulatives to demonstrate two equal parts. Ensure non-examples are shown to consolidate understanding  Link back to multiplication/ division for finding half of quantity 	 Link back to multiplication/division for finding half of quantity 	Use arrays and knowledge of halving and doubling to find half of quantity 	To find a half, I need to split the whole into __ equal parts There are __ altogether They are shared into 2 equal groups There are __ in each group Each group is __ of the whole There are __ altogether. To find half, I need to share the total into __ equal groups. There are __ in each group Half of __ is __ If double __ is __, then half of __ is __
	Quarters Using different manipulatives to demonstrate four equal parts. Ensure non-examples are shown to consolidate understanding  Once understanding of quarters is secure, demonstrate how one of these groups/sections is one quarter 	Once understanding of quarters is secure, demonstrate how one of these groups/ sections is one quarter 	 **Connection between half and quarters** 	There are __ quarters in a whole To make quarters, I need to split the whole into __ equal parts There are __ altogether. They are shared into __ equal groups Each group is a __ of the whole There are __ in each group One quarter of __ is __
	• Dienes (fraction of quantity) • Unifix cubes • Two-colour counters • Real-life objects (teddies, toys etc.) • Fraction magnets	• Dienes (fraction of quantity) • Tens frames • Part-whole models • Arrays • Bar models	• Number sentences • Bar models • Part-whole models	Vocabulary: Half, quarter, equal parts

Year 2 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• recognise, find, name and write fractions 1/3 , 1/4 , 2/4 and 3/4 of a length, shape, set of objects or quantity • write simple fractions, for example 1/2 of 6 = 3 and recognise the equivalence of 2/4 and 1/2	Thirds Link back to multiplication/division for finding third of quantity 	 Use arrays and bar models to find thirds of quantities 		The whole has been split into __ equal parts. Each part is worth a __ There are __ altogether. They are shared into __ equal groups Each group is a __ of the whole There are __ in each group One third of __ is __
	Quarters Recognise, name and understand parts of a fraction. Recognise that the numerator corresponds to the amount of sections/groups  Link back to multiplication/division for finding third of quantity 	  Use arrays and bar models to find quarters of quantities 		The whole has been split into __ equal parts. __ parts are shaded. The fraction being represented is __/__ There are __ altogether They are shared into __ equal groups Each groups is a __ of the whole There are __ in each group There are __ in __ groups __ quarters of __ is __
	Recognising equivalents Use manipulatives to reveal equivalence 			1/2 is __ to 2/4
	• Dienes (fraction of quantity) • Unifix cubes • Two-colour counters • Real-life objects (teddies, toys etc.) • Fraction magnets	• Dienes (fraction of quantity) • Tens frames • Part-whole models • Arrays • Bar models • Fraction bars	• Number sentences • Bar models • Part-whole models	Vocabulary: Half, quarter, equal parts, fraction, numerator, denominator, third, equivalent, three quarters

Year 3 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 • recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators • recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators • recognise and show, using diagrams, equivalent fractions with small denominators • add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7] • compare and order unit fractions, and fractions with the same denominators • solve problems that involve all of the above	Tenths Link to dividing by 10 when working out fractions of quantities 		Use arrays and bar models to find tenths of quantities Counting in tenths 	The number line starts at __ and ends at __ The number line has been split into __ equal parts This means the number line is counting in __
	Unit and non-unit fractions Use unifix cubes to make fraction bars – numerator is different colour 	 Identifying fraction and drawing fraction bars	Understanding of parts of the fraction 	There are _- equal parts The denominator is __ __ of the equal parts are shaded The numerator is __ The fraction shaded is __
	Finding fractions of quantities 			__ ÷ __ = __, so 1/__ of __ is __ 1/__ of __ is __, so __/__ of __ is __
	Equivalent fractions Using fraction walls and bars to identify equivalent fractions 			I know __ is equivalent to __ because…
	Calculate using fractions with the same denominator 			When adding/subtracting fractions with the same denominator, only the __ changes I have __, so I need __ more to make a whole.
	Compare and order fractions 			When comparing fractions with the same denominator/numerator, the bigger the numerator/denominator the __ the fraction.
	• Dienes (fraction of quantity) • Unifix cubes • Two-colour counters • Fraction magnets • Tens frame (tenths)	• Dienes (fraction of quantity) • Part-whole models • Arrays • Bar models • Fraction bars • Fraction wall	• Number sentences • Bar models • Part-whole models	Vocabulary: Half, quarter, equal parts, fraction, numerator, denominator, third, equivalent, three quarters, tenths, bigger, smaller, whole

Year 4 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• recognise and show, using diagrams, families of common equivalent fractions • count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10 • solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number • add and subtract fractions with the same denominator • recognise and write decimal equivalents of any number of tenths or hundreds • recognise and write decimal equivalents to 1/4 , 1/2 , 3/4 • solve simple measure and money problems involving fractions and decimals to 2 decimal places	Tenths and hundredths Deepen understanding of tenths and introduce concept of hundredths by using hundred square/dienes to illustrate it is the whole split into 100 equal parts **Link to decimals – dividing by 10/100 on place value grid**    	Apply knowledge of tenths to understand link between tenths and hundredths $\frac{45}{100} = \frac{\square}{10} + \frac{\square}{100}$ $\frac{3}{10} = \frac{\square}{100}$	There are __ hundredths in __ tenths __ hundredths is equivalent to __ tenths and __ hundredths __ + __ = 10, so __ tenths + __ tenths = 1 whole __ + __ = 100, so __ hundredths + __ hundredths = 1 whole
	Equivalent fractions Use fraction bars and representations to show equivalent fractions     			If I divide each part into __ equal parts, then they will each represent __ I can divide each part into __ equal parts to show that __ is equivalent to __
	Calculate using fractions with the same denominator   		 $\frac{6}{7} - \frac{2}{7} = \frac{\square}{7}$ $\frac{\square}{15} + \frac{1}{15} + \frac{7}{15} = 1$	When adding/subtracting fractions with the same denominator, only the __ changes I have __, so I need __ more to make a whole.
	Decimal equivalents Use representations to reveal the decimal equivalent to fractions    		1/4 = __/100 = 0.__ 1/2 = __/100 = 0.__ 3/4 = __/100 = 0.__
	• Dienes (fraction of quantity) • Unifix cubes • Two-colour counters • Fraction magnets	• Dienes (fraction of quantity) • Part-whole models • Arrays • Bar models • Fraction bars • Hundred square • Fraction wall	• Number sentences • Bar models • Part-whole models	Vocabulary: Half, quarter, equal parts, fraction, numerator, denominator, third, equivalent, three quarters, tenths, bigger, smaller, hundredths, decimal, whole

Year 5 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• compare and order fractions whose denominators are all multiples of the same number • identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths • recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, 2/5 + 4/5 = 6/5 = 1 1/5] • add and subtract fractions with the same denominator, and denominators that are multiples of the same number • multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams • read and write decimal numbers as fractions [for example, 0.71 = 71/100] • recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per 100', and write percentages as a fraction with denominator 100, and as a decimal fraction • solve problems which require knowing percentage and decimal equivalents of 1/2 , 1/4 , 1/5 , 2/5 , 4/5 and those fractions with a denominator of a multiple of 10 or 25	Finding equivalent fractions 		Apply knowledge of factors/multiples to find equivalent fractions  	The numerator has been multiplied/divided by __, so the denominator must be multiplied/divided by __.
	Mixed numbers and improper fractions Use bar models to find how many wholes and how many 'left over' **Link to division and remainders**  		Apply knowledge of factors/ multiples to mentally calculate  	There are __ in one whole, so there are __ in __ wholes I can regroup __ to make __ wholes with __ parts left over. As a mixed number, this is __ and __
	Compare and order fractions including fractions greater than 1 Know that if a mixed number has more wholes, it is automatically greater  		 	When comparing fractions with the same denominator/numerator, the bigger the numerator/denominator the __ the fraction.
	Calculate using fractions with the same denominator, including mixed numbers Calculate using fractions with denominators that are multiples of the same number – convert first by making denominators the same using knowledge of multiples 		 	The mixed number of __ can be partitioned into __ and __ __ is made up of __ wholes and __
	Multiplying with fractions Use bar models to reveal that only the numerator changes – the amount of equal parts the whole is split into is not changing 		$4 \times 1\frac{3}{8} = 4 \times \frac{11}{8} = \frac{44}{8} = 5\frac{4}{8} = 5\frac{1}{2}$	When I multiply a fraction by an integer, I multiply the __ by the integer and the __ remains the same
	Percentages  Use representations to reveal the decimal and percentage equivalents to fractions 		$\frac{\square}{4} = 75\%$ ▸ $\frac{7}{10} = _____\%$	__% is equivalent to __/100
	• Place value counters (decimals) • Unifix cubes • Fraction magnets	• Place value counters (decimals) • Part-whole models • Arrays • Bar models • Fraction bars • Fraction wall	• Number sentences • Bar models • Part-whole models	Vocabulary: Half, quarter, equal parts, fraction, numerator, denominator, third, equivalent, three quarters, tenths, bigger, smaller, hundredths, decimal, mixed number, improper fractions, whole, percentage

Year 6 NC Objectives	Concrete	Pictorial	Abstract	Vocabulary and Stem Sentences
• use common factors to simplify fractions; use common 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 the concept of equivalent fractions • multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, 1/4 × 1/2 = 1/8+9] • divide proper fractions by whole numbers [for example, 1/3 ÷ 2 = 1/6] • associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, 3/8] • recall and use equivalences between simple fractions, decimals and percentages, including in different contexts	Simplifying fractions *Refer back to equivalence from previous year groups to demonstrate how they are the same*		Apply knowledge of factors to identify the simplest form  	Both the numerator and denominator can be divided by __ __ in its simplest form is __
	Add and subtract any fraction Convert to same denominator first by cross multiplying	 		To add/subtract the fractions, I could convert them both to fractions with a denominator of __ __ is made up of __ wholes and __
	Multiplying and dividing with fractions Use bar models to reveal the relationship between the numerator/denominator when multiplying and dividing			When multiplying a pair of fractions, I need to multiply the __ and multiply the __ __ ones divided by __ is equal to __, so __ eighths divided by __ is equal to __ eighths
	Decimal and percentage equivalents Use representations to reveal the decimal and percentage equivalents to fractions **Link to division and remainders**			The fraction __ can be expressed as __ ÷ __ __% is equivalent to __/100 If 1/__ is equal to __%, then __/__ is equal to __% To find an equivalent fraction with a denominator of 100, I need to __ by __
	• Place value counters (decimals) • Unifix cubes • Fraction magnets	• Place value counters (decimals) • Part-whole models • Arrays • Bar models • Fraction bars • Fraction wall	• Number sentences • Bar models • Part-whole models	Vocabulary: Half, quarter, equal parts, fraction, numerator, denominator, third, equivalent, three quarters, tenths, bigger, smaller, hundredths, decimal, mixed number, improper fractions, whole, percentage, simplifying, convert

Key Learning in Other Areas				
	Number and Place Value	**Measurement**	**Geometry (shape and position/direction)**	**Statistics**
EYFS (development matters)	• Develop fast recognition of up to 3 objects, without having to count them individually • Know that the last number reached when counting a small set of objects tells you how many there are in total • Link numerals and amounts • Say one number for each item in order: 1-5 • Recite numbers past 5 • Explore the composition of 3 • Compare quantities using language: 'more than', 'fewer than' • Solve real world mathematical problems with numbers up to 5 • Talk about and identify patterns around them. • Extend and create ABAB patterns. Notice and correct an error in a repeating pattern.	• Make comparisons between objects relating to size, length, weight and capacity • Begin to describe a sequence of events, real or fictional, using words such as first and then • Compare length, weight and capacity	• Talk about and explore 2D and 3D shapes using informal mathematical language: 'sides', 'corners', 'straight', 'flat', 'round' • Understand position through words alone – for example the bag is under the table – with no pointing • Describe a familiar route • Discuss routers and locations, using words like in front of and behind • Select shapes appropriately: flat surfaces for building, a triangular prism for a roof etc • Combine shapes to make new ones – an arch, a bigger triangle etc. • Select, rotate and manipulate shapes • Compose and decompose shapes to recognise that shapes can have other shapes within it	

Year 1	• Count to and across 100
	• Count, read and write numbers to 100 in numerals
	• Count in 2s, 5s and 10s
	• Identify 1 more and less
	• Identify and represent numbers using different representations
	• Use the language of more than, less than, most, least
	• Read and write numbers from 1 to 20 in numerals and words
		• Compare, describe and solve practical problems for:
		  ○ Lengths and heights
		  ○ Mass and weight
		  ○ Capacity and volume
		  ○ Time
		• Measure and begin to record
		  ○ Length and height
		  ○ Mass and weight
		  ○ Capacity and volume
		  ○ Time (hours, minutes, seconds)
		• Recognise and know the value of different coins and notes
		• Sequence events in chronological order using language (days of the week, weeks, months, years)
		• tell the time and draw hands on the clock for the hour and half past the hour
			• recognise and name common 2D and 3D shapes
			• describe position, direction and movement, including whole, half, quarter and three-quarter terms (*including left and right, top, middle and bottom, on top of, in front of, above, between, around, near, close and far, up and down, forwards and backwards, inside and outside)*	

Year 2	• count in steps of 2, 3, 5s and 10s • recognise the place value in two-digit numbers • identify, represent and estimate numbers using different representations • compare and order numbers using inequalities • read and write numbers to at least 100 in numerals and words • use place value and number facts to solve problems • *partition numbers in different ways* • *begin to understand 0 as a place holder*	• choose and use appropriate standard units to estimate and measure (m/cm, kg/g, ˚C, l/ml) using appropriate equipment • compare and order measurements using inequalities • recognise and use the symbols for pounds and pence • combine amounts to make a particular value • solve problems using money, including addition and subtraction, and giving change • compare and sequence intervals of time • tell, write and draw hands on the clock to 5 minutes, including quarter past/to • know the number of minutes in an hour and hours in a day	• identify and describe the properties of 2D shapes (sides, vertical line of symmetry) • identify and describe the properties of 3D shapes (edges, vertices, faces) and identify 2D shapes on their surfaces • compare and sort 2D and 3D shapes • order and arrange combinations of objects in patterns and sequences • use vocabulary to describe position, direction and movement • distinguish between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise) • *draw lines and shapes using a straight edge*	• interpret and construct pictograms, tally charts, block diagrams and 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

	Number and Place Value	Measurement	Geometry (shape and position/direction)	Statistics
Year 3	• count in multiples of 4, 8, 50 and 100 • find 10 and 100 more or less • recognise the place value in three-digit numbers • compare and order numbers up to 1,000 • identify, represent and estimate numbers using different representations • read and write numbers up to 1,00 in numerals and words • solve number problems and practical problems involving these • *partition numbers flexibly*	• measure, compare, add and subtract with measurements (m/cm/mm, kg/g, l/ml) *including mixed units and simple equivalents* • measure the perimeter of 2D shapes • add and subtract money to give change • tell and write the time from an analogue clock, including Roman numerals and 12/24-hour clocks (*digital 12-hour)* • estimate, reads and draw the hands to the minute • record and compare time in terms of seconds, minutes and hours • use time vocabulary (o'clock, am/pm, morning, afternoon, noon and midnight) • know the number of seconds in a minute and the number of days in each month, year and leap year • compare durations of events (calculate time for events/tasks)	• draw 2D shapes and make 3D shapes • recognise 3D shapes in different orientations and describe them • identify right angles and recognise its link to other turns • identify whether angles are greater than or less than a right angle • identify horizontal and vertical lines • identify parallel and perpendicular lines	• interpret and present data using bar charts, pictograms and tables • solve one-step and two-step questions using information presented in scaled bar charts, pictograms and tables
Year 4	• count in multiples of 6, 7, 9, 25 and 1,000 • find 1,000 more or less • count backwards through 0 to negative numbers • recognise the place value in 4-digit numbers • order and compare numbers beyond 1,000 • identify, represent and estimate numbers using different representations • round to the nearest 10, 100 and 1,000 • solve number and practical problems that involve the above • read Roman numerals to 100 and know the context around the numeral system • divide a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths • round decimals with 1 decimal place to the nearest whole number • compare numbers with the same number of decimal places up to 2 decimal places • solve simple measure and money problems involving fractions and decimals to 2 decimal places	• convert between different units of measurement • measure and calculate the perimeter of a rectilinear figure in centimetres and metres (*understand perimeter as 2(a+b))* • find the area of rectilinear figures by counting squares • estimate, compare and calculate different measures (including money) • read, write and convert between analogue and digital time (12/24- hour) • solve problems involving converting from hours to minutes, minutes to seconds, years to months, weeks to days • *use decimal notation within measurement*	• compare and classify shapes based on their properties and sizes (different triangles and quadrilaterals) • identify acute, obtuse and right angles and order them based on size • identify lines of symmetry in 2D shapes • complete a figure based on lines of symmetry • *decide if a polygon is regular or irregular* • describe positions on a grid as coordinates (first quadrant only) • describe translations as a given unit left/right and up/down • plot specified points on a coordinate grid • complete shapes on a coordinate grid	• interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs • solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

	Number and Place Value	Measurement	Geometry (shape and position/direction)	Statistics

Year 5	• read, write and order numbers up to 1,000,000
	• recognise the place value in 7-digit numbers
	• count in steps of powers of 10
	• interpret negative numbers in context
	• count forwards and backwards with positive and negative whole numbers
	• round to the nearest 10, 100, 1,000, 10,000 and 100,000
	• solve problems involving above
	• read Roman numerals up to 1,000
	• recognise years written in Roman numerals
	• read and write decimal numbers as fractions [for example, 0.71 = 71/100]
	• recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
	• round decimals with 2 decimal places to the nearest whole number and to 1 decimal place
	• read, write, order and compare numbers with up to 3 decimal places
	• solve problems involving number up to 3 decimal places
	• *recognise and describe number sequences involving fractions and decimals and find the rule/pattern for them*
		• convert between different units of measurement
		• understand and use approximate equivalences between metric and imperial (inches, pounds, pints)
		• measure and calculate the perimeter of rectilinear shapes in cm and m (*use knowledge to calculate missing sides)*
		• calculate and compare the area of rectangles using standard units (m/cm^2)
		• estimate the area of irregular shapes
		• estimate volume/capacity (using 1 cm^3 blocks to build)
		• solve problems involving converting units of time *and money*
		• use all 4 operations to solve problems involving measure, including decimals and scaling
			• identify 3D shapes (cubes/cuboids) from 2D representations
			• know angles are measured in degrees
			• estimate and compare acute, obtuse and reflex angles
			• measure and draw angles in degrees *using a protractor*
			• identify
			  ○ angles at a point and 1 whole turn (360°)
			  ○ angles at a point on a straight line and half a turn (180°)
			  ○ other multiples of 90°
			• use the properties of rectangles to deduce related facts and find missing lengths/angles
			• distinguish between regular and irregular polygons based on reasoning about equal sides and angles
			• *become accurate in drawing lines with a ruler to the nearest mm*
			• *use conventional markings for parallel and perpendicular lines*
			• identify, describe and represent the position of a shape following a reflection (*parallel to axis*) or translation, using the appropriate language, and know that the shape has not changed *including using coordinate grids*
				• solve comparison, sum and difference problems using information presented in a line graph
				• complete, read and interpret information in tables, including timetables
				• *begin to decide which representations of data are the most appropriate and why*

Year 6	• read, write, order and compare numbers up to 10,000,000 • recognise the place value in 8-digit numbers • round any whole number to a given degree • use negative numbers in context • calculate intervals across 0 • solve number and practical problems that involve all of the above • identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places • multiply one-digit numbers with up to 2 decimal places by whole numbers • use written division methods in cases where the answer has up to 2 decimal places	• solve problems involving the calculation and conversion of units of measure, including using decimal notation up to 3 decimal places • use, read, write and convert between standard units, including from a smaller unit of measurement to a bigger and using decimal notation up to 3 decimal places • convert between metres 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 • calculate the area of parallelograms and triangles • calculate, estimate and compare volume of cubes and cuboids using standard units (cm/m^3) and extending to other units (mm/km^3) • *use, add and subtract positive and negative integers for measures such as temperature* • *relate the area of rectangles to parallelograms and triangles, for example, by dissection, and calculate their areas, understanding and using the formulae*	• draw 2-D shapes using given dimensions/angles • recognise, describe and build simple 3-D shapes, including making nets • compare and classify geometric shapes based on their properties and sizes • find unknown angles in any triangles, quadrilaterals, and regular polygons • illustrate and name parts of circles 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 • find missing angles *and lengths from known measurements* • describe positions on a full coordinate grid (4 quadrants) • draw and translate simple shapes on the coordinate plane • reflect simple shapes in the axes • *predict missing coordinates in shapes using the properties of the shape*	• interpret and construct pie charts and line graphs • use these to solve problems • calculate and interpret the mean as an average *and know when it is appropriate to find the mean of a data set* • *encounter and draw graphs relating 2 variables*

Year 6	Ration and Proportion	Algebra
	• solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts • solve problems involving the calculation of percentages and for comparison • solve problems involving similar shapes where the scale factor is known or can be found • solve problems involving unequal sharing and grouping • *recognise proportionality in contexts when the relations between quantities are in the same ratio* • *link percentages or 360° to calculating angles of pie charts*	• use simple formulae • generate and describe linear number sequences • express missing number problems algebraically • find pairs of numbers that satisfy an equation with 2 unknowns • enumerate possibilities of combinations of 2 variables • *use symbols/letters to represent variables/unknowns in mathematical situations that they already understand*

Appendix 1 – Physical Resources

Below is a list of physical resources within school that can be used to support maths teaching within the classroom

<table>
<tr>
<td>In classes:
• Dienes
• PV counters
• Two-sided counters
• Dice
• Unifix cubes
• Numicon
• Fraction magnets</td>
<td rowspan="2">In shared areas:
• Bead strings
• Shapes
• Money
• Clocks
• Arrow cards
• Calculators
• Cuisenaire rods
• Balance scales and weights
• Measuring jugs and cylinders
• Mirrors
• Peg boards
• Geo sets
• Sand timers
• Maths posters
• Set squares
• Compasses
• Metre sticks
• Number and fraction fans
• Maths picture books
• Dice
• Fraction tiles
• Stopwatches
• Maths games
• Various maths posters</td>
</tr>
<tr>
<td>In paper resource boxes (copies saved in maths curriculum file):
• PV grids
• More and less function machines
• Number lines
• Hundred squares
• Part whole models
• Fraction walls
• Gattengo charts
• Multiplication squares
• Number mats (words and numerals)
• Roman numeral mats
• Rounding mats
• Tens frames</td>
</tr>
</table>

Appendix 2 - Digital Resources

Below is a list of digital resources that can be used to support maths teaching within the classroom

- Purple Mash – graphing, times tables, counting, calculation
- https://polypad.amplify.com/p
- https://www.iseemaths.com/
- https://wodb.ca/
- https://mathsbot.com/manipulativeMenu
- https://toytheater.com/category/teacher-tools/virtual-manipulatives/
- https://mathigon.org/
- https://mathsframe.co.uk/en/resources/category/22/most-popular
- https://nrich.maths.org/teachers/primary