Woodmansey CE Primary School

Mathematics Policy

1. INTRODUCTION

This policy is a working document, which reflects the ethos and practice within the school in relation to Mathematics. It has been written with due regard to the requirements of the National Curriculum 2014.

The Mathematics Subject Leader: Mrs Rosie Fisher with support from Mr. Richard Atkinson (Maths Specialist Teacher, Mastery Specialist Teacher – Yorkshire Ridings Maths Hub, SLE for Maths and the Early Years)

2. PHILOSOPHY OF MATHEMATICS TEACHING

The whole ethos of Woodmansey CE Primary School is to provide every child with a happy, caring, learning environment in which he or she can begin building foundations of learning and develop their full potential – whatever their needs and irrespective of ability, race or gender.

Woodmansey CE Primary School believes that:

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

The school's curriculum for mathematics aims to ensure that all pupils:

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

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and

competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

> It's better to solve one problem five different ways, than to solve five problems only one way. George Polya

3. ROLES AND RESPONSIBILITIES

The governing body should, in cooperation with the Executive Head teacher/ Head of School, determine the school's general policy and approach to Mathematics at Woodmansey CE Primary School.

The mathematics Subject Leader: Moderating of the standards of children's work and the quality of teaching in Mathematics is the responsibility of the Mathematics Subject Leader and Senior Management Team. The work of the Mathematics Subject Leader also involves supporting colleagues in the teaching of Mathematics, being informed about current developments in the subject, and providing a strategic lead and direction for the subject in the school.

4. PRACTICE

At Woodmansey CE Primary School pupils are provided with a variety of opportunities to develop and extend their mathematical skills, in accordance with the school's policy on Accelerated Learning techniques.

Lessons follow a flexible, mastery scheme provided through the 'Maths - No problem' textbooks and workbooks. The series has been created using the principles of Singapore Mathematics and is fully aligned to the 2014 English National Curriculum. The programme provides all the elements that teachers and pupils need to explore mathematical concepts with confidence and in depth. To achieve this, children:

1. Study each concept in depth so there is sufficient time to comprehend one concept before the next one is introduced and
2. Sequence topics so, as much as possible the **mental distance between concepts is small** and the previously learned concept will help in learning each new one

The teaching of Mathematics at Woodmansey CE Primary School provides opportunities for:

- whole class work
- group work
- paired work
- individual work
- group/individual work with a teacher or teaching assistant

At Woodmansey CE Primary School we recognize the importance of establishing a secure foundation in mental calculation and recall of number facts before standard written methods are introduced. Teachers may make reference to the Teaching Mental Calculations book (QCA/99/380) and the Teaching Written Calculations book (QCA/99/486) and the Mathematical Vocabulary book (DfEE/99) when planning a unit of work. Also guidance in the new National Curriculum 2014. This is in order to ensure progression in mental and written strategies taught throughout the school.

5. ASSESSMENT

Assessment is regarded as an integral part of teaching and learning at Woodmansey CE Primary School, and is a continuous process. We are constantly assessing our pupils and recording their progress, in line with the School's assessment policy and Framing Learning in the Classroom (FLiC) software. We strive to make our assessment purposeful, allowing us to match the correct level of work to the needs of the pupils, thus benefiting the children and ensuring progress.

Information for assessment will be gathered in various ways; by talking to the children, observing their work, marking their work, SATs papers, NfER tests and Assess and Review lessons. These sources of evidence will enable teachers to complete ongoing Teacher Assessments, using FLiC, across different skills which are appropriate for either KS1 or KS2 and described in the National Curriculum 2014.

During lessons, once children are working independently, teachers and TAs should be doing quick / flash marking and assessment to ascertain who has understood and who hasn't. The teacher then knows who they need to best support in the next lesson, or where appropriate, in the same lessons so that misconceptions are addressed immediately.

At this point in the lesson, the teacher pulls together those who are not demonstrating security and "plugs the gap", meanwhile the TA has the majority and keeps the independent activities running, constantly fueling the work rate and providing further extension and mastery activity, provided by the teacher in advance or advised by the teacher at that time.

Information from these assessments will be used to: inform future planning, identify strengths and weaknesses, provide individual and group target setting, set children appropriately from Year 3 upwards and provide information for teachers, pupils, parents and future schooling.

6. PARENTAL INVOLVEMENT

At Woodmansey CE Primary School we encourage parents to be involved in the mathematics curriculum by:

- providing them with a parents information on the school website detailing an overview of the curriculum
- inviting them into school twice yearly to discuss the progress of their child
- reporting on mathematical progress in their child's/ren's report biannually with a progress report in January and end of year report in June
- inviting parents of Year 6 pupils to a meeting on supporting children with SATs
- informing parents of significant changes in the Mathematics curriculum
- encouraging parents to be involved in homework activities and making the learning objectives and the task clear and achievable

7. SPECIAL EDUCATIONAL NEEDS

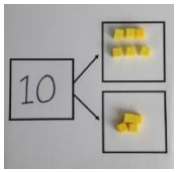
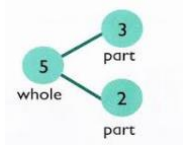
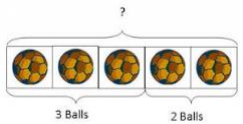
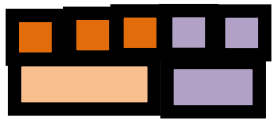
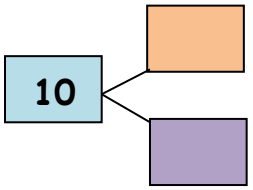
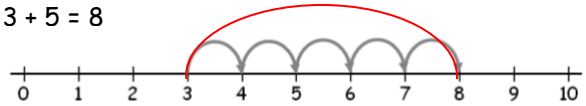
Children who have a difficulty with mathematics are identified and catered for in line with the school's SEND Policy. (See School website: www.woodmanseyprimary.school)

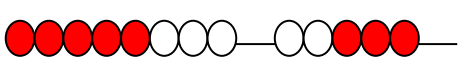
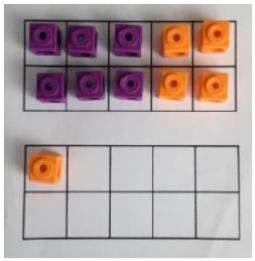
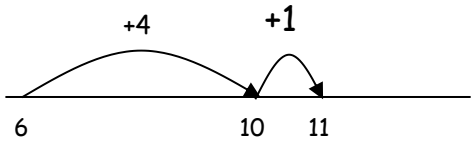
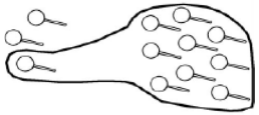
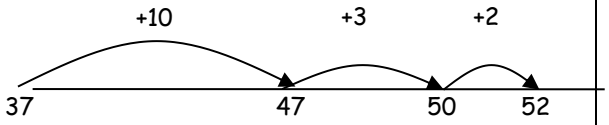
8. LIST OF APPENDICES

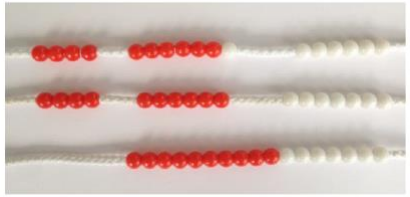
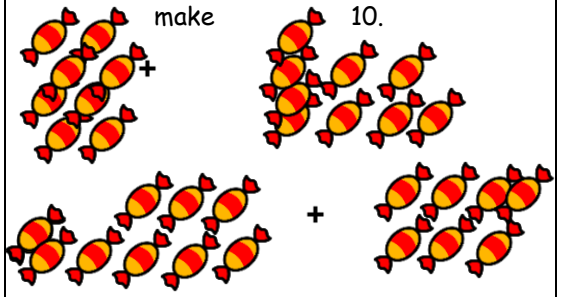
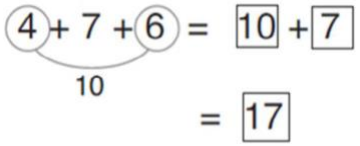
APPENDIX 1: Progression towards a standard written method of calculation

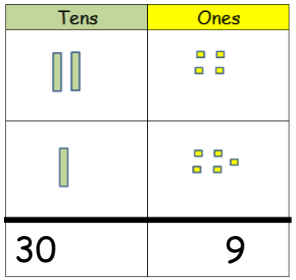
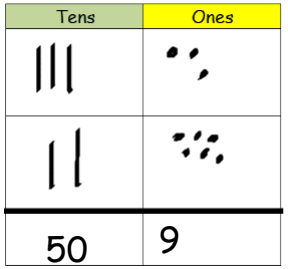
APPENDIX 2: The new expectations for each year group from National Curriculum 2014.

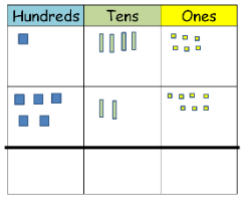
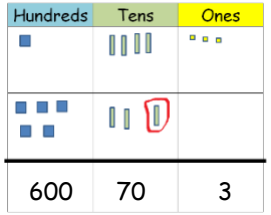
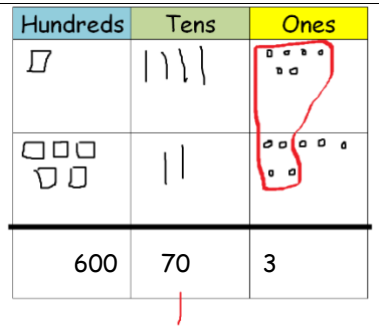
I. PROGRESSION yTOWARDS A STANDARD WRITTEN METHOD OF CALCULATION

Addition			
	Concrete	Pictorial	Abstract
Part-part whole	Use objects to add two numbers together as a group or in a bar.    	Use pictures to add two numbers together as a group or in a bar.    	**Use the part-whole diagrams to move into the abstract.** 2 + 8 = 10 10= 6 + 4 
Counting on	**Count on from the larger number** - 3 + 5 a child chooses the larger number, even when it is not the first number, and counts on from there: *'six, seven, eight'* '5'  Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer. 	Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones or one big jump. 3 + 5 = 8  Children will begin to use 'empty number lines' themselves starting with the larger number and counting on. First counting on in tens and ones. 34 + 23 = 57	Place the larger number in your head and count on the smaller number to find your answer. **8 = 14**

Addition			
	Concrete	Pictorial	Abstract
Regrouping to make 10	Start with the bigger number and use the smaller number to make 10. Bead strings or 10 frames and objects can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.   **5 + 6 = 11**	Use pictures or a number line. Regroup or partition the smaller number to make 10. 6 + 5 = 11 4 1   **3 + 9 =**	Bridging through ten can help children become more efficient. 37 + 15 = 52 

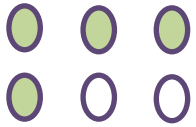
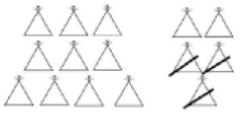
Adding single digit 3	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	Add together three groups of objects. Draw a picture to recombine the groups to make 10. 	Combine the two numbers that make 10 and then add on the remainder. 

Addition			
	Concrete	Pictorial	Abstract
Column, no regrouping	Add together the ones first then add the tens. Use the Base 10 blocks first *before moving onto place value counters.* 24 + 15 = 	After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions. 33 + 26 = 	Children use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies. They begin to use an expanded layout that underpins the standard written method. 85 = 80 + 5 + 46 40 + 6 120 + 11 =131

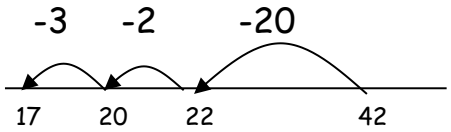
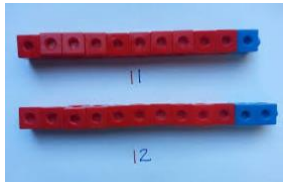
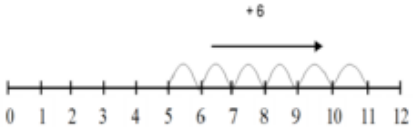
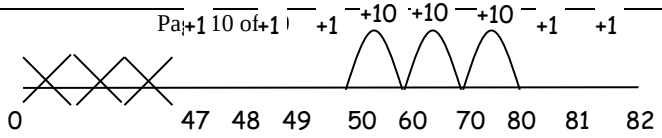
Column with regrouping	Make both numbers on a place value grid, *this example is completed using place value counters.*  146 Add + 527 nits and exchange 10 ones for one 10.  Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.	Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.  Once drawn, the children group any series of counters which are greater than ten. They should circle ten of the counters before adding onto the next column (like the exchange in the previous example).	Start by partitioning the numbers before moving on to clearly show the exchange below the addition. 20 + 5 40 + 8 60 + 13 = 73 Children will consolidate the above and move on to carrying below the line. 625 + 48 = 673 (1) 783 + 42 = 825 (1) 367 + 85 = 452 (1 1)

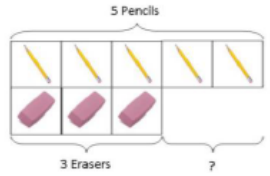
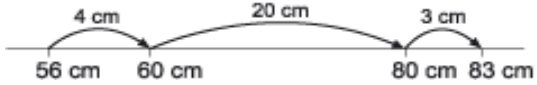
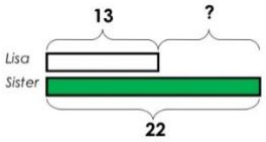
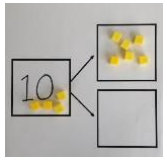
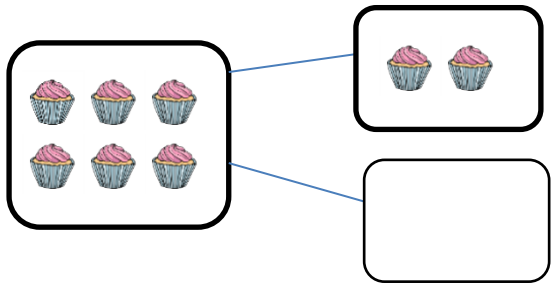
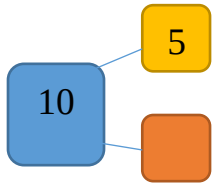
Addition

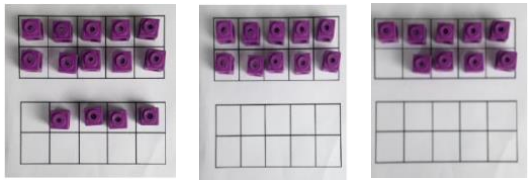
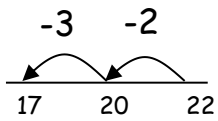
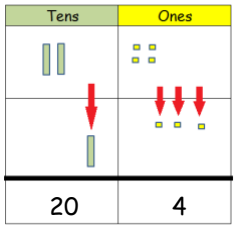
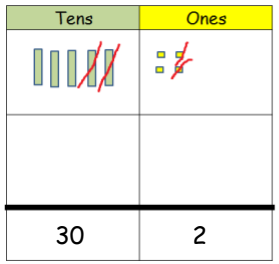
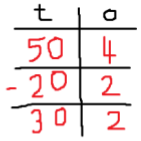
National Curriculum Guidance	***Addition and subtraction*** 789 + 642 becomes 7 8 9 + 6 4 2 1 4 3 1 1 1 Answer: 1431 874 – 523 becomes 8 7 4 – 5 2 3 3 5 1 Answer: 351 932 – 457 becomes 8 12 1 9 3 2 – 4 5 7 4 7 5 Answer: 475 932 – 457 becomes 1 1 9 3 2 – 4 5 7 5 6 4 7 5 Answer: 475

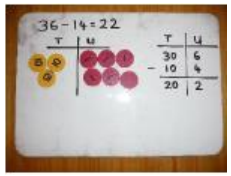
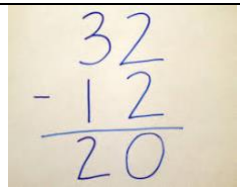
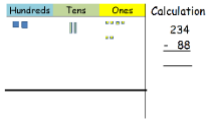
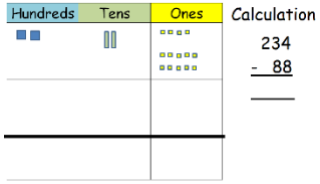
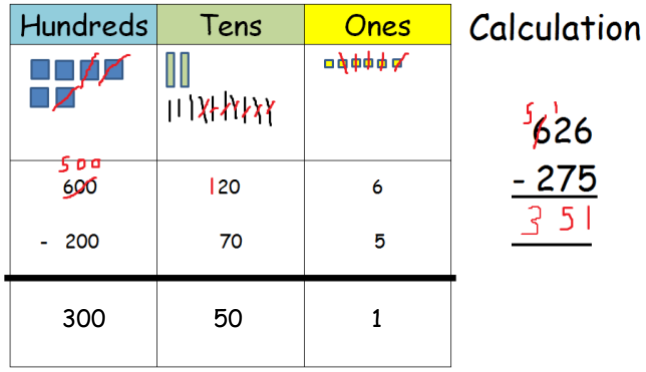
Subtraction			
	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away. 	**Cross out drawn objects to show what has been taken away.**  15 – 3 = 12	18 - 3 = 15 8 - 2 = 6

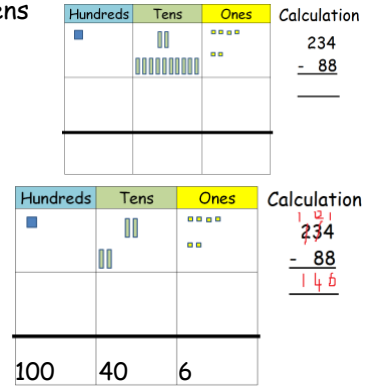
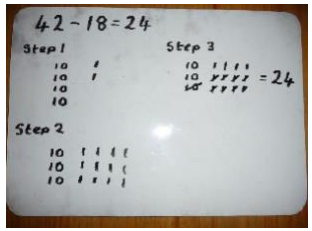
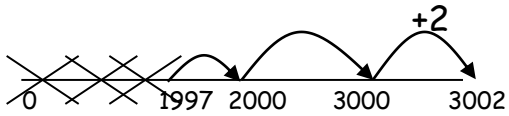
Subtraction			
	Concrete	Pictorial	Abstract

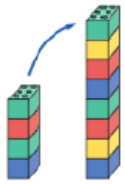
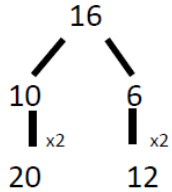
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4 = 11  Use counters and move them away from the group as you take them away counting backwards as you go. 	**Children to also use number lines to count back.** 10 and 4 less  Start at the bigger number and count back the smaller number showing the jumps on the number line.  This can progress all the way to counting back using two 2 digit numbers. Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4). Subtracting the tens in one jump and the units in one jump. Bridging through ten can help children become more efficient. 42 – 25 = 173  	18 - 3 = 15 8 - 2 = 6
Counting on – finding the difference	Compare amounts and objects to find the difference. Use cubes to build towers or make bars to find the difference.  Use basic bar models with items to find the difference.	Using a number line to count on.  11 – 5 = 6 When dealing with larger numbers, the number line should still show 0 so children can cross out the section from 0 to  	18 - 3 = 15 8 - 2 = 6

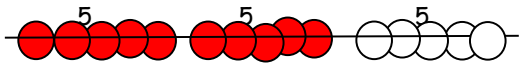
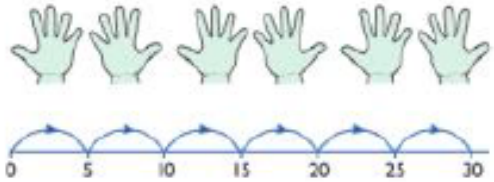
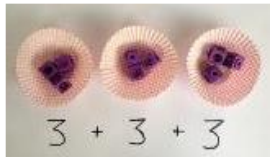
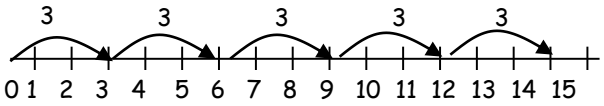
	 A teddy costs 50p and doll costs 20p. How much more does the teddy cost? 	the smallest number. They then associate this method with 'taking away'. 82 – 47   **Using the bar method.** 	
Part part whole	Link to addition- use the part whole model to help explain the inverse between addition and subtraction.  If 10 is the whole and 6 is one of the parts. What is the other part? 10 - 6 =	Use a pictorial representation of objects to show the part-part whole model. 	Move to using numerals within the part whole model. 

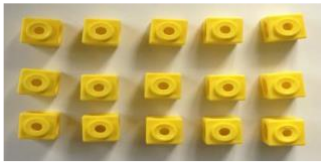
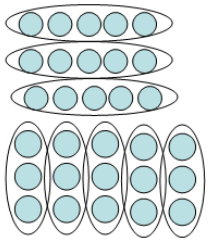
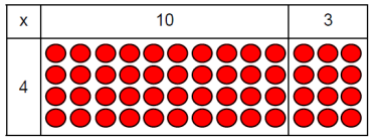
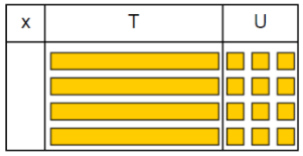
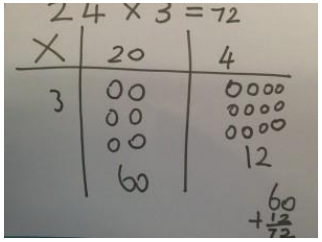
Subtraction			
	Concrete	Pictorial	Abstract
Make 10	Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9. 14 – 5 = 9 	Using a numberline whilst partitioning the number you re subtracting. Start at 22. Take away 2 to reach 20. Then take away the remaining 3 so you have taken away 5 altogether. You have reached your answer. 22 – 5 = 17 3 2 	16 – 8 = How many do we take off to reach the next 10? How many do we have left to take off?
Column method without regrouping	Use Base 10 to make the bigger number then take the smaller number away. Always write the calculation alongside, as seen in the example below. 37 – 13 = 	Draw the Base 10 or place value counters alongside the written calculation to help to show working.  	*Initially, the children will be taught using examples that do not need the children to exchange.* Partitioning and decomposition. e.g. 89 = 80 + 9 - 57 - 50 + 7 30 + 2 = 32 This will eventually lead to;

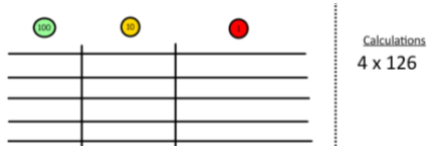
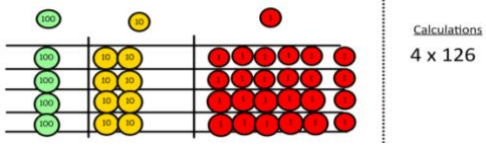
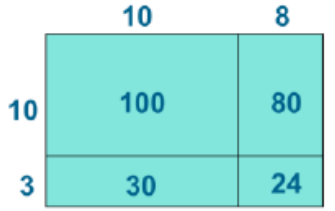
	Show how you partition numbers to subtract. Again make the larger number first. 		
Column method with regrouping	Use Base 10 to start with before moving on to *place value counters*. Start with one exchange before moving onto subtractions with 2 exchanges.  Make the larger number with the place value counters  Start with the ones, can I take away 8 from 4 easily? I need to exchange one of the tens for ten ones. Now I can subtract the ones.  Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens. Now I can	Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.  When confident, children can find their own way to record the exchange/regrouping.	**Partitioning and decomposition** Children can start their formal written method by partitioning the number into clear place value columns. 754 = - 86 H T O Step 1 700 + 50 + 4 - 80 + 6 H T O Step 2 700 + 40 + 14 *(exchange T-O)* - 80 + 6 H T O Step 3 600 + 140 + 14 *(exchange H-T)* - 80 + 6 600 + 60 + 8 = 668 This would be recorded by the children as 600 140 7~~0~~0 + ~~5~~0 + 14 - 80 + 6 600 + 60 + 8 = 668

	take away eight tens and complete the subtraction. Show the written methods beside to gather understanding. 	Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.  **Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.** 	**Decomposition** **When children are secure** with the previous method they move on to decomposition. 614 1 ~~7~~ ~~1~~4 - 86 668

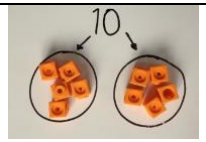
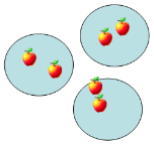
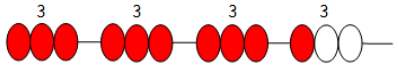
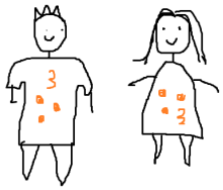
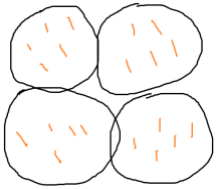
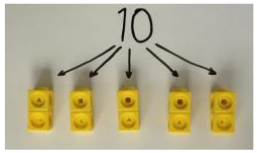
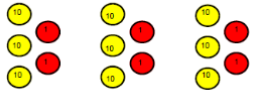
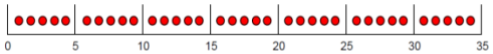
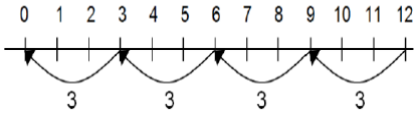
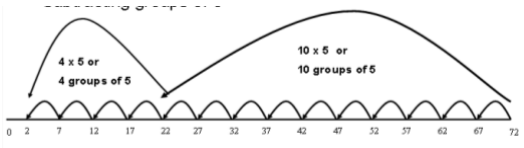
Multiplication			
	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number. 	**Draw pictures to show how to double a number.** **Double** · 8 	Partition a number and then double each part before recombining it back together. 

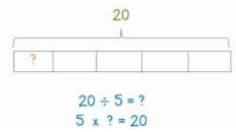
Counting in multiples	Count in multiples supported by concrete objects in equal groups (**commutativity**).  Show on bead bar or on a number line: 3 x 5 = 5 + 5 + 5 	Use a number line or pictures to continue support in counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Repeated addition	Use different objects to add equal groups.  	Children will develop their understanding of multiplication and use jottings to support calculation: Repeated addition can be shown easily on a number line: 5 x 3 = 3+3+3+3+3 (5 lots of 3) 	Using symbols to stand for unknown numbers to complete equations using inverse operations □ x 5 = 20 3 x △ = 18 □ x ○ = 32

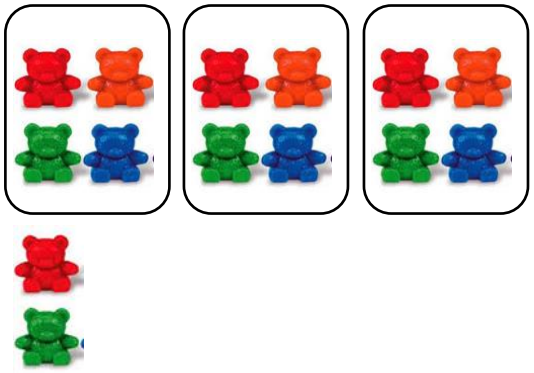
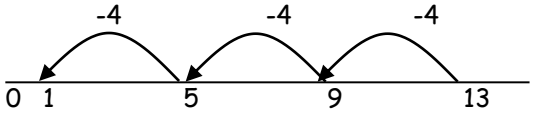
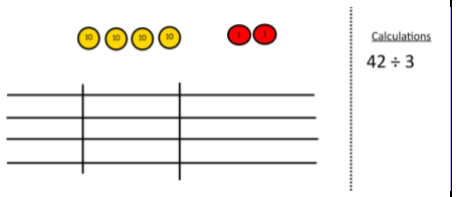
Arrays – Showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences. 	Children should be able to model a multiplication calculation using an array. Arrays can be drawn in different rotations to find **commutative** multiplication sentences.  3 x 5 = 15 5 x 3 = 15	Use an array to write multiplication sentences and reinforce repeated addition. e.g.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15
Grid method – NOT in national curriculum	Show the link with arrays to first introduce the grid method. e.g. 13 x 4 =  4 rows of 10 4 rows of 3 Move on to using Base 10 to move towards a more compact method.  4 rows of 13	Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below. 	This can be followed by the formal written grid method. **TU x TU** 72 x 38 Children will approximate first; 72 x 38 is approximately 70 x 40 = 2800 x | 70 | 2 30 | 2100 | 60 8 | 560 | 16 2100 + 560 + 60 + 16 2736 1

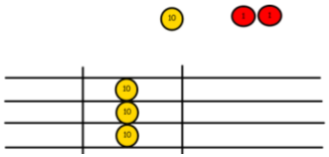
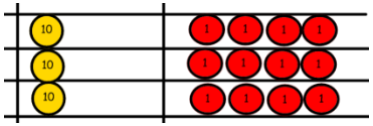
	Move on to *place value counters* to show how we are finding groups of a number.We are multiplying by 4 so we need 4 rows.  Fill four rows with 126.  Add them together making any appropriate exchanges (see addition section).		*Grid method used for area work.* 

Column multiplication	***Short multiplication***
	24 × 6 becomes $\begin{array}{rrr} & 2 & 4 \\ \times & & 6 \\ \hline 1 & 4 & 4 \\ \hline & {\scriptstyle 2} & \end{array}$ Answer: 144
	342 × 7 becomes $\begin{array}{rrrr} & 3 & 4 & 2 \\ \times & & & 7 \\ \hline 2 & 3 & 9 & 4 \\ \hline & {\scriptstyle 2} & {\scriptstyle 1} & \end{array}$ Answer: 2394
	2741 × 6 becomes $\begin{array}{rrrrr} & 2 & 7 & 4 & 1 \\ \times & & & & 6 \\ \hline 1 & 6 & 4 & 4 & 6 \\ \hline & {\scriptstyle 4} & {\scriptstyle 2} & & \end{array}$ Answer: 16 446
	Long multiplication
	24 × 16 becomes $\begin{array}{rrr} & {\scriptstyle 2} & \\ & 2 & 4 \\ \times & 1 & 6 \\ \hline 2 & 4 & 0 \\ 1 & 4 & 4 \\ \hline 3 & 8 & 4 \\ \hline \end{array}$ Answer: 384
	124 × 26 becomes $\begin{array}{rrrr} & {\scriptstyle 1} & {\scriptstyle 2} & \\ & 1 & 2 & 4 \\ \times & & 2 & 6 \\ \hline 2 & 4 & 8 & 0 \\ & 7 & 4 & 4 \\ \hline 3 & 2 & 2 & 4 \\ \hline {\scriptstyle 1} & {\scriptstyle 1} & & \end{array}$ Answer: 3224
	124 × 26 becomes $\begin{array}{rrrr} & {\scriptstyle 1} & {\scriptstyle 2} & \\ & 1 & 2 & 4 \\ \times & & 2 & 6 \\ \hline & 7 & 4 & 4 \\ 2 & 4 & 8 & 0 \\ \hline 3 & 2 & 2 & 4 \\ \hline {\scriptstyle 1} & {\scriptstyle 1} & & \end{array}$ Answer: 3224

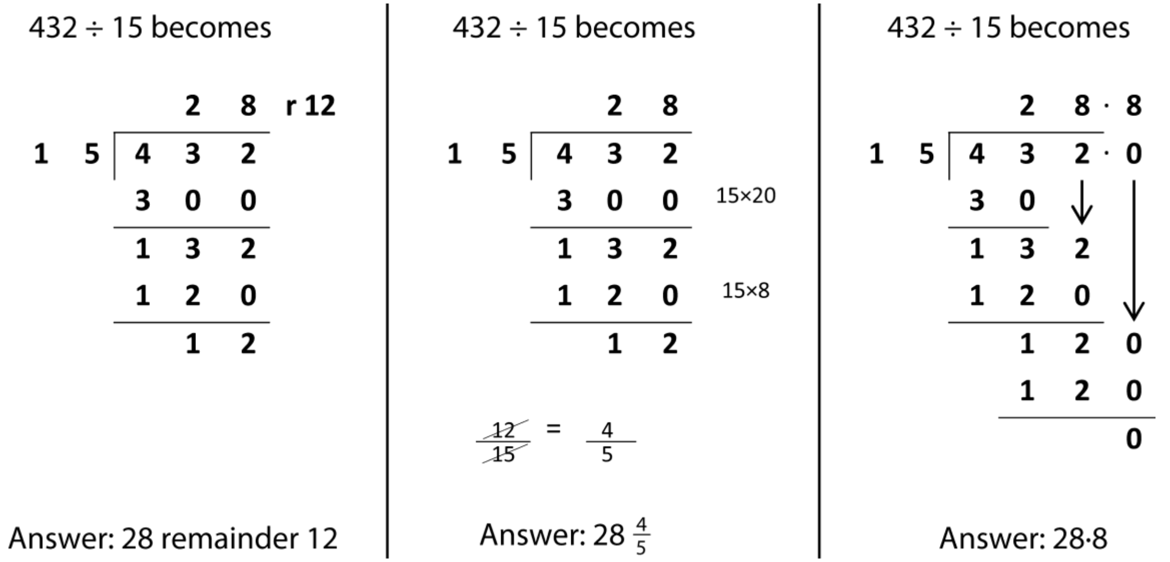
Division			
	Concrete	Pictorial	Abstract
Sharing into groups	 Children will understand equal groups and share items out in play and problem solving.  e.g. 6 ÷ 3 = 	Children will develop understanding of division and use jottings to support calculation. e.g. 6 ÷ 2 =  their  **20 ÷ 4 =**	Share 9 buns between three people. 9 ÷ 3 = 3 Using symbols to stand for unknown numbers to complete equations using inverse operations □ ÷ 2 = 4 20 ÷ □ = 4 □ ÷ □ = 4
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  96 ÷ 3 = 32  	Use a number line to show jumps in groups. The number of jumps equals the number of groups (repeated subtraction).  	

		For bar method, split it the number of groups you dividing by and work out many would be within each  into are how group.	

Division			
	Concrete	Pictorial	Abstract
Division with a remainder	Divide objects between groups and see how much is left over. E.g. 14 ÷ 3 = 4 remainder 2. 	**Children may use an empty number line to support their calculation. Children should also move onto calculations involving remainders.** 13 ÷ 4 = 3 r 1  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. 32 ÷ 5 = 6r2
Short division	Use place value counters to divide using the bus stop method. Place the counters in the bus stop, partitioning the tens and ones. Then place them into groups. For example; 96 ÷ 3 = 3 rows of 30 and 3 rows of 2.	42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups.  We can put 1 ten in each group and we have 1 ten left over.	

		 We exchange this ten for ten ones and then share the ones equally among the groups. We look how much in 1 group so the answer is 14. 	
Short and long division	***Short division*** 98 ÷ 7 becomes 1 4 7 | 9 8 2 Answer: 14 432 ÷ 5 becomes 8 6 r 2 5 | 4 3 2 3 Answer: 86 remainder 2 496 ÷ 11 becomes 4 5 r 1 1 1 | 4 9 6 5 Answer: $45\frac{1}{11}$		

Long division



Year 1 Primary Curriculum Programme of Study for Mathematics	
NUMBER: Pupils should be taught to	
Number and place value:	
identify using objects and pictorial representations and use the vocabulary of: equal to; more than; less than (fewer); most; least	count from 0 to and across 100, forward and backwards, beginning with 0 or 1, and from any given number
count, read and write numbers to 100 in numerals, count in different multiples including ones, twos, fives and tens	given a number, identify one more and one less
recognise odd and even numbers	read and write numbers from 1 to 20 in numerals and words
Addition and subtraction	
read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately	add and subtract 1-digit and 2-digit numbers to 20 (9+9, 18-9), including zero
solve simple word problems that involve addition and subtraction, using concrete objects and pictorial representations	represent and use number bonds and related subtraction facts within 20
Multiplication and division	
solve one-step problems involving simple multiplication and division, with teacher support	
Fractions	
recognise, find and name ½ as one of two equal parts of an object, shape or quantity	Recognise, find and name ¼ as one of four equal parts of an object, shape or quantity
GEOMETRY AND MEASURES: Pupils should be taught to	
Properties of shapes	
recognise and name common 3-D and 2-D shapes, including:	
2-D shapes (eg. Square, rectangle, circle and triangle)	3-D shapes (eg. Cube, pyramid and sphere)
Position, direction, motion	
describe position, directions and movements including half, quarter and three-quarter turns	
Measures	
compare, measure and record the following using standard units for:	
lengths and heights (eg. long / short, longer / shorter, tall / short, double / half)	lengths and heights (metres, centimetres)
mass or weight (grams, kilograms)	capacity and volume (litres)
time (hours, minutes, seconds)	
compare, describe and solve practical problems for:	
lengths and heights (eg. long/short, longer / shorter, tall /short, double / half)	mass (eg. heavylift, heavier than, lighter than)
capacity and volume (full / empty, more than, less than, quarter, three quarters full or empty)	time (quicker, slower, earlier, later)
recognise and use pounds (£) and pence (p) with different denominations of money, including coins and notes	tell the time to the hour and half past the hour
sequence events in chronological order using common terms such as: before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening	recognise and use the language of dates, including days of the week, weeks, months and years

Year 2 Primary Curriculum Programme of Study for Mathematics

NUMBER: Pupils should be taught to

Number and place value:	
read and write numbers to at least 100 in numerals and in words	recognise the place value of each digit in a 2-digit number (tens, ones)
count in steps of 2, 3, 5 and 10, count in tens from any number, and give 10 more or less than a given number to 100	compare and order numbers from 0 up to 100; use <, > and = signs
identify, represent and estimate numbers using different representations, including the number line	solve word problems using place value and number facts with increasing precision and + and -
Addition and subtraction	
rapidly recall and use addition and subtraction facts to 20 and use related facts up to 100	
add and subtract numbers using concrete objects, pictorial representations and mentally, including:	
a 2-digit number and ones	a 2-digit number and tens
two 2-digit numbers	adding three 1-digit numbers
use subtraction in 'take away' and 'find the difference' problems	recognise and show that addition can be done in any order (commutative) and subtraction cannot
recognise and use addition and subtraction as inverse operations including to check calculations	solve word problems with addition and subtraction of numbers with up to 2-digits
Multiplication and division	
recall multiplication and division facts for the 2, 5 and 10 multiplication tables	use the multiplication (x), division (÷) and equals (=) signs to read and write mathematical statements
write and calculate mathematical statements for multiplication and division within the multiplication tables	recognise and use the inverse relationship between multiplication and division to check calculations
ensure pupils can recognise and show that multiplication can be done in any order (commutative) and division cannot	solve word problems involving multiplication and division
Fractions	
recognise, find, name and write fractions $\frac{1}{4}$, 1/3, $\frac{1}{2}$, 2/4 and $\frac{3}{4}$ of a length, shape, set of objects or quantity	count in halves and quarters to ten
Write sample fractions, eg. $\frac{1}{2}$ of 6 = 3, and recognise the equivalence of 2/4 and $\frac{1}{2}$	

GEOMETRY AND MEASURES: Pupils should be taught to

Properties of shapes	
recognise and name common 3-D and 2-D shapes	identify and describe the properties of 2-D shapes, including the number of sides, right angles and line symmetry
identify and describe the properties of polygons and non-polygons	identify and describe the properties of 3-D shapes including the number of edges, vertices and faces
identify 2-D shapes on the surface of 3-D shapes, for example rectangle and square on a cuboid, circle on a cylinder, triangle on a pyramid	compare and sort common 2-D and 3-D shapes and everyday objects
Position, direction, motion	
Use mathematical vocabulary to describe position, direction and movement, order and arrange combinations of mathematical objects in patterns, including rotation as a turn and in terms or right angles for quarter and half, and three quarter turns (clock-wise and anti-clockwise), and movement in a straight line	
Measures	
Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm/mm); mass (kg/g); temperature (°C); volume and capacity (litres/ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels	
Read relevant number scales to the nearest numbered unit	Tell and write the time to 5 minutes including quarter past/to the hour and draw hands on a clock face to show these times
Solve simple problems in a practical context involving + and – of the same unit including giving change	Compare and order lengths, mass, volume/capacity and record the results using >,< and =
Recognise and use symbols for pounds (£) and pence (p); recognise coins and notes of different values; combine amounts to make particular value and match different combinations of coins to equal the same amounts of money; add and subtract money of the same unit	
Statistics	
Construct and interpret simple pictograms, tally charts, block diagrams and simple tables	

Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity	Ask and answer questions about totalling and comparing categorical data

Year 3 Primary Curriculum Programme of Study for Mathematics

NUMBER: Pupils should be taught to

Number, place value and rounding	
Read and write numbers to at least 1000 in numerals and in words	Recognise the place value of each digit in a 3-digit number (hundreds, tens, ones)
Identify, represent and estimate numbers using different representations	Count in multiples of 50 and 100 from 0; give 10 or 100 more or less than a given number
Compare and order numbers up to 1000	
Addition and subtraction	
Add and subtract numbers with up to 3 digits, including using columnar addition and subtraction	Accurately add and subtract numbers mentally including: 3-digit numbers and ones; 3-digit numbers and tens; 3-digit numbers and hundreds
Solve word problems including missing number problems, using number facts, place value, and more complex addition and subtraction	Estimate the answer to a calculation and use inverse operations to check answers
Multiplication and division	
Recall and use multiplication and division for the 3, 4 and 8 multiplication tables	Write and calculate mathematical statements for multiplication and division within the multiplication tables; and for 2-digit numbers x 1-digit numbers, using mental and written methods
Solve problems, including missing number problems, involving x and ÷, including integer scaling problems and correspondence problems	
Fractions	
Identify, name and write unit fractions and non-unit fractions with small denominations	Compare and order unit fractions and fractions with the same denominators
Recognise and show, using diagrams, equivalent fractions with small denominators	Perform calculations with addition and subtraction of fractions with the same denominator within one whole (eg. 5/7 + 1/7 = 6/7)
Count up and down in tenths; recognise that tenths arise in dividing an object into tenths and in dividing single digit numbers or quantities by ten	Solve problems that involve all of the above

GEOMETRY AND MEASURES: Pupils should be taught to

Properties of shapes	
Make 2-D and 3-D shapes; recognise in different orientations; and describe with increasing accuracy	Recognise angles as a property of shape and associate angle as an amount of turning
Identify right angles, recognise that two right-angles make a half-turn and four a complete turn; identify whether angles are greater or less than a right angle	Identify horizontal, vertical, perpendicular, parallel and curved lines
Measures	
Recognise and use full names and abbreviations for metric units of measure	Measure, compare, add and subtract; lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml); and time (hours/minutes/seconds)
Measure the perimeter of simple 2-D shapes	Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12 hour and 24 hour digital clocks
Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as am/pm, morning, afternoon, noon and midnight	Know the number of seconds in a minute and the number of days in each months, year and leap year
Compare duration of events, for example to calculate the time taken up by particular events or tasks	Add and subtract amounts of money to give change, using both £ and p
Statistics	
Read, interpret and present data using pictograms and tables	Solve problems using information presented in pictograms, bar charts and tables

Year 4 Primary Curriculum Programme of Study for Mathematics

NUMBER: Pupils should be taught to

Number, place value and rounding	
Identify, represent and estimate numbers using different representations	Recognise and place value of each digit in a 4-digit number (thousands, hundreds, tens, and ones)
Order and compare numbers beyond 1000	Count in multiples of 6, 7, 9, 25 and 1000 from any given number, and 1,000 more or less than a given number
Round any number to the nearest 10, 100 or 1000	Read and write negative numbers; order, count forwards and backwards with positive and negative whole numbers through zero
Read Roman numerals to 100 and know that over time, the numeral system changed to include the concept of zero and place value	Solve word problems that involve all of the above and increasingly large positive numbers
Addition and subtraction	
Add and subtract numbers using formal written methods with up to 4-digits	Solve addition and subtraction two-step problems in contexts deciding which operations and methods to use and why
estimate, within a range, the answer to a calculation and use inverse operations to check answers	
Multiplication and division	
Recall multiplication and division facts for multiplication tables up to 12 x 12	Mentally perform multiplication and division calculations quickly and accurately, including multiplying by 0 and dividing by 1; x together 3 numbers
Multiply or divide 2-digit and 3-digit numbers by a 1-digit number using formal written methods	Recognise and use factor pairs and commutativity in mental calculations
Solve word problems involving the four operations, including the distributive law to multiply 2-digit numbers by 1-digit, integer scaling problems and harder correspondence problems such as 'n' objects are connected to 'm' objects	
Fractions	
Recognise and show, using diagrams, families of common equivalent fractions	Count up and down in hundredths; recognise hundredths arise when dividing an object by 100 and dividing tens 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
Decimals	
Compare numbers with the same number of decimal places up to 2 decimal places	Find the effect of dividing a 2-digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths
Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and any number of tenths and hundredths	
Solve simple measure and money problems involving fractions and decimals to 2 decimal places	Round decimals with one decimal place to the nearest whole number

GEOMETRY AND MEASURES: Pupils should be taught to

Properties of shapes	
Identify lines of symmetry in 2-D shapes presented in different orientations	Compare and classify geometric shapes, including squares, rectangles and triangles based on their properties and sizes
Identify acute and obtuse angles and compare the size of different angles	Describe movements between positions as translations of a given unit to the left / right and up / down
Position, direction, motion	
Describe positions, and movements between positions, on a 2-D grid, and as co-ordinates in the first quadrant	Plot specified points and draw sides to complete a given polygon
Recognise a symmetric figure and complete a symmetric figure with respect to a specific line of symmetry	
Measures	
Convert between different units of measure, for example: kilometre to metre; metre to centimetre; centimetre to millimetre; kilogram to gram; litre to millilitre; hour to minute; minute to second; year to month; week to day	Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days
Find the area of squares and rectangles and related composite shapes by counting squares	Measure and calculate the perimeter of a rectilinear figure, where each side is labelled in centimetres and metres (including squares)
Estimate, compare and calculate different measures, including money in pounds and pence	Read and convert time between analogue and digital 12- and 24-hour clocks
Statistics	
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

Year 5 Primary Curriculum Programme of Study for Mathematics

NUMBER: Pupils should be taught to

Number, place value, approximation and estimation	
Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit	Count forwards or backwards in steps of 100, 1,000 or 10,000 for any given number up to 1,000,000
Round any number up to 1,000,000 to the 10, 100, 1,000 and 10,000	Interpret negative numbers in context, count forwards and backwards with positive and negative numbers through zero
Read Roman numerals to 1,000 (M) and recognise years written in Roman numerals	Solve number problems and practical problems that involve all of the above
Solve addition and subtraction multi step problems in contexts, deciding which operations and methods to use and why	
Addition and subtraction	
Add and subtract whole numbers with more than 4-digits, including using formal written methods	Add and subtract numbers mentally with increasingly large numbers
Use rounding to check answers to calculations and determine, in the context of the problem, levels of accuracy	
Multiplication and division	
Identify multiples and factors, including all factor pairs of a number, and common factors of two 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 the prime numbers up to 19	Multiply and divide numbers mentally drawing upon known facts
Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000	Divide numbers up to 4-digits by a 1-digit number, using a formal written method, and interpret remainders appropriately
Multiply and divide numbers up to 4-digits by a 1-digit number or 2-digit number using a formal written method, including a long multiplication for 2-digit numbers	Recognise and use square numbers and square roots, and the notation for square(^{2}) and square root ($\sqrt{}$)
Solve word problems involving addition and subtraction, multiplication and division, including scaling by simple fractions and problems involving simple rules. Also understand the meaning of the = sign	
Fractions	
Compare and order fractions whose denominators are all multiples of the same number	Recognise mixed numbers and improper fractions and convert from one form to the other
Add and subtract fractions with the same denominator and multiples of the same number	Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
Multiply proper factions and mixed numbers by whole numbers, supported by materials and diagrams	
Decimals	
Read and write decimal numbers as fractions (eg. 0.71 = 71/100)	Solve problems involving numbers up to three decimal places
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 three decimal places	Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
Percentage	
Recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred" and write percentages as a fraction with denominator hundred, and as a decimal fraction	Solve problems which require knowing % and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, 1/5, 2/5, 4/5 and those with a denominator of a multiple of 10 or 25

GEOMETRY AND MEASURES: Pupils should be taught to:

Properties of shapes	
Measure angles in degrees and draw a given angle, writing its size in degrees	
Know angles are measured in degrees and identify:	
Right angles and $\frac{1}{4}$ turn (total 90°)	Estimate and compare acute, obtuse and reflex angles
Angles at a point and one whole turn (total 360°)	Angles at a point on a straight line and $\frac{1}{2}$ a turn (total 180°)
Reflex angles and compare different angles	
Distinguish between regular and irregular polygons based on reasoning about sides and angles	Use the properties of rectangles to deduce related facts and find missing lengths and angles
Identify 3-D shapes including cubes and cuboids from 2-D representations	
Position & Direction	
Identify, describe and represent the position of a shape following a reflection or translation using the appropriate vocabulary	

Measures	
Add, subtract, multiply and divide units of measure (eg. length, mass, volume, money) using decimal notation	Solve problems involving converting between units of time
Convert between different units of metric measure	Understand and use basic equivalencies between metric and common imperial units and express them in approximate terms
Calculate, estimate and compare the perimeter, and the area of squares, rectangles and related composite shapes using standard units, including centimetre squared (cm^2) and metre squared (m^2)	Estimate volume and capacity in practical contexts, for example using sand and water, $1cm^3$ blocks or interlocking cubes to build cubes and cuboids
Statistics	
Complete tables and bar graphs from given information and solve problems using data presented in bar graphs, tables and line graphs. Also read and interpret information in tables and times tables	

Year 6 Primary Curriculum Programme of Study for Mathematics

NUMBER: Pupils should be taught to

Number, place value and rounding	
Read, write, order and compare numbers up to 10 million and determine the value of each digit	Use negative numbers in context and calculate intervals across zero
Solve number and practical problems that involve all of the above	Round any number to a required degree of accuracy
Addition and subtraction, multiplication and division	
Add and subtract negative integers	Multiply multi-digit numbers up to 4-digits by a 2-digit whole number using formal method of long multiplication
Divide numbers up to 4-digits by a 2-digit whole number using formal method of long division, and interpret remainders as whole number remainders, fractions, decimals or by rounding, as appropriate for the context	Perform mental calculations, including with mixed operations and large numbers
Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy	Identify common factors, common multiples and prime numbers
Carry out combined operations involving the four operations accurately and state the order of operations	Solve word problems involving addition, subtraction, multiplication and division, deciding which operation and methods to use and why
Fractions	
Add and subtract mixed numbers and fractions with different denominators, using the concept of equivalent fractions	Multiply simple unit fractions by fractions and pairs of proper fractions, writing the answer in its simplest form
Use common factors to simplify fractions. Use common multiples to express fractions in the same denomination	Associate a fraction with division to calculate decimal fraction equivalents (eg. 0.375) for a simple fraction (eg. 3/8)
Divide proper fractions by whole numbers	Solve problems which require answers to be rounded to specified degrees of accuracy
Decimals	
Identify the value of each digit to three decimal places and multiply and divide numbers up to three decimal place by 10, 100 and 1,000	Multiply and divide numbers with up to two decimal places by 1-digit and 2-digit whole numbers
Percentage	
Use percentage for comparison and calculate percentages of whole numbers or measures such as 15% of 360	Recall and use equivalences between fractions, decimals and percentages, including in different contexts
Ratio and proportion	
Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	Solve problems involving similar shapes where the scale factor is known or can be found
Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples	
Algebra	
Find pairs of numbers that satisfy number sentences involving two unknowns	Use simple formulae expressed in words
Enumerate all possibilities of combinations of two variables	Express missing number problems algebraically

GEOMETRY AND MEASURES: Pupils should be taught to

Properties of shapes

Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons	Illustrate and name parts of circles, including radius, diameter and circumference
	Draw 2-D shapes using given dimensions and angles
Recognise, describe and build simple 3-D shapes, including making nets	Describe properties of cuboids and other common 3-D shapes including prisms and identify parallel plans and symmetries
Recognise angles where they meet at a point	Find unknown angles involving angles at a point, on a straight line, in a triangle (180°), in a quadrilateral (360°) and vertically opposite angles
Position, direction, motion	
Describe positions on the full coordinate grid (all four quadrants)	Construct, translate and reflect simple shapes on the coordinate plane
Measures	
Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, including between miles and kilometres, using decimal notation to up to 3 decimal places	Recognise that shapes with the same areas can have different perimeters and vice versa
Calculate the area of parallelograms and triangles	Recognise when it is necessary to use the formulae for area and volume of shapes
Calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3) and extending to other units, such as mm^3 and km^3	Use decimal notation to three decimal places to solve problems involving calculation and conversion of measures
Statistics	
Interpret and contract pie charts and line graphs and use these to solve problems	Calculate and interpret the mean as an average