PROGRESSION THROUGH CALCULATION GUIDANCE
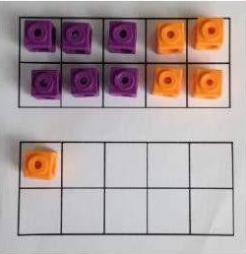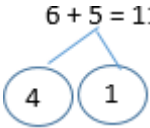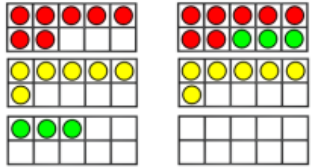
This guidance has been developed from the White Rose Calculation Policy: working document, which was written as a guide to indicate the progression through Addition, Subtraction, Multiplication and Division in Years 1 – 6.
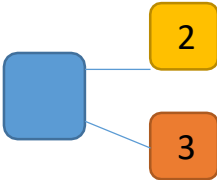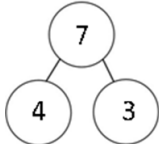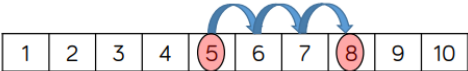
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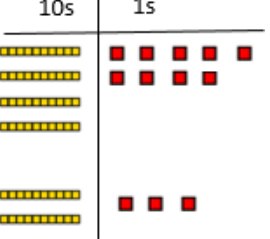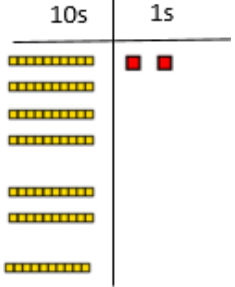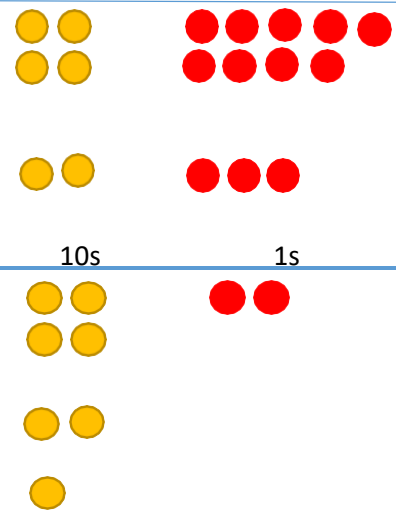
CALCULATION GUIDANCE: Addition

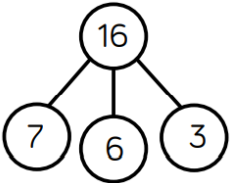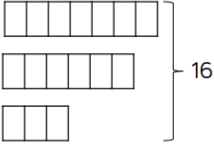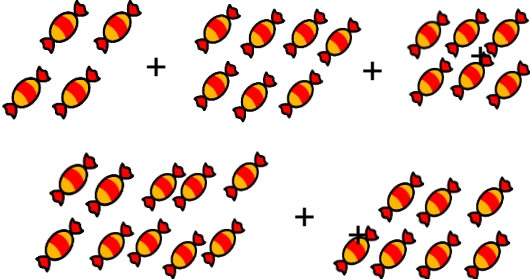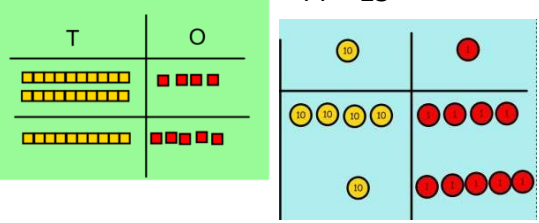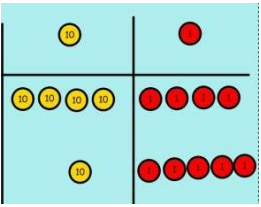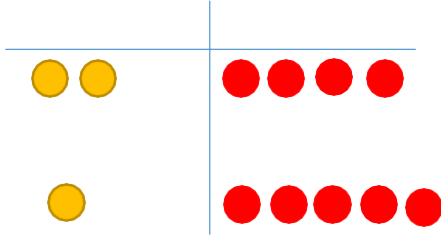|	Objective	Concrete	Pictorial	Abstract
Year 1	Number bonds of 5, 6, 7, 8, 9 and 10	Use cubes to add two numbers together as a group or in a bar.	Use pictures to add two numbers together as a group or in a bar. 3 / 2 (bar)	$2 + 3 = 5$ $3 + 2 = 5$ $5 = 3 + 2$ $5 = 2 + 3$ 7 / 4, 3 $3 + 4 = 7$ Use the part-whole diagrams as shown above to move into the abstract.
	Counting	Use a number track to count on in ones and find the total. Number tracks are also used in Year 2. $5 + 3 = 8$	Use a number line to count on in ones.	$5 + 3 = 8$

CALCULATION GUIDANCE: Addition

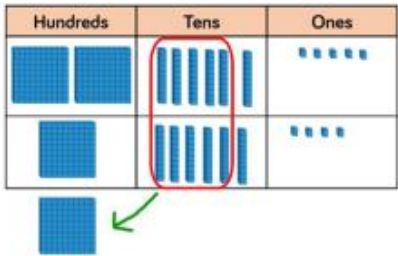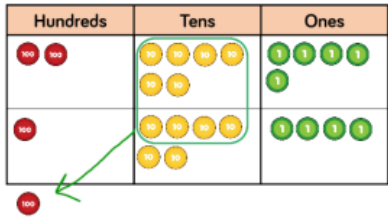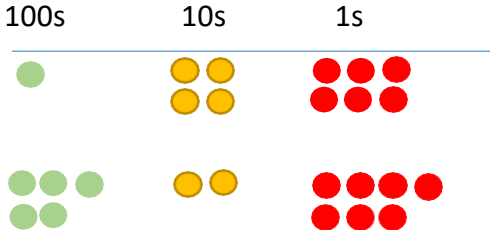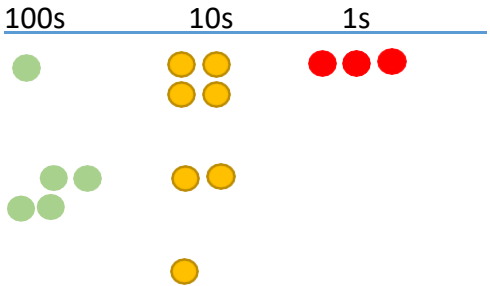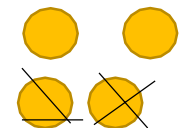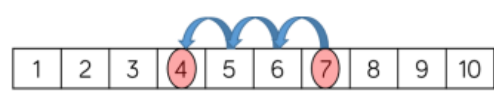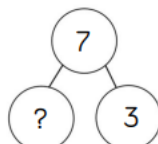|	Objective	Concrete	Pictorial	Abstract
Year 1	Regrouping to make 10	6 + 5 = 11 Start with the bigger number and use the smaller number to make 10.	6 + 5 = 11 4 1 6 + 4 = 10 10 + 1 = 11	6 + 5 = 11
Year 2	Adding 3 single digit numbers	7 + 6 + 3 = 16 10 16 7 6 3 16	Add together three groups of objects. Draw a picture to recombine the groups to make 10.	7 + 6 + 3 = 16 10 Combine the two numbers that make 10 and then add on the remainder.
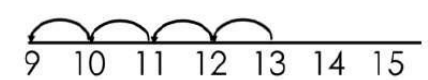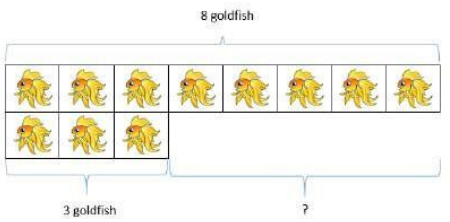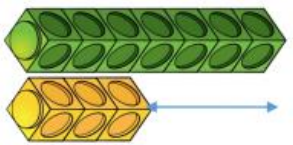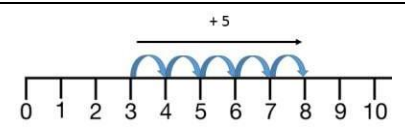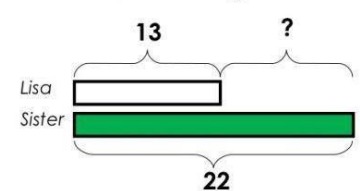
CALCULATION GUIDANCE: Addition

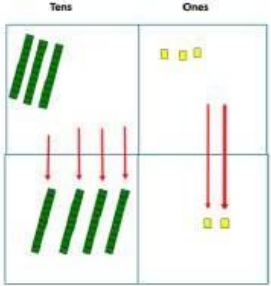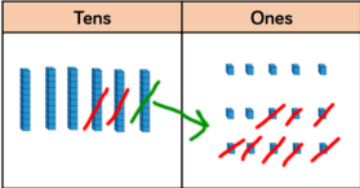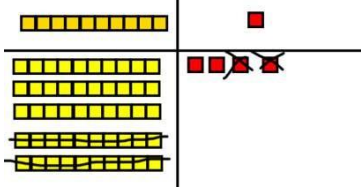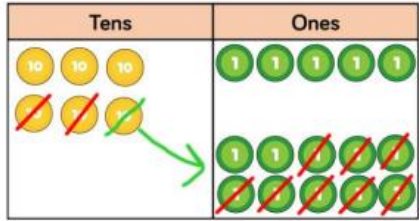|	Objective	Concrete	Pictorial	Abstract
Year 2	Column method (without regrouping ie not crossing the ten)	Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters. 24 + 15 = 44 + 15 = 	Children can draw the counters to help them to solve additions. 10s 1s 	24 + 15 = 39 24 + 15 39
	Column method (with regrouping ie crossing the ten)	Make both numbers on a place value grid. 10s 1s 49 + 23 = Add up the units and exchange 10 ones for 1 ten. 10s 1s 	Using place value counters, children can draw the counters to help them to solve additions. 10s 1s 	40 + 9 20 + 3 60 + 12 = 72
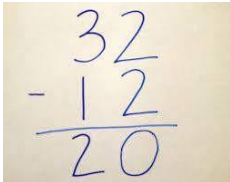
CALCULATION GUIDANCE: Addition

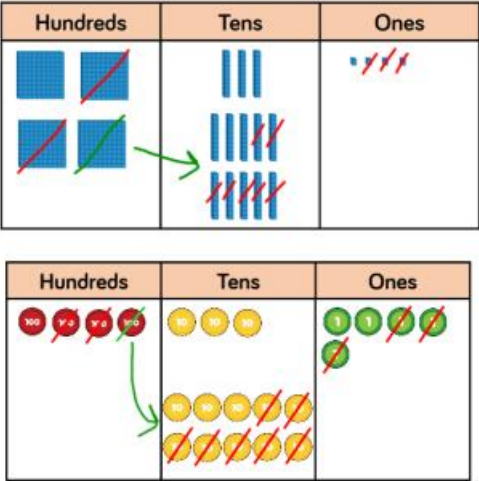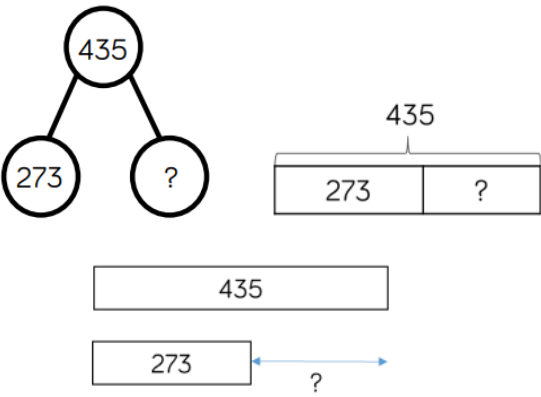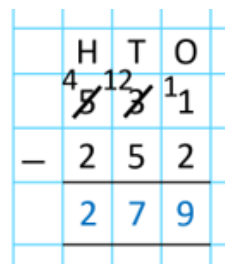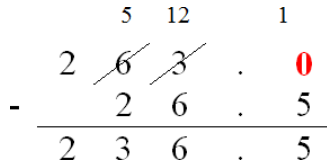|	Objective	Concrete	Pictorial	Abstract
Year 3/4	Column method (with regrouping ie crossing ones and tens)	Add up the tens and regroup 10 tens for 1 one hundred. 265 + 164 = 429 1 **NB** By Year 4 children will progress on to adding four-digit numbers.	100s 10s 1s 100s 10s 1s Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding. **NB** Addition of money needs to have £ and p added separately.	100 + 40 + 6 <u>500 + 20 + 7</u> 600 + 70 + 3 = 673 As the children progress, they will move from the expanded to the compacted method eg 1378 + 2148 = 3526 (1 1) As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.
Year 5/6	Column method with regrouping	Consolidate understanding using numbers with more than 4 digits and extend by adding numbers with up to 3 decimal places. In Years 5 and 6, children are encouraged to work in the abstract, using the column method to add larger numbers efficiently. However, the use of concrete and pictorial resources continues to be used to support children's learning in Years 5 and 6 to enable them to progress to being confident working in the abstract.		

CALCULATION GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
Year 1 & 2	Taking away ones	Use physical objects, counters, cubes etc. to show how objects can be taken away. 4 – 2 = 2	Cross out drawn objects to show whathas been taken away. 4 – 2 = 2	4 – 2 = 2
	Subtract 1-digit numbers	7 – 3 = 4 (Part-whole models are also used in Year 2).	Count back on a number line or numbertrack Start at the bigger number and count back the smaller number, showing the jumps on the number line.	eg Put 13 in your head, count back 4. What number are you at? 13 – 4 = 9 Use your fingers to help.
	Find the difference	Compare amounts and objects to find the difference. 8 goldfish 3 goldfish ?	Count on to find the difference. Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them. Draw a bar model to find the difference between two numbers.	Hannah has 8 goldfish. Helen has 3 goldfish. Find the difference between the number of goldfish the girls have.

CALCULATION GUIDANCE: Subtraction
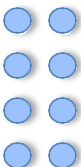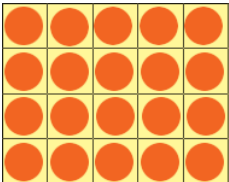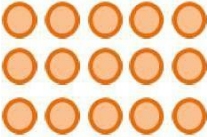
	Objective	Concrete	Pictorial	Abstract
Year 2/3	Subtract 1 and 2 digit numbers to 100	75 − 42 = 33 Use Base 10 to make the bigger number then take the smaller number away. 65 − 28 = 37	Draw the Base 10 or place value counters alongside the written calculation to help to show working. 65 − 28 = 37	47−24=23 40 + 7 − 20 + 4 20 + 3 This will lead to a clear written column subtraction. 32 − 12 20 65 − 28 37

CALCULATION GUIDANCE: Subtraction
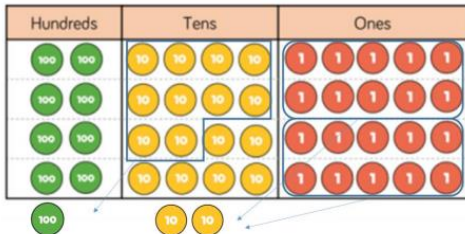
	Objective	Concrete	Pictorial	Abstract
Year 3 onwards	Subtract numbers up to 3 digits. The same concrete resources are used when subtracting 4 and more digits.	435 − 273 = 162	Children draw the counters onto a place value grid. Show the subtraction and the exchange by crossing out counters. When confident, children can find their own way to record the exchange/regrouping. Draw and use bar models and part-whole models to support subtraction. 	Children start their formal written method by partitioning the number into clear place value columns. This will lead to an understanding of subtracting any number of digits including decimals without the need to label the place value columns. By Year 5/6 children are encouraged to work in the abstract using column method to subtract numbers efficiently.

CALCULATION GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
Year 1/2	Repeated addition	2p + 2p + 2p Use different objects to add equal groups.	There are 3 plates. Each plate has two star biscuits on. How many biscuits are there? 2 + 2 + 2 = 6	Write addition sentences to describe objects and pictures. 2 + 2 + 2 = 6
	Arrays- showing commutative multiplication	Create arrays using counters/cubes to show multiplication sentences.	Draw arrays in different rotations to find commutative multiplication sentences. 4 × 2 = 8 2 × 4 = 8 2 × 4 = 8 4 × 2 = 8 Link arrays to area of rectangles.	Use an array to write multiplication sentences and reinforce repeated addition. 5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15
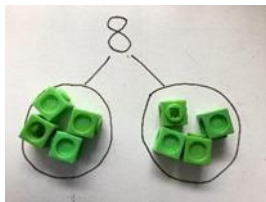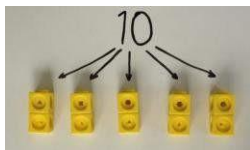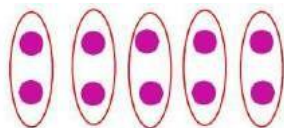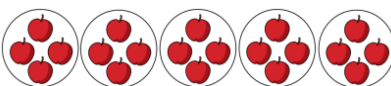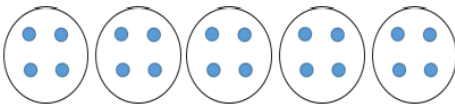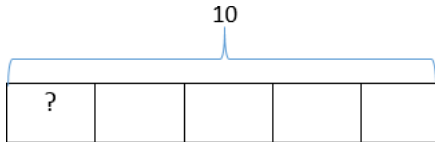
CALCULATION GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
Year 3/4	Multiply 2 and 3 digit numbers by 1 digit.	$34 \times 5 = 170$ $245 \times 4 = 980$	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 columnsto show their thinking	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. |×|30|5
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7	210	35	 $210 + 35 = 245$ Expanded method may also be used before the formal method. Progressing to using the formal method for multiplication in Year 4.

CALCULATION GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
	4-digit by 1 digit	$1{,}826 \times 3 = 5{,}478$		
Year 5/6	Multiplying numbers up to 4-digits by 2-digits	22 x 31 = 682	Children draw an area model and write the addition calculation to support them with their multiplication. **22 x 31 =** **600 + 60 + 20 +2 = 682** **234 x 32 =** **6000 + 900 + 120 + 400 + 60 + 8 = 7488**	

CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 1/2	Sharing	Use an even number of cubes to practically share between two people.	Children use pictures or shapes to share quantities. 8 ÷ 2 = 4	Share 8 buns between two people. 8 ÷ 2 = 4
	Grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.	How many groups of 4 are there? Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group. 10 ÷ 5 = ? 5 x ? = 10	10 ÷ 5 = 2 Divide 10 into 5 groups. How many are in each group?

CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
	Division with arrays	Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$	Draw an array and use lines to split the array into groups to make multiplication and division sentences.	Find the inverse of multiplication and division sentences by creating four linking number sentences. $5 \times 3 = 15$ $3 \times 5 = 15$ $15 \div 5 = 3$ $15 \div 3 = 5$

Year 3/4	Divide 2-digit numbers by 1-digit numbers with and without remainders	Tens Ones
		$53 \div 4 = 13\ r1$
			Children use their own drawn diagrams to help them divide numbers into equal groups.
			
			53
			÷ 4
			40 13
			10 12 1
			         ÷ 4
			         3
				The concrete and pictorial leads on to the formal method for division in Years 4 and 5.
				Example shown without remainders.
				
				1 3
				4 5 ^{1}2

CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 4	Divide 3- digits by 1 digit (sharing)	$844 \div 4 = 211$ $856 \div 4 = 214$ Children to use place value counters to share 3-digit numbers into equal groups.	Children use their own drawn diagrams to help them divide numbers into equal groups.	

CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 5	Divide 3-digit and 4-digit numbers by 1 digit (grouping)	$$856 \div 4 = 214$$ $$8,532 \div 2 = 4,266$$	Children to draw own counters and group them into equal groups. $$856 \div 4 = 214$$	Children are encouraged to move away from the concrete and the pictorial when dividing numbers with multiple exchanges.

CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 6	Divide up to 4-digits by 2-digits – short division method.	Children are encouraged to move away from the concrete and the pictorial when dividing numbers with multiple exchanges.	Children are encouraged to move away from the concrete and the pictorial when dividing numbers with multiple exchanges.	$1 \times 15 = 15$ $2 \times 15 = 30$ $3 \times 15 = 45$ $4 \times 15 = 60$ $5 \times 15 = 75$ $10 \times 15 = 150$ Children can write out multiples to support their calculations with larger remainders.