Heptonstall Primary School

Calculation Policy
Year 3 and 4

This booklet contains the calculation methods used in year 3 and 4 for each of the four operations – addition, subtraction, multiplication and division.

Please use this document as a tool to support your child at home. The methods we use in school may or may not be familiar to you. Children can become confused when they seek support from an adult at home because often, the adult will teach the method they themselves were taught.

Knowing how the methods in this booklet work will help you to help your child. All staff in school use this document so that we can ensure consistency in our approach.

Year 3

Year 3

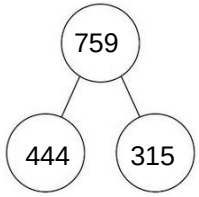
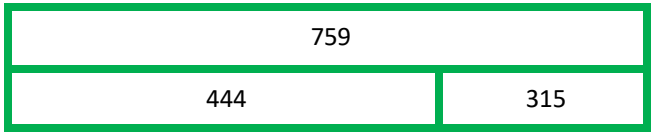
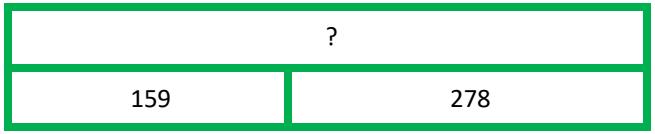
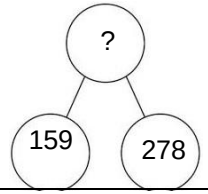
LOWER KEY STAGE 2

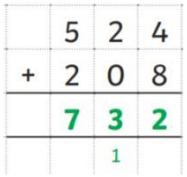
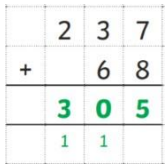
The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.

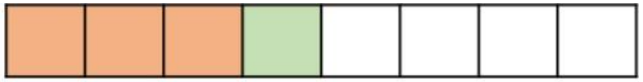
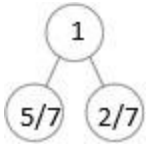
Addition and subtraction: Children are taught to use place value and number facts to add and subtract numbers mentally and they will develop a range of strategies to enable them to become less reliant on the 'counting in 1s' or fingers-based methods of Key Stage 1. In particular, children will learn to add and subtract multiples and near multiples of 10, 100 and 1000 (year 4) and will become fluent in complementary addition as an accurate means of achieving fast and accurate answers to 3-digit subtractions. Standard written methods for adding larger numbers are taught, learned and consolidated, and written column subtraction is also introduced.

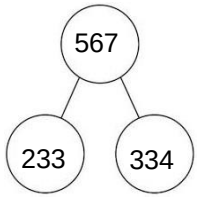
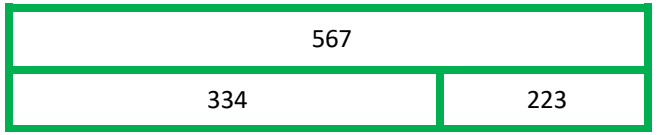
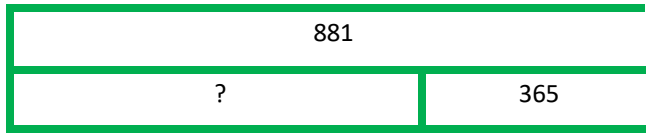
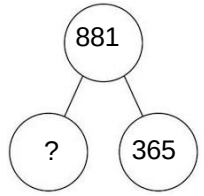
Multiplication and division: This key stage is also the period during which all the multiplication and division facts are thoroughly memorised, including all facts up to 12 × 12. Efficient written methods for multiplying or dividing a 2-digit or 3-digit number by a 1-digit number are taught, as are mental strategies for multiplication or division with large but 'friendly' numbers, e.g. when dividing by 5 or multiplying by 20.

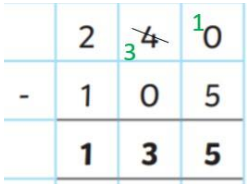
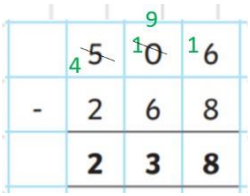
Fractions and decimals: Children will develop their understanding of fractions, learning to simplify fractions and find equivalents as well as finding fractions of amounts and quantities. The concept of a decimal number is introduced and children consolidate a firm understanding of 1-place decimals, dividing whole numbers by 10 and 100 and seeing the effect on the digits.

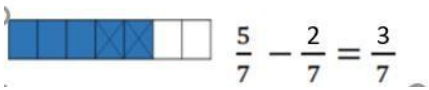
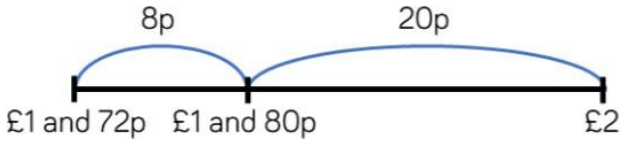
	National Curriculum Objectives	Mental calculation	Written calculation
Y3 +	Add and Subtract numbers mentally, <u>including:</u> • a three-digit number and 1s • a three-digit number and 10s • a three-digit number and 100s Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction Estimate the answer to a calculation and use	Use place value knowledge to add a 3-digit number and ones, tens and hundreds up to 1000. Place value grids and counters are used to help children visualise and understand what they are doing mentally. Children are encouraged to use the basic number facts they know to help them. For example: <u>Adding ones:</u> 5 + 3 = 8 so, 34<u>5</u> + <u>3</u> = 348 6 + 4 = 10 so, 45<u>6</u> + <u>4</u> = 460 **<u>Adding tens:</u>**	**<u>Continue to use part whole models and bar models</u>** **<u>Use to represent related addition and subtraction facts.</u>**  444 + 315 = 759 315 + 444 = 759 So… 759 – 444 = 315 759 – 315 = 444  **<u>Use to help solve missing number problems/ inverse. Use to check answers to a calculation.</u>** We know that 159 + 278= ? We can help visualise this problem by putting it into a bar model (or part whole model), now we know we need to add them together. We can do 159 + 278 to find our missing number (=437). We can now do 437 – 289 to check. If we get 159 we are correct.  

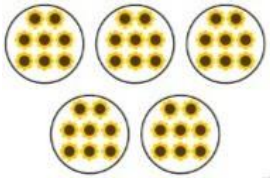
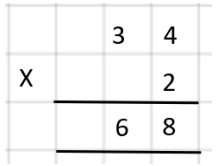
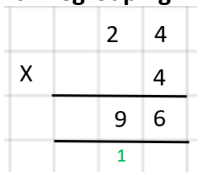
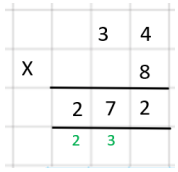
	inverse operations to check answers	70 + 20 = 90 so, 876 + 20 = 896 Where numbers bridge over 100, children are encouraged to look at the hundreds and tens as a 2-digit number: 891 + 10 = 901 **Adding hundreds:** **400 + 300= 700** so, 472 + 300= 772 Relate number bonds to 10 to number bonds to 100 and 1000 (e.g. 3 + 7 = 10 so 30 + 70 = 100 therefore 300 + 700 = 1000 and be able to recall them.	**Column addition for up to two 3-digit number, with 1 or more regrouping** Use of (compact) column addition with up to two 3-digit numbers (may also do 3 digit number + 2 digit number, or three 3 digit numbers added together etc). May have no regrouping, one regroup or multiple regroups. **Regroup once**  Starting with the ones, add each column in turn. When adding 4 ones + 8 ones = 12 = 1 ten and 2 ones. Place 1 ten under the equal sign on the ten column and the 2 ones in the answer ('hang it on the washing line') **Regroup multiple times**  Starting with the ones, add each column in turn. Regroup tens and hundreds as required ('hang it on the washing line') NB: Children to understand commutative law. Numbers can be added in any order and it will not effect the answer. NB: Emphasis to be made on the place value of each digit so children do not think it is 8 - 7. Ask questions such as 'What is the value of 8 in this calculation?', 'Can you show me this number partitioned?' **Estimate the answer to a calculation** Children to look for the nearest multiple of 10 or 100 and add the 2 numbers together to get an estimate. **51 + 29 =** ☐ **50 + 30 = 80** **204 + 198 =** ☐ **200 + 200 = 400**

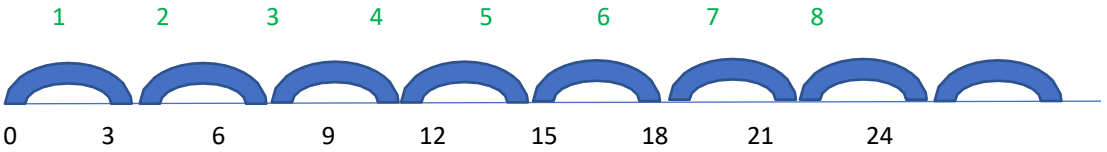
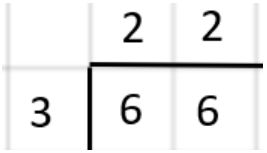
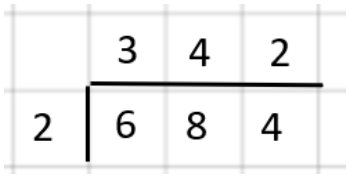
	Add and subtract fractions with the same denominator within one whole		**Add and subtract fractions with the same denominator** • Children use practical equipment and pictorial representations to add two or more fractions with the same denominator where the total is less than 1. • Children understand that we only add the numerators and the denominators stay the same.  We can use this model to calculate $\frac{3}{8}+\frac{1}{8}=\frac{4}{8}$ NB: Children need to recognise that fractions add to 1 whole 1/3 + 2/3 = 1 3/8 + 5/8 = 1  **Adding amounts of money** Children add two amounts of money using pictorial representations to support them. They are encouraged to add the pounds first and then add the pence. Children then exchange the pence for pounds to complete their calculations.
	Add and subtract amounts of money to give change, using both £ and p in practical contexts		£2 and 35p + £1 and 75 p. There is £3 and 110p. Altogether there is £1 and10p.   £5 and 30p + £3 and 75p. There is £8 and 105p. Altogether there is £9 and 5p.

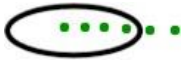
			Adding measurement Use of column addition with up to two 4-digit numbers (may also use up to two 5-digit number). May have no regrouping, one regroup or multiple regroups. • Differentiate using the partitioning method. e.g. litre and millilitre 5l and 161ml + 1l and 437ml 5 1 6 1 + 1 4 3 7 6 5 9 8
Y3 –	Add and subtract numbers mentally, including: Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction	Use place value knowledge to a subtract a 3-digit number and ones, tens and hundreds up to 1000. Place value grids and counters are used to help children visualise and understand what they are doing mentally. Children are encouraged to use the basic number facts they know to help them. For example: Subtracting ones: 5 - 3 = 2 so, 345 - 3 = 342 Subtracting tens: 70 - 20 = 50 so, 876 - 20 = 856 Where numbers bridge over 100, children are encouraged to look at the hundreds and tens as a 2-digit number: 801 - 10 = 791	**Continue to use part whole models and bar models** **Use to represent related addition and subtraction facts.**  233 + 334 = 567 334 + 233 = 567 **So…** 567 – 334 = 233 567 – 233 = 334  **Use to help solve missing number problems and represent inverse**. We know that 781 - ? = 365 We can help visualise this problem by putting it into a bar model (or part whole model) like on the right. Now we can see the other subtraction we need to do. We now know we can do 881 – 365 to find our missing number which is 516   **Column subtraction for up to two 3-digit number, with 1 or more exchange**

	Estimate the answer to a calculation and use <u>inverse operations to</u> check answers	<u>Subtracting hundreds:</u> 400 – 300 = 100 so, <u>4</u>72 - <u>3</u>00= <u>1</u>72	Use of (compact) column subtraction with up to two 3-digit numbers (may also do 3-digit number – 2 digit number etc). May have no exchanging, one exchange or multiple exchanging. **One exchange**  Starting with the ones, subtract each column in turn. When subtracting 0 ones from 5 ones, exchange 1 ten from the tens column to make 1 ten and 4 ones (14). Change the 4 tens into 3 tens. NB: Emphasis to be made on the place value of each digit so children do not think it is 2 - 1. Ask questions such as 'What is the value of 2 in this calculation?', 'Can you show me this number partitioned?' **Multiple exchanging**  Starting with the ones, subtract each column in turn. Exchange in the tens / hundreds as required **Estimation:** Children to look for the nearest multiple of 10 or 100 and subtract the 2 numbers to get an estimate. **59 – 31 = ☐ 60 – 30 = 30** **598 - 203 = ☐ 600 - 200 = 400** **<u>Add and subtract fractions with the same denominator</u>** Children use practical equipment and pictorial representations to subtract fractions with the same denominator within one whole.

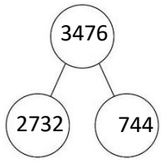
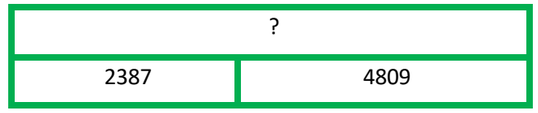
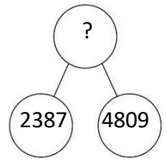
	Add and subtract fractions with the same denominator within one whole Add and subtract amounts of money to give change, using both £ and p in practical contexts		Children understand that we only subtract the numerators and the denominators stay the same. Use the models to help you subtract the fractions.  $\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$ **Subtracting amounts of money** Children use different methods to subtract money. They will see examples where they can physically remove the coins, and examples where they will need to use their knowledge of converting money to exchange £1 for 100 pence. Children also use number lines to count on or back to calculate the difference between two amounts.  Alex has £3 and 50p. She gives £2 and 10p to her sister. How much money does she have left? £3 − £2 = £1. 50p − 10p = 40p. Alex has £1 and 40p remaining.  Tommy has £1 and 72p. Rosie has £2 How much more money does Rosie have than Tommy? Rosie has 28p more than Tommy **<u>Subtracting measurement</u>** Use of column subtraction with up to two 4-digit numbers (may also use up to two 5-digit number). May have no regrouping, one regroup or multiple regroups. • Differentiate using the partitioning method. e.g. litre and millilitre 7l and 263ml – 2l and 621ml $\begin{array}{rcccc} & {}^{6}\not{7} & {}^{1}2 & 6 & 3 \\ - & 2 & 6 & 2 & 1 \\ \hline & 4 & 6 & 4 & 2 \end{array}$

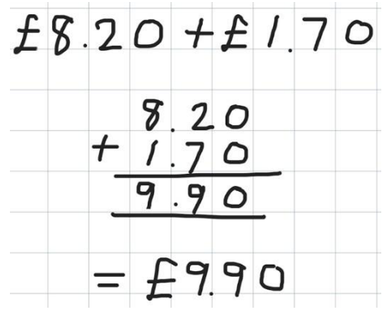
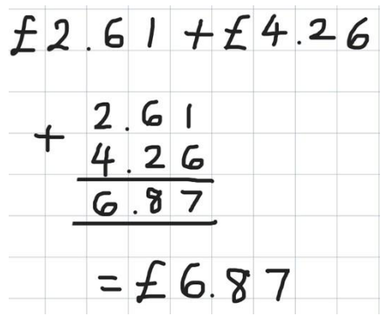
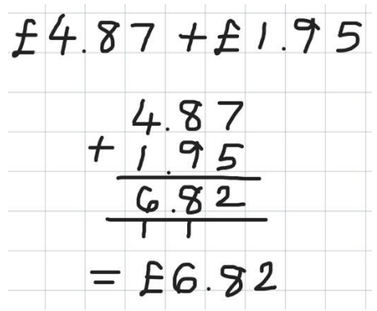
Y3 **×**	Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for <u>two-digit numbers times</u> one-digitnumbers, using mental and progressing to formal written methods	Know by heart all the multiplication facts in the ×3, ×4 and ×8 tables Recognise that multiplication is commutative 3 x 5 = 15 5 x 3 = 15 NB: Reinforce division facts as inverse of multiplication throughout teaching. Multiplying by 1 Know that any number x by 1 = itself **For example: 8 x 1 = 8** Multiplying by 0 Know that any number x by 0= 0	 Understanding multiplication as equal groups of and that multiplication is commutative. There are 3 equal groups of 4. 3 x 4 = 12 or 4 x 3 = 12  There are 5 equal groups of 8. 5 x 8 = 40 or 8 x 5 = 40 Using known multiplication facts and partitioning to answer 2 digit by 1digit calculations :  3 2 x 3 = 30 2 30 x 3 = 90 (3 x 3) 2 x 3 = 6 30 + 6 = 36 **<u>Formal written method: 2 digit numbers by 1 digit number (2, 3, 4, 5 and 8 times tables)</u>** **<u>No regrouping</u>**  NB: Emphasis to be made on the place value of each digit so children do not think it is 2 x 3 . Ask questions such as 'What is the value of 3 in this calculation?', 'Can you show me this number partitioned?' **With Regrouping**  

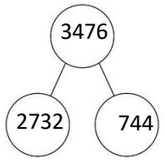
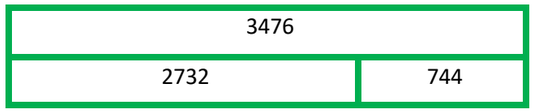
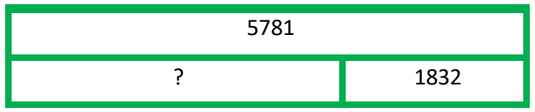
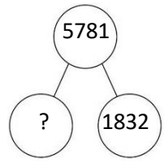
Y3 **÷**	Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	Know by heart all the division facts derived from the ×2, ×3, ×4, ×5, ×8 and ×10 tables. Recognise that division is not commutative Use place value and number facts in mental division Check that Children can halve even numbers to 100, halve odd numbers to 20 NB: Reinforce multiplication facts as inverse of division throughout teaching columns.	**<u>Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods</u>** To understand division as equal groupings:  21 shared into equal groups of 3. **21 ÷ 3 = 7** or **21 ÷ 7 = 3** **<u>Chunking on a number line: (numbers that will divide equally by 2, 3, 4, and 8)</u>** Using a number line to count from zero in the multiple until you get to the required amount. Count the number of jumps made to get the answer. **24 ÷ 3 = 8**  **<u>Bus stop method: (2 and 3 digit, multiples of 2, 3, 4, 5 and 8- no remainders)</u>** **No regrouping**   NB: Emphasis to be made on the place value of each digit so children do not think it is 3 ÷ 6. Ask questions such as 'What is the value of 6 in this calculation?', 'Can you show me this number partitioned?' **With regrouping**

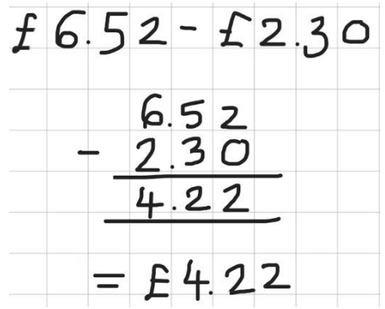
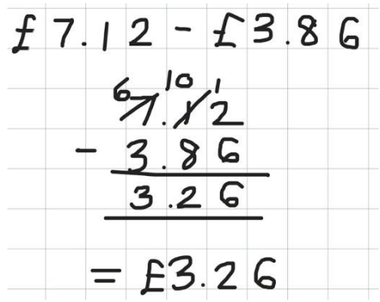
			1 2 8 | 9 1 6 **Diagrams to help:** 1 equal group of 8 and 1 remaining  1 5 2 4 | 6 2 0 8 1 equal group of 4 and 2 remaining 

Year 4

	National Curriculum Objectives	Mental Calculation	Written Calculation
Y4 +	Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate Estimate and use inverse operations to check answers to a calculation Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	Simple mental addition to ensure no errors with column addition. Use of place value to find 10, 100 or 1000 more. Use of place value to find morethan a given number and including in negative numbers. **For example: Find 3 more than -8.** Use number line initially, then jottings and then mentally Relate number bonds to 10 to number bonds to 100 and 1000 (e.g. 3 + 7 = 10 so 30 + 70 = 100 therefore 300 + 700 = 1000 and be able to recall them. NB: Emphasis to be made on the place value of each digit and when introduced in Y4 (already done version of this in Y2 and Y3) to the method children should be shown it with counters and place value grid on the IWB to model regrouping. If need practical apparatus - use Numicon or Base 10 to model the regrouping.	**<u>Continue to use part whole models and bar models</u>** **<u>Use to represent related addition and subtraction facts.</u>**  2732 + 744 = 3476 744 + 2732 = 3476 **So…** 3476 – 2732 = 744 3476 – 744 = 2732  **<u>Use to help solve missing number problems/ inverse. Use to check answers to a calculation.</u>** We know that 2387 + 4809 = ? We can help visualise this problem by putting it into a bar model (or part whole model) like on the right, now we know we need to add them together. We can do 2387 + 4809 to find our missing number (=7196). We can now do 7196 – 2387 to check. If we get 4809 we are correct.   **<u>Column addition for up to two 4-digit number, with 1 or more regrouping</u>** Use of (compact) column addition with up to two 4-digit numbers (may also do 4 digit number + 3 digit number, or three 4 digit numbers added together etc). May have no regrouping, one regroup or multiple regroups. **Regroup once** 5162 +3497 8659 1 Starting with the ones, add each column in turn. When adding 6 tens + 9 tens = 15 tens = 1 hundred = 5 tens. Place 1 hundred <u>under</u> the equal sign on the hundred column and the 5 tens in the answer (‘hang it on the washing line’) **Regroup multiple times** 5864 +3497 9361 1 1 1 Starting with the ones, add each column in turn. Regroup tens, hundreds and/or thousands as required (‘hang it on the washing line’)

	(See above)	(See above)	**Column addition for decimals** Use of (compact) column addition for numbers with the same amount of decimal places **For example**: when solving addition problem with a money context that goes into the decimal system with tenths and hundredths For two amounts with same number of decimal places (only tenths):  For two amounts with same number of decimal places (tenths and hundredths):  For two amounts with same number of decimal places (tenths & hundredths) and require regrouping: 

Y4 **–**	Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate Estimate and use inverse operations to check answers to a calculation Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	Simple mental subtraction to ensure no errors with column subtraction. Use of place value to find 10, 100 or 1000 less. Use of place value to find less than a given number and going into negative numbers. For example: Find 7 less than 2. Use number line initially, then jottings and then mentally	**<u>Continue to use part whole models and bar models</u>** **<u>Use to represent related addition and subtraction facts.</u>**  2732 + 744 = 3476 744 + 2732 = 3476 **So…** 3476 – 2732 = 744 3476 – 744 = 2732  **<u>Use to help solve missing number problems and represent inverse</u>**. We know that 5781 - ? = 1832 We can help visualise this problem by putting it into a bar model (or part whole model) like on the right. Now we can see the other subtraction we need to do. We now know we can do 5781 – 1832 to find our missing number.   **<u>Column subtraction for up to two 4-digit number, with 1 or more exchange</u>** Use of (compact) column subtraction with up to two 4-digit numbers (may also do 4 digit number – 3 digit number etc). May have no exchanging, one exchange or multiple exchanging. One exchange 6 1 5749 - 3471 2278 Starting with the ones, subtract each column in turn. When subtracting 4 tens -7 tens, exchange 1 hundred to make: 14 tens – 7 tens = 7 tens Multiple exchanges 6 13 1 5742 - 3476 2266 Starting with the ones, subtract each column in turn. Exchange tens, hundreds and/ or thousands as required. NB: Emphasis to be made on the place value of each digit and when introduced in Y4 (already done version of this in Y2 and Y3) to the method children should be shown it with counters and place value grid on the IWB to model exchanging. If need practical apparatus - use Numicon or Base 10 to model the exchanging.

	(See above)	(See above)	**Column Subtraction** **Column subtraction for decimals** Use of (compact) column subtraction for numbers with the same amount of decimal places **For example**: when solving subtraction problem with a money context that goes into the decimal system with tenths and hundredths. For two amounts with same number of decimal places:  For two amounts with same number of decimal places and require exchanging: 

Y4

x

Recall multiplication facts for multiplication tables up to 12 × 12

Use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; multiplying together 3 numbers

Recognise and use factor pairs and commutativity in mental calculations

Multiply two-digit and three-digit numbers by a one-digit number using formal written layout

Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

(not necessarily in this order)

Learn shortcuts for mental multiplication

For example:

- to x4 you x2 and x2 again
- to x5 you x10 and divide by 2
- to x20 you x2 and x10

Use known multiplication facts to mentally solve other multiplications

For example: if you know 8x3=24 you know…

- 8x30=240
- 80x3=240
- 80x30=2400

Multiplication is commutative

Factor pairs of numbers

Fact families – using known fact to find the others

For example: if you know 9x4=36 then you know 4x9=36 and 36÷9=4 and 36÷4=9

Multiplying by 1

Know that any number x by 1 = itself

For example: 81 x 1 = 81

Multiplying by 0

Know that any number x by 0= 0

For example: 72 x 0 = 0

Multiplying 3 numbers together and shortcuts to take

For example: 8 x 7 x 2

First solve 8 x 7 = 56 (as it's the trickier one)

Then 56 x 2 = 112 (as doubling is easier)

Multiplying a number by 10 and 100

Use of place value grids

Moving 1 place to the left for x10
or 2 places to the left for x100
or 3 places to the left for x1000

NB: Start with counters then write digits in.

Th Thousands	H Hundreds	T Tens	U Units	
			1	
		1	0	x 10
	1	0	0	x 100

Once children understand the place value reasons behind this they can use shortcuts of putting zeros onto the end (making it more of a mental calculation)

For example: 78 x 10. Multiplying by 10 → 10 has 1 zero so I need to put 1 zero on the end of my number → 780
For example: 6 x 100. Multiplying by 100 → 100 has 2 zeroes so I need to put 2 zeroes on the end of my numbers → 600
For example: 52 x 100. Multiplying by 100 → 100 has 2 zeroes so I need to put 2 zeroes on the end of my numbers → 5200

Children to learn both of the following methods and choose what they prefer to use (guided towards choosing column method.)

NB: If children struggled, can use either of these methods with counters & PV grid.

Using grid method for multiplication

123 × 5

×	100	20	3
5	500	100	15

500
+ 100
+ 15
615

Multiplying 2 and 3 digit numbers x 1 digit numbers using grid method.

- First – partition the number into its (hundreds,) tens and ones.
- Draw grid and set out partitioned numbers into the grid.
- Multiply each partitioned number along the top by the 1 digit number, fill in the answer
- Line up all the parts of the answer and complete a column addition
- Now you have the final answer

Using column method for multiplication

	H	T	O	
		3	4	
×			5	
	1	7	0	

1 2

Multiplying 2 and 3 digit numbers x 1 digit numbers using column multiplication method

- First set out the numbers in a column method ensuring HTO are accurately lined up
- Start by multiplying the ones by the x number
- Record the answer under the line in the correct column
- Work through the tens and then hundreds.
- If the digits are larger than 9 they need to be regrouping into the next place value column as the children are familiar in doing with column addition.

Y4 **÷**	(Multiplication & Division) Recall division facts for multiplication tables up to 12 × 12 Use place value, known and derived facts to divide mentally, including dividing by 1 Recognise and use factor pairs and commutativity in mental calculations (Fractions & Decimals) Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths	Use their multiplication knowledge to divide mentally. Eg. 8 x 9 = 72 so 72 ÷ 8 = 9 Use inverse of factors and factor pairs. Eg. Know that factors of 36 are 1 and 36, 2 and 18, 3 and 12, 4 and 9, and 6. Therefore we know that 36 ÷ 3 = 12. Know that division is not commutative. Fact families – using known fact to find the others Eg. if you know 9x4=36 then you know 4x9=36 and 36÷9=4 and 36÷4=9 Know that any number ÷ by 1 = itself Eg. 81 ÷ 1 = 81	***Dividing a number by 10 and 100*** Use of place value grids Moving 1 place to the right for ÷10 or 2 places to the right for ÷100 NB: Start with counters then write digits in. Th Thousands / H Hundreds / T Tens / U Units 1 0 0 1 0 → ÷ 10 1 → ÷ 100 ***Bus stop Division*** Bus stop division for 2 or 3 digit numbers divided by 1 digit number (no remainders) Start with numbers that fully divide (no regrouping required) - with 2 digit 2 1 / 4 8 4 — or 3 digit 3 1 2 / 3 9 3 6 Then move onto some regrouping across - with 2 digit 1 5 / 3 4 ¹5 — or 3 digit & one regroup 2 1 4 / 4 8 5 ¹6 or 3 digit & one regroup 0 4 5 / 8 3 ³6 ⁴0