Dunstall Hill Primary School

Calculation Policy (Virtual)

The purpose of our Calculation Policy is to ensure consistency in the teaching of Mathematics throughout the school and to ensure that pupils develop efficient written and mental methods of calculation, underpinned by conceptual understanding.

Calculation Policy

This policy provides an overview of the strategies used in our school to teach Mathematics, specifically the four operations, as defined within the National Curriculum in England: Mathematics Programme of Study.

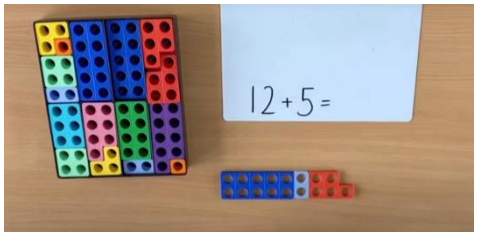
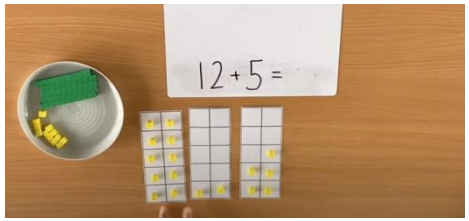
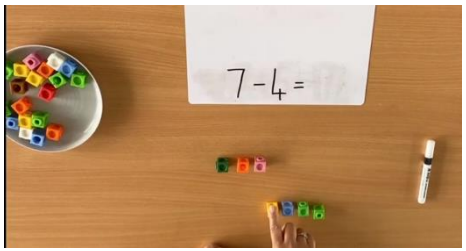
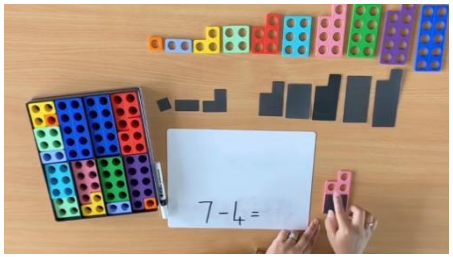
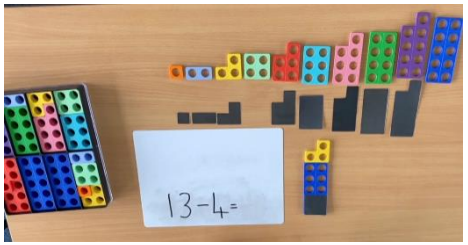
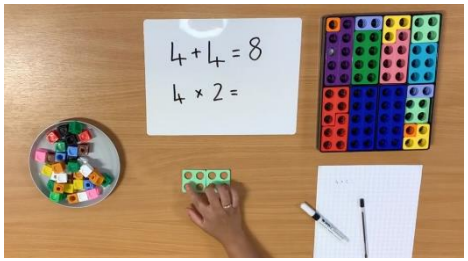
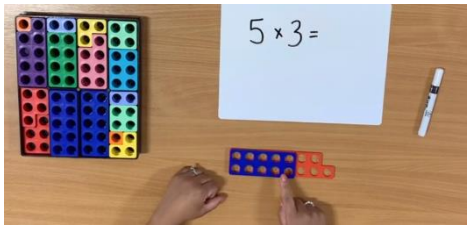
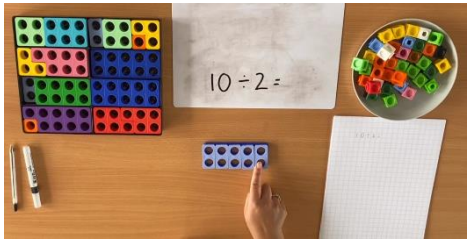
The progression of the four operations (+, -, x and ÷) are shown across each of the primary year groups 1 - 6. This is a guide since children progress at different rates. Teachers should model strategies appropriate to the ability of the children they teach, regardless of their year group, whilst striving to achieve age related expectations at the end of the academic year.

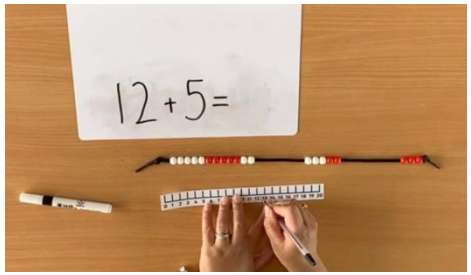
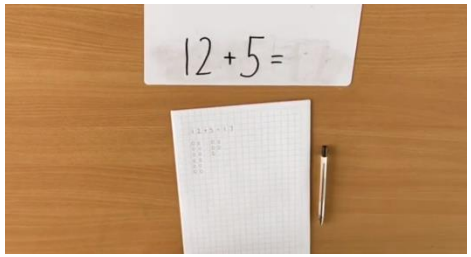
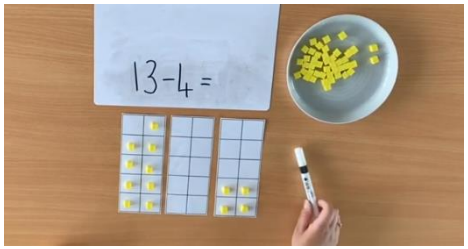
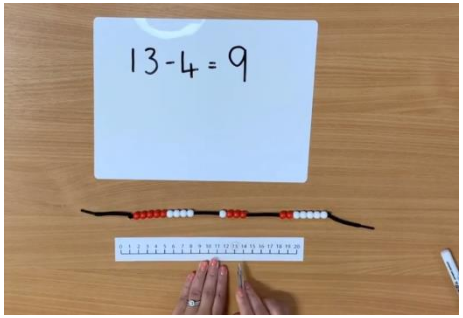
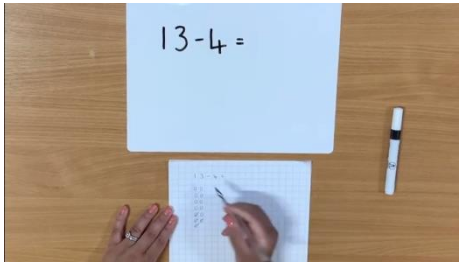
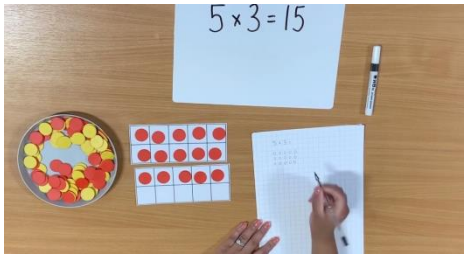
At Dunstall Hill Primary School, we believe that children should be introduced to the processes of calculation through the **concrete**, **pictorial** and **abstract** (CPA) approach. Our children are introduced to calculation through practical activities, using **concrete** resources. As children develop their understanding of the underlying concepts and mathematical models, they develop ways of recording to support their thinking. In the first instance, this recording takes the form of **pictorial** representations. Over time, children learn how to use models and images to support their mental and informal written methods of calculation.

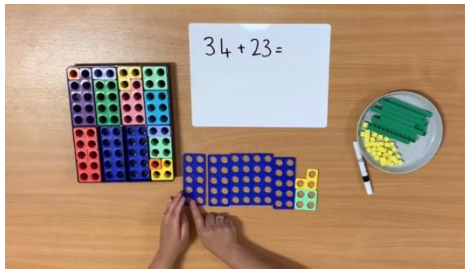
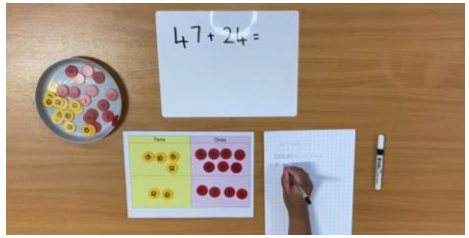
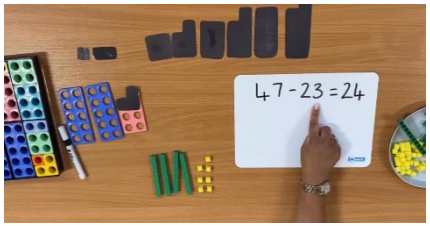
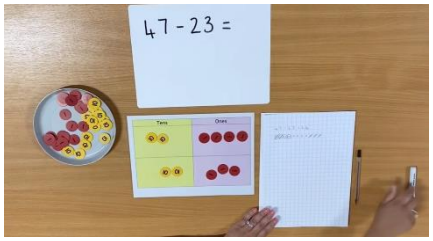
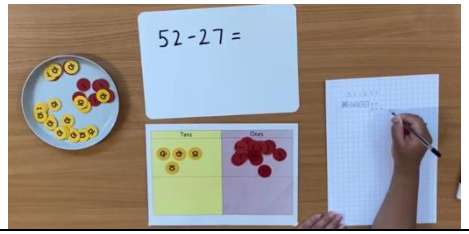
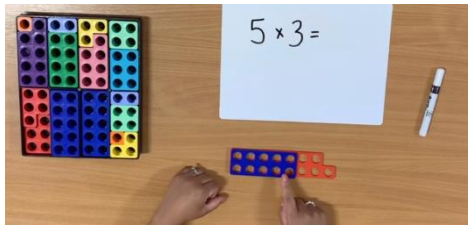
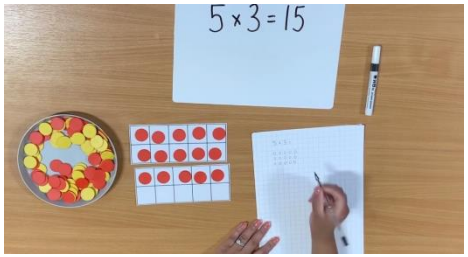
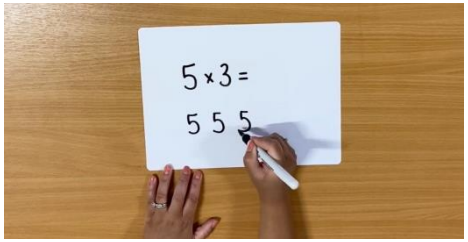
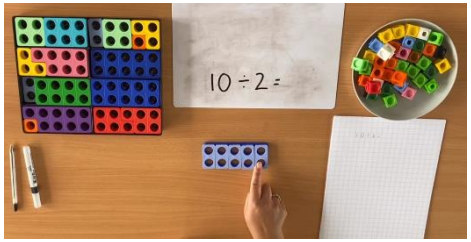
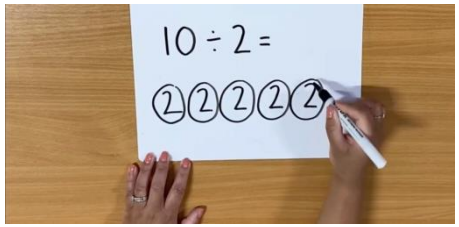
As children become more proficient in their use of mental methods, their informal written methods also become more efficient. Some recording takes the form of jottings, which are used to support children's thinking. More **abstract**, formal written methods are taught only when the child is able to use a wide range of mental calculation strategies and these are always underpinned by **concrete** and **pictorial** experiences.

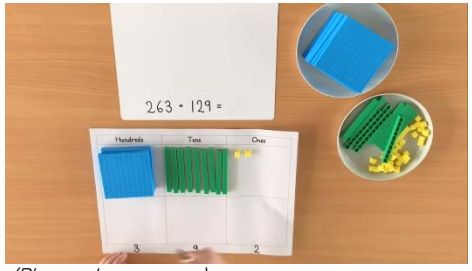
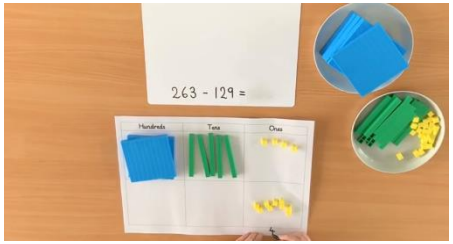
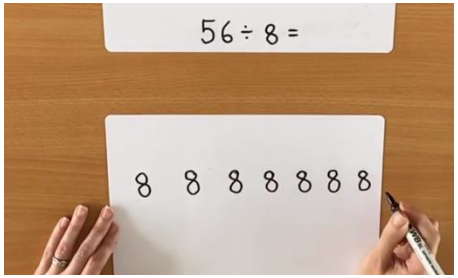
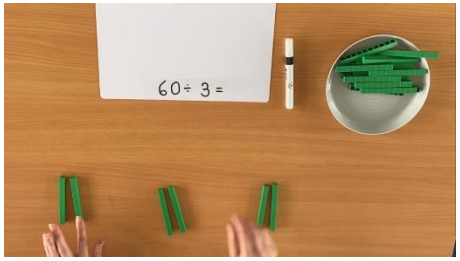
Our ultimate aim is for children to be able to select an efficient method to solve problems. Therefore children will be encouraged to look at a calculation or problem and to determine the most appropriate method to choose – pictures, mental calculation with or without jottings or a formal, written method.

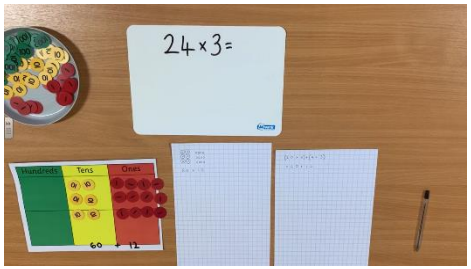
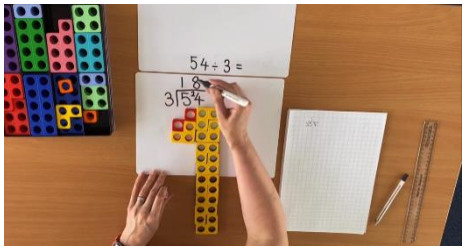
The end of year expectations in the National Curriculum shows the progression in children's use of calculation within the following strands 'Addition and Subtraction' and 'Multiplication and Division'. These end of year expectations will be achieved through the use of the following written methods of calculation.

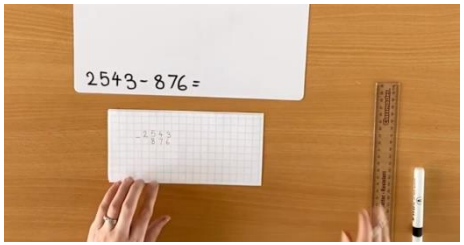
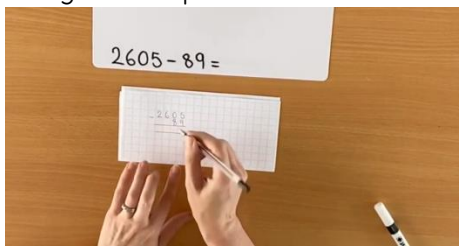
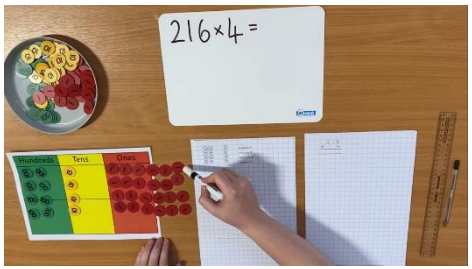
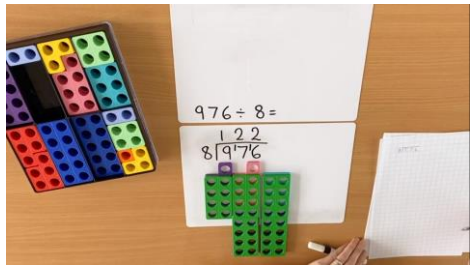
Year	Addition +	Subtraction –	Multiplication x	Division ÷
1	• Add **one-digit and two-digit numbers** to 20 including zero. • Read, write and interpret mathematical statements involving addition (+) and equal (=) signs.	• Subtract **one-digit and two-digit numbers** to 20 including zero. • Read, write and interpret mathematical statements involving subtraction (–) and equal (=) signs.	• Begin to understand **multiplication** through doubling numbers and quantities. • Use arrays and sets of 'equal groups' to look at other multiples, e.g. x 5.	• Begin to understand **division** through grouping and sharing small quantities.
	Addition of single digits: 5 + 3 = 8 *(Cubes and Numicon)*  Addition of two digit numbers to 20 and a one digit number: 12 + 5 = 17 *(Numicon)*  *(Dienes and ten frames)* 	Subtraction of single digits 7 – 4 = 3 *(Cubes)*  *(Numicon)*  Subtraction of a one-digit number from a two-digit number to 20. 13 – 4 = 9 *(Numicon)* 	Doubling – linking to x 2 Double 4 is 8, 4 + 4 = 8 or 4 x 2 = 8 *(Cubes, Numicon and counters)*  *Use an array or equal groups to solve multiplication problems for multiples other than 2* 5, 3 times or 5 x 3 = 15 *(Numicon)* 	Sharing equally Share 10 into 2 equal groups *(Cubes and counters)*  Grouping How many 2s are in 10? What is 10 grouped into twos? *(Cubes, Numicon and counters)* 

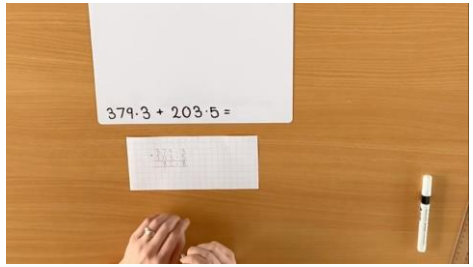
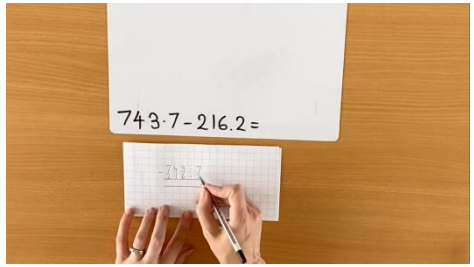
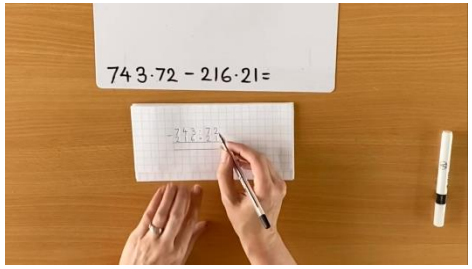
	(Bead string and number line)  *(Counters)*  	*(Dienes and ten frames)*  *(Bead string and number line)*  *(Counters)*  	*(Arrays, ten frames and counters)*  	

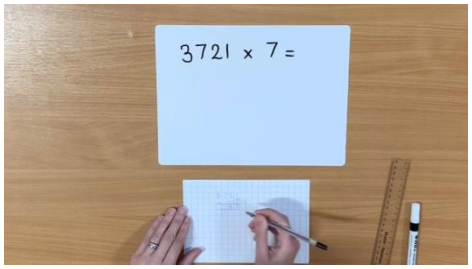
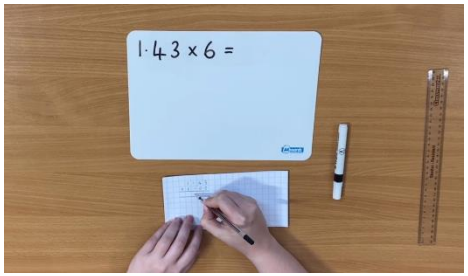
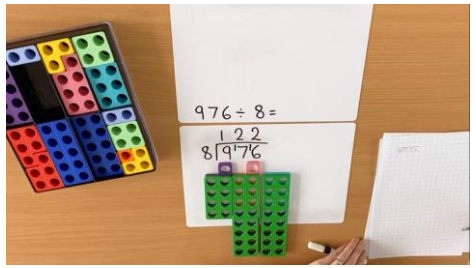
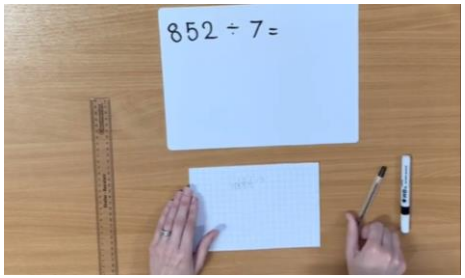
2	• Add numbers, including: ▪ a **two-digit number and ones** ▪ a **two-digit number and tens** ▪ **two two-digit numbers** ▪ adding **three one-digit numbers** • Show that addition of two numbers can be done in any order (**commutative**).	• Subtract numbers, including: ▪ a **two-digit number and ones** ▪ a **two-digit number and tens** ▪ **two two-digit numbers** • Show that subtraction of two numbers cannot be done in any order.	• **Calculate** multiplication statements within the **2, 5 and 10 multiplication tables** and write them using the multiplication (×) and equals (=) signs. • Show that multiplication of two numbers can be done in any order (**commutative**).	• **Calculate** division statements within the **2, 5 and 10 multiplication tables** and write them using the division (÷) and equals (=) signs. • Show that division of numbers cannot be done in any order.
	Addition of two two-digit numbers (no exchange): 34 + 23 = 57 *(Numicon and dienes)*  Addition of two two-digit numbers (exchange) 47 + 24 = 71 *(Place value counters)* 	Subtraction two two-digit numbers (no exchange) 47 – 23 = 24 *(Numicon and dienes)*  *(Place value counters)*  Subtraction of two two-digit numbers (exchange) 52 – 27 = 25 *(Place value counters)* 	Multiplication of two numbers within the 2, 3, 5, 10 multiplication tables. Introduce x sign to mean 'how many times'' and model recording calculations 5 x 3 = 15 or 5, 3 times = 15 *(Numicon)*  *(Arrays, ten frames and counters)*  *(Counters – one to many correspondence)* 	Division of numbers within known multiplication tables *Consolidate understanding of 'sharing' and 'grouping' as outlined within Year 1.* Grouping How many 2s are in 10? What is 10 grouped into twos? *(Cubes, Numicon and counters)*  *(Counters – one to many correspondence)* 

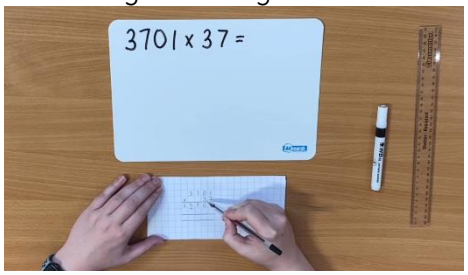
3	• Add numbers mentally, including: ▪ a **three-digit number and ones** ▪ a **three-digit number and tens** ▪ a **three-digit number and hundreds** • Add numbers with **up to three digits**, using **formal written methods** of **columnar addition**	• Subtract numbers mentally, including: ▪ a **three-digit number and ones** ▪ a **three-digit number and tens** ▪ a **three-digit number and hundreds** • Subtract a **two-digit or 3-digit number from a two-digit or 3 digit number** using a **formal written method**	• Recall and use multiplication facts for the **3, 4 and 8 multiplication tables**. • Multiply using multiplication tables that they know, including for **two-digit numbers times one-digit numbers**, using **efficient written methods- 'partitioning method'**	• Recall and use division facts for the **3, 4 and 8 multiplication tables.** • Divide using known multiplication tables, including for **two-digit numbers divided by one-digit numbers**, using mental methods, progressing to **efficient written methods**
	Addition of numbers with up to three digits 263 + 129 = 392 *(Dienes)*  *(Place value counters)*  Refer to the calculation policy for progression steps.	Subtraction of numbers with up to three digits 263 – 129 = 134 *(Dienes)*  *(Place value counters)*  Refer to the calculation policy for progression steps.	Recall and use multiplication facts for the 3, 4 and 8 multiplication tables. 8 x 4 = 32 *(Counters – one to many correspondence)*  Multiplication of a two-digit number by a one-digit number. 13 x 4 = 52 *(Dienes)* 	Recall and use division facts for the 3, 4 and 8 multiplication tables. 56 ÷ 8 = 7 *(Counters – one to many correspondence)*  Division of a two-digit number by a one-digit number, using known multiplication tables. 60 ÷ 3 = 20 *(Dienes)* 

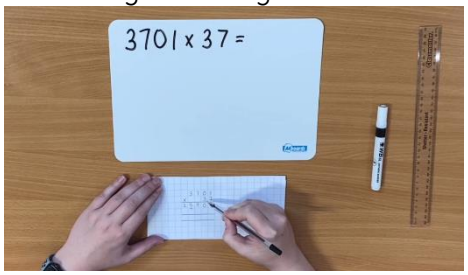
			24 x 3 = 72 *(Place value counters)* 	*(Place value counters)*  Dividing a two-digit numbers by one-digit numbers. 54 ÷ 3 = 18 *(Numicon)* 

4	• Add numbers with **up to 4 digits** using mental strategies and the **formal written methods (columnar addition)** • Add numbers with **2 decimal places**, using **formal written methods (columnar addition)**	• Subtract numbers with **up to 4 digits** using mental strategies and the **formal written methods (columnar subtraction)** • Subtract numbers with **2 decimal places**, using **formal written methods (columnar subtraction)**	• Recall multiplication facts for **multiplication tables up to 12 x 12**. • Multiply **two-digit and three-digit numbers by a one-digit number** using formal written layout e.g. 84 x 6, 216 x 4 • Multiply **three-digit numbers with 1 decimal place by a one-digit number** using formal written layout e.g. 134.5 x 7	• Recall division facts for **multiplication tables up to 12 x 12**. • Divide numbers up to **3 digits by a 1 digit number** using the formal written method (no remainders)
	Addition of numbers with up to four digits: Refer to the Year 3 place value counters videos. *(Column method)* four digit + four digit  four digit + three digit 	Subtraction of numbers with up to four digits Refer to the Year 3 place value counters videos. four digit – four digit  four digit – three digit  Using 0 as a place holder 	Recall and use multiplication facts for the multiplication tables up to 12 x 12. Refer to the Year 3 counters videos. Multiplication of two and three digit numbers by a one-digit number 216 x 4 = 864 *(Place value counters)*  Refer to the calculation policy for progression steps.	Recall and use division facts for the multiplication tables up to 12 x 12. Refer to the Year 3 counters videos. Divide numbers with up to three-digit by a one-digit number 976 ÷ 8 = 122 *(Numicon)*  Refer to the calculation policy for progression steps.

	Using 0 as a place holder  Numbers with 1 decimal place  Numbers with 2 decimal places  *Use partitioning methods to support understanding of columnar addition where appropriate.	Method 1  Method 2  Numbers with 1 decimal place  Numbers with 2 decimal places  *Use partitioning methods to support understanding of columnar subtraction where appropriate.		

5	• Add **whole numbers** with **more than 4 digits** (and with **up to 3 decimal places**), including using formal written methods (columnar addition)	• Subtract **whole numbers** with **more than 4 digits** (and with **up to 3 decimal places**), including using formal written methods (columnar subtraction)	• Multiply numbers **up to 4 digits by a 1 digit number** using a formal written method *e.g. 3721 x 7* • Multiply **one-digit numbers with up to three decimal places by whole numbers** • Multiply numbers **up to 4 digits by 2-digit number** using a formal written method *e.g. 3721 x 37*	• Divide numbers up **to 4 digits by a one-digit number** using the formal written method and **interpret remainders** • Divide numbers up **to 4 digits with up to 3 decimal places by a one-digit number** using the formal short written method
	The same as Year 4 but with larger numbers and with a greater number of decimals places - up to 3 decimal places. *Continue to ensure that the use of '0' as a placeholder is used to ensure pupils are confident with the exchanging and adding on process.*	*The same as Year 4 but with larger numbers and with a greater number of decimals places - up to 3 decimal places.* *Continue to ensure that the use of '0' as a placeholder is used to ensure pupils are confident with the exchanging process.*	Multiplication of a four-digit numbers by a one-digit numbers. Refer to the Year 4 place value counters videos. 3721 x 7 = 26047  Multiplication of a one-digit number with up to three decimal places by a one-digit number.  *Develop to up to 4 digits with up to 3 decimal places by a one-digit number.*	Division of numbers with up to four digits by a one-digit number. *Consolidate understanding of using the formal written method without remainders as outlined within Year 4.* *(Numicon) (as used in Year 4)* 976 ÷ 8 = 122  Three-digit number divided by one-digit number – with remainders 852 ÷ 7= 121 r 5 *Round up or down given the context of the problem.* 

			Multiplication of a four-digit number by a two-digit number. 	Four-digit number divided by one-digit number – with remainders- interpreted as a decimal (to 3 decimal places) 6497 ÷ 8 = 812.125  Refer to the calculation policy for progression steps.

6	• Add **multi-digit numbers with more than 4 digits (with up to 3 decimal places)**, using formal written methods (columnar addition)	• Subtract **multi-digit numbers with more than 4 digits (with up to 3 decimal places)**, using formal written methods (columnar subtraction)	• Multiply **multi-digit numbers up to 4 digits by a two-digit whole number** using the formal written method of long multiplication	• Divide numbers **up to 4 digits (with up to 3 decimal places) by a two-digit whole number** using the formal written method of division, and **interpret remainders as whole number remainders, fractions, or by rounding**, as appropriate for the context - Short division - Long division
	The same as Year 4 and 5 but with multi-digit numbers with more than 4 digits (and with up to 3 decimal places).	*The same as Year 4 and 5 but with multi-digit numbers with more than 4 digits (and with up to 3 decimal places).*	Multiplication of a four-digit number by a two-digit number. 	*Consolidate understanding of using the formal written method for dividing three-digit number with up to 3 decimal places by one-digit number as outlined in Year 5.* Division of numbers with up to four-digits and three decimal places, by a two-digit whole number. 4138 ÷ 17 = 243 r 7 Long Division