Addition & Subtraction Calculation Policy

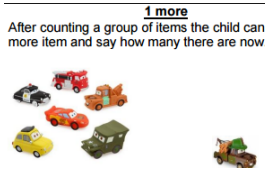
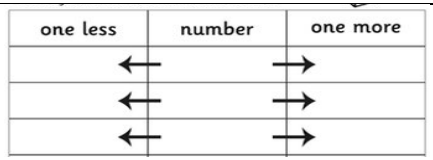
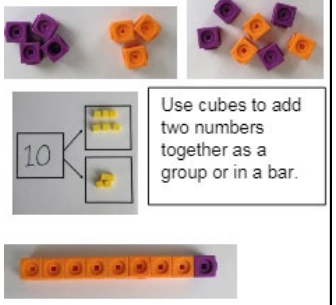
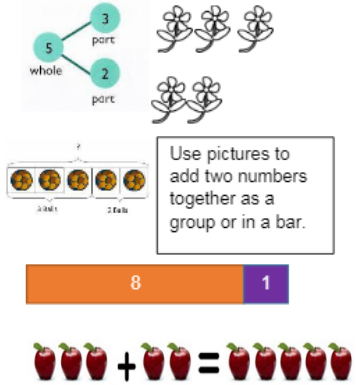
Highlands Primary School

Mrs A Monteiro

Addition and subtraction

EYFS:

The principal goal of teaching maths in EYFS is to ensure that children can count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they will learn to add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

End of year expectations	**Concrete**	**Pictorial**	**Abstract**	**Using and applying**
Say which number is one more or less than a given number to 20.	 Using fingers to add one more. 	Drawing pictures and adding another to make a total.		I have 13 sweets. I eat one. How many have I got left? Jack has four buckets of water, Jill ha 9 buckets of water. How many buckets of water do they have altogether?
Add two single-digit numbers using quantities and objects and count on to find the answer. (including doubling 2 single digit numbers)			4 + 3 = 7 10= 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.	I have 13 sweets. I eat one. How many have I got left? Jack has four buckets of water, Jill ha 9 buckets of water. How many buckets of water do they have altogether?

Addition and subtraction

Key Stage 1:

- The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources (for example, concrete objects and measuring tools).

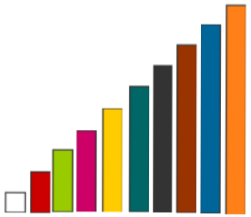
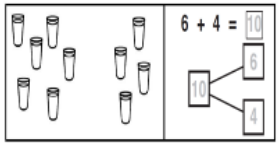
- By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.

End of year expectations	Rapid recall	Mental calculation	Language	Using and applying
Year 1	Count to and across 100, forwards and backwards, beginning with 0 or one, or from any given number Count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens 1 more or less than a number	Add and subtract 1-digit and 2-digit numbers to 20, including 0	Add Addend Sum Altogether Total Take away Difference More than Less than Equal to Part Whole	I'm thinking of a number. I've subtracted 5 and the answer is 7. What number was I thinking of? Explain how you know. I'm thinking of a number. I've added 8 and the answer is 19. What number was I thinking of? Explain how you know. I know that 7 and 3 is 10. How can I find 8 + 3? How could you work it out? Show children a price list with items costing up to 20p. I have 20p to spend. If I spend 20p exactly, which two items could I buy? And another two, and another two.

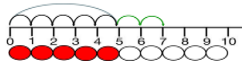
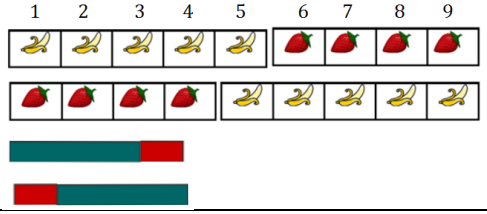
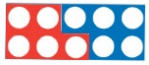
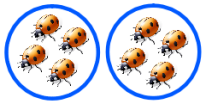
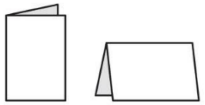
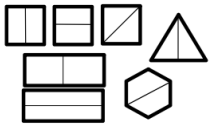
Addition and subtraction

Year 2	Count in steps of two, three, and five from 0, and in tens from any number, forward and backward	Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: • a 2-digit number and ones • a 2-digit number and tens • two 2-digit numbers • adding three 1-digit numbers Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot 5	Sum Difference Minuend Subtrahend Inverse Calculate Partition Two-digit	Solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying an increasing knowledge of mental and written methods

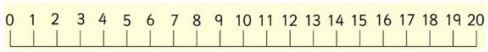
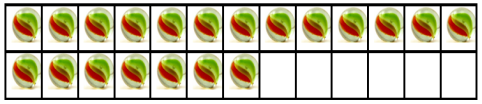
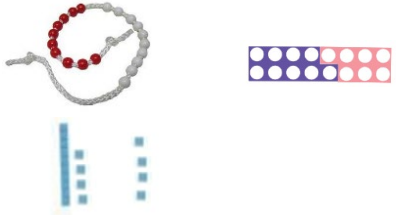
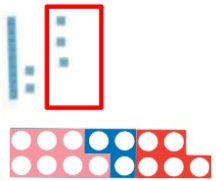
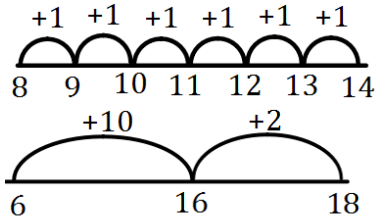
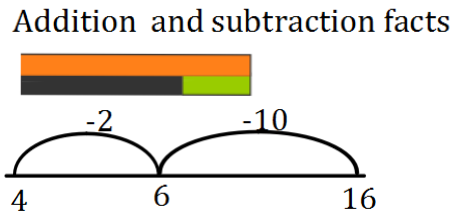
Addition and subtraction

End of Year 1 expectations	Concrete	Pictorial	Conceptual	Using & applying
Identify one more or one less.	Counting on and back using familiar objects and resources.   One more  One less	Introduce bar models to compare quantities.   	Introduction to + - and = symbols to create number sentences. 5 – 1 = 4 4 + 1 = 5 Missing number problems. 4 = □ - 1 5 = □ + 1 □ – 1 = 5 □ + 1 = 8	5 people were on a bus. 1 **more** person got on. How many people are there **altogether**? I have £6. My brother has £1 **less** than me. How much money does he have? Use the numbers 3 to 8. How many pairs can you find which have **difference** of 1?
Use addition as combining groups (aggregation).	Counting using familiar objects and resources.   1, 2, 3, 4  1, 2, 3 1, 2, 3, 4, 5, 6, 7	Drawing pictures  Bar models.  	Using number sentences and beginning to calculate mentally. 7 + 2 = 9 2 + 7 = 9 9 = 2 + 7 Missing number problems. 9 = □ + 5	I bought 5 sweets. My friend gave me 4 more. How many do I have in **total**?

Addition and subtraction

Addition as counting on (augmentation) .	Counting using familiar objects and resources.  	Counting on using a number line.  5 + 2 = 7 *'2 more than 5 is 7.'* Bar model comparisons. 	Using number sentences and beginning to calculate mentally by keeping a number in their head and counting on. 7 + 2 = 9 2 + 7 = 9 9 = 2 + 7 Missing number problems. 9 = □ + 5	How many different additions can find with a total of 9?
Doubling and halving numbers within 20 (as repeated addition and subtraction).	Using familiar objects and resources.     	Using a variety of models and images.    	Using number sentences and beginning to calculate mentally. 6 + 6 = Double 9 = 14 = Double … Half of 18 = … 10 = half of…. 7 = 14 - □ 4 + □ = 8	Class 1 has 8 girls. Class 2 has **double** the number of girls. How many girls are there in Class 2? How many **doubles** can you find which include the number 4? E.g. Double 4 = 8 Double 2 = 4 Double 7 = 14 etc.

Addition and subtraction

Add and subtract 1-digit and 2-digit numbers to 20, including 0	Using familiar objects and resources.  Addition facts   Subtraction facts	Using number lines.  Using bar models  Addition and subtraction facts 	Using number sentences and calculating mentally. 13 + 4 = 17 17 = 13 + 4 4 + 13 = 17 17 = 4 = 13 17 – 4 = 13 13 = 17 - 4 17 – 13 = 4 4 = 17 - 13 Missing number problems. 15 = □ + 6 18 - □ = 4	My sister is 17. My brother is 9. What is the **difference between** their ages? Class 1 collected £7 for charity. Class 2 collected £8. If they **put** their money **together**, how much would they have?
Represent and use number bonds and related subtraction facts within 20 to add and subtract 1-digit and 2-digit numbers to 20, including 0	Using familiar objects and resources. **Addition facts**  **Subtraction facts** 	Using number lines. Jumping in 1s  Jumping in 10s and units Using bar models 	Using number sentences and calculating mentally. 13 + 4 = 17 17 = 13 + 4 4 + 13 = 17 17 = 4 + 13 17 – 4 = 13 13 = 17 - 4 17 – 13 = 4 4 = 17 - 13 Missing number problems. 15 = □ + 6 18 - □ = 4	My foot is 19cm long. My friend's foot is 14cm long. **Calculate** the **difference** between the lengths. How many additions/ subtractions can you make with an even/odd answer? Which patterns can you see in the numbers you have used?

Addition and subtraction

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.

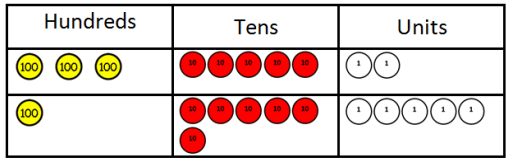
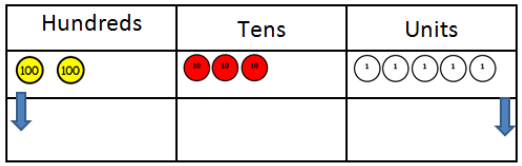
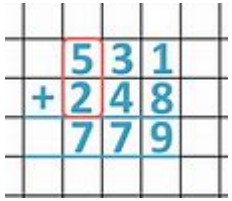
- At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. By the end of year 4, pupils should have learnt their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.

End of year expectations	Rapid recall	Mental calculation	Language	Using and applying
Year 3	Count from 0 in multiples of 4, 8, 50 and 100 Work out if a given number is greater or less than 10 or 100 Recognise the place value of each digit in a 3-digit number (hundreds, tens, and ones)	Add and subtract numbers mentally, including: • a 3-digit number and ones • a 3-digit number and tens • a 3-digit number and hundreds	Carry Exchange Compact Expanded Boundary Column	Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction Flo and Jim are answering a problem: Danny has read 62 pages of the class book, Jack has read 43. How many more pages has Danny read than Jack? Flo does the calculation 62 + 43. Jim does the calculation 62–43.

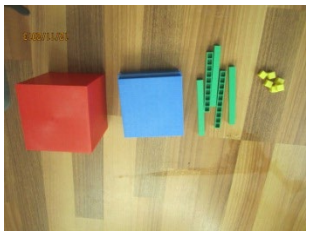
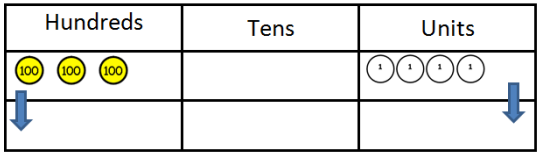
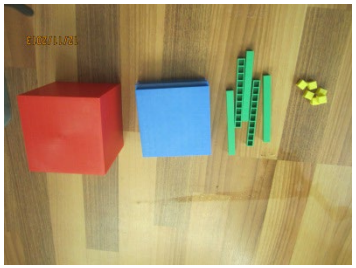
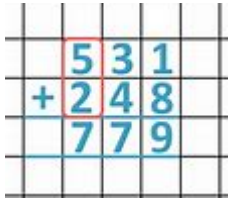
Addition and subtraction

Year 4	Count in multiples of 6, 7, 9, 25 and 1000 Count backwards through 0 to include negative numbers		Increase Decrease Tenths Hundredths	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate Solve addition and subtraction two-step problems in context, deciding which operations and methods to use and why Write three calculations where you would use mental calculation strategies and three where you apply a column method. **Explain the decision you made for each calculation**.

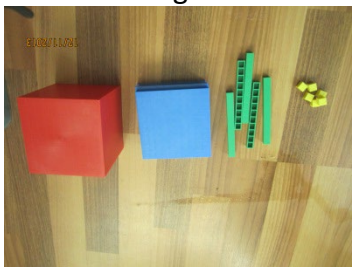
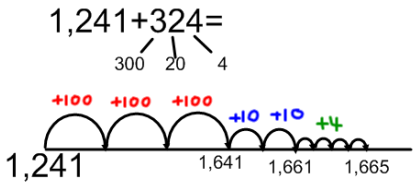
Addition and subtraction

Year 3:	Concrete	Pictorial	Conceptual applying	Using & applying
Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	 352 + 165 Combining the tens and exchanging for a 100.  235 – 83 (Move 83 down to show what's left – exchange a hundred for tens).	Children to draw deines, HTU grids and number lines to support their calculations, as above.	Expanded methods crossing tens ***or*** hundreds boundaries but ***not*** both. $300 + 50 + 2$ $+ \underline{100 + 60 + 5}$ $\underline{500 + 10 + 7} = 517$ 100 100 $\cancel{200} + 130 + 5$ $- \underline{\quad 80 + 3}$ $\underline{100 + 50 + 2} = 152$ Progression onto compact methods: 	Use the digits 1, 2, 3, 4 and 5. Make a 2 digit and a 3-digit number. Add them together. Find ways you can make 168, 483, 339. Use the digits 0, 1, 2, 3 and 4. Make a 3-digit number then reverse the digits. Add your two numbers. Repeat with other examples. What do you notice?

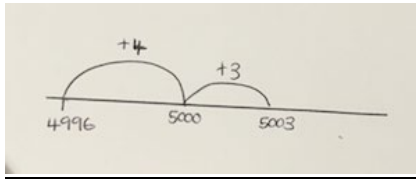
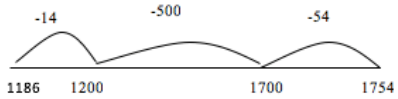
Addition and subtraction

HTU ± HTU Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	Follow methods shown in Year 3 using apparatus to cross both boundaries. E.g. 438 + 385 = 624 – 257 = 	Children to draw deines, HTU grids and number lines to support their calculations.	Expanded column methods.	My book has 426 pages. I am on page 137. How many more pages do I have to read until I am half way through my book?
TU - HTU Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	 304 – 137 (Move 137 down to show what's left – exchange a hundred for tens; then exchange a ten for units). 	Children to draw deines, HTU grids and number lines to support their calculations. (as above).	Expanded column method 200 90 ~~300~~ + ~~100~~ + 14 - 100 + 30 + 7 100 + 60 + 7 = 167 Progression onto column methods: 	Use the digits 2 to 8 and make two 3-digit numbers. Find the difference. How many pairs of numbers can you find where the difference is: a 3-digit number with consecutive digits? e.g. 572 – 449 = 123

Addition and subtraction

Year 4	Concrete	Pictorial	Conceptual	Using and applying
Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate	Follow process shown in Year 3. • Addition crossing one boundary. • Addition crossing more than one boundary. • Subtraction with exchanging through one boundary. • Subtraction with exchanging through more than one boundary. • Subtraction with exchanging through zero. 	<u>Addition</u> Children to draw deines, ThHTU grids and number lines to support their calculations. E.g. 	<u>Addition</u> <u>Horizontal Expansion</u> 1367 + 1185 = 552 1000 + 300 + 60 + 7 <u>1000 + 100 + 80 + 5</u> 2000 + 400 +140 +12 =2544 **<u>By the end of year 4, children should be using a formal written method for addition.</u>** 1367 + 236 = 1367 + 236 1603 11 ***It is crucial to know or be able to derive key number facts TU + TU mentally or with jottings before progressing.*** <u>Missing numbers.</u> 1352 + 165 = □ □ + 2265 = 3517 3522 + □ = 5517	I walked 1360m, 2764m and then 2188m. How much further do I have to walk until I have travelled 7 km? Use the following numbers: 2, 2, 3, 4, 4, 5, 7, 7, 8, 8 and 9. Make a pair of 4-digit numbers with a difference of: 1, 10, 100, 1000. How many ways can you do it?

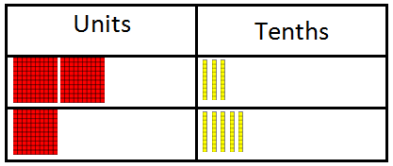
Addition and subtraction

		<u>Subtraction</u> **<u>Counting on when finding a small difference</u>** e.g. 5003 – 4996 = 7  <u>Counting back to subtract</u> Use of number facts to count back to find the difference. 1754 – 568 = 1186  For those children with a secure mental image of the number line they could record the jumps only.	<u>Subtraction</u> <u>Expanded decomposition</u> 252 – 114 = 40 12 200 + ~~50~~ + ~~2~~ -(100 + 10 + 4) 100 + 30 + 8 Partitioning each number and working from right to left, subtracting the bottom number from the top. Where the subtraction is not possible i.e. 2 – 4 can't be done, the next value is "REPARTITIONED". So, "repartition 50 + 2 into 40 + 12". It is important to cross out the whole number and replace completely. Do NOT put a 'one in the air'! (It is not a 1, it is a 10.) Then repeat the subtraction <u>Compact decomposition</u> 6 14 4 ~~7~~ ~~5~~ 14 - 3 2 8 6 1 4 6 8 It is still vital that the correct language of place value is used. The tens are REPARTITIONED (not "'borrow' a 1" and it is not "7 takeaway 2" but "700 takeaway/subtract/ minus 200").	

Addition and subtraction

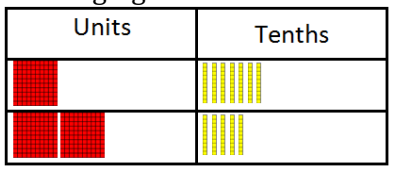
U.t ± U.t

Addition without crossing boundaries:



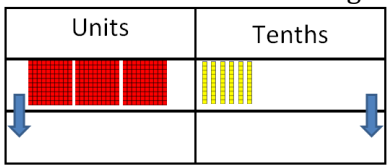
2.3 + 1.5

Exchanging tenths for a new unit:



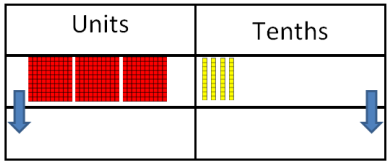
1.7 + 2.5

Subtraction without crossing boundaries:



3.6 – 2.1 (Move 2.1 down to show what's left).

Exchanging a unit for tenths.

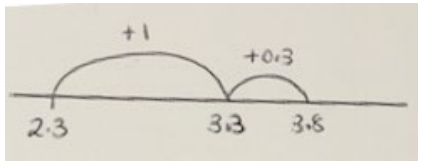


3.4 – 1.7 (Move 1.7 down to show what's left).

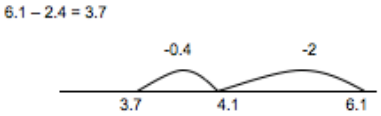
<u>Number line for addition and subtraction</u>

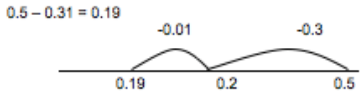
<u>Use known number facts and place value to add</u>

2.3 + 1.5 = 3.8



<u>Use known number facts and place value to subtract.</u>





N.B. Please refer to the end of year expectation for the size and range of numbers to be using e.g. ThHTU, decimals, etc.

Expanded methods.

2.3 + 1.5 =

$$\begin{array}{r} 2 + 0.3 \\ +\ 1 + 0.5 \\ \hline 3 + 0.8 \end{array} = 3.8$$

$$\begin{array}{r} 3 + 0.6 \\ -\ 2 + 0.1 \\ \hline 1 + 0.5 \end{array} = 1.5$$

$$\begin{array}{r} 2 \quad 1.4 \\ \cancel{3} + \cancel{0.4} \\ -\ 1 + 0.7 \\ \hline 1 + 0.7 \end{array} = 1.7$$

Compact column methods.

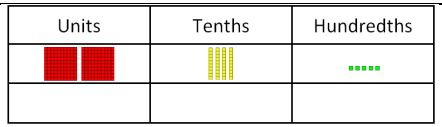
$$\begin{array}{r} 2.3 \\ +\ 1.5 \\ \hline 3.8 \end{array} \qquad \begin{array}{r} 1.7 \\ +\ 2.5 \\ \hline 4.2 \\ 1 \end{array}$$

$$\begin{array}{r} 3.6 \\ -2.1 \\ \hline 1.5 \end{array} \qquad \begin{array}{r} 2 \\ \cancel{3}.14 \\ -1.7 \\ \hline 1.7 \end{array}$$

I ran across the playground in 9.4 seconds. My brother was 1.5 seconds faster than me. My sister was 2.7 seconds slower than my brother. How long did my sister take to run across the playground?

Use the digits 0 to 9. Make two decimals (units and tenths). Add them together. How many pairs can you make with a total of 10?

Addition and subtraction

U.th ± U.th	 Develop process shown in U.t ± U.t • Addition crossing one boundary. • Addition crossing more than one boundary. • Subtraction with exchanging through one boundary. • Subtraction with exchanging through more than one boundary. • Subtraction with exchanging through zero.	**Number line.**	Expanded methods to develop concepts of place value with hundredths. Compact column methods as above.	Any 2 books cost £8.00 in a sale. The price of my books would have been £3.89 and £5.75 before the sale. How much money did I save by buying the books in the sale? Use the digits 1 to 9. Make 3 decimals (units tenths and hundredths) and subtract them from 20. What's the closest answer to zero you can make?

Addition and subtraction

Upper Key Stage 2:

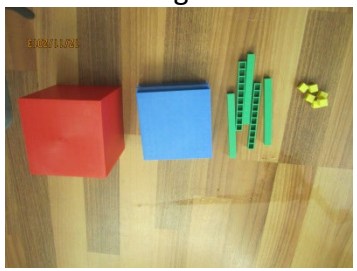
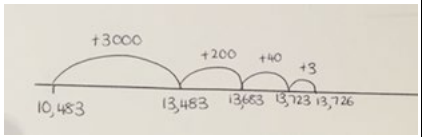
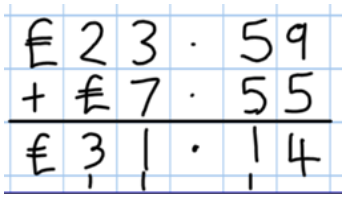
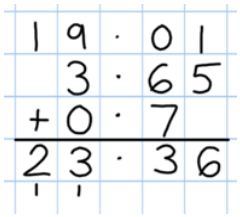
- The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.

- At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems.

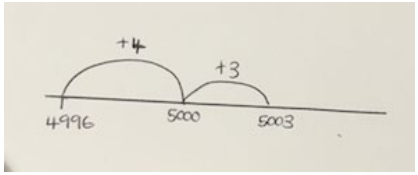
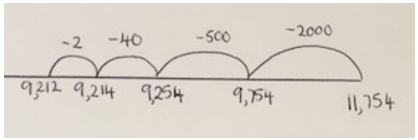
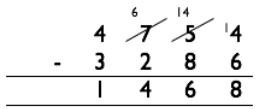
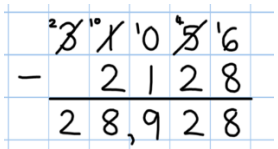
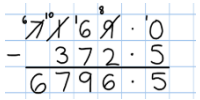
- By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.

End of year expectations	Rapid recall	Mental calculation	Language	Using and applying
Year 5	All times tables up to 12 x 12	Add and subtract numbers mentally with increasingly large numbers (e.g. 12 462 – 2300 = 10 162) Rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.	Thousandths	Solve problems involving numbers up to three decimal places *(Taken from Y5 Fractions, Decimals and Percentages)*
Year 6	All times tables up to 12 x 12			Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

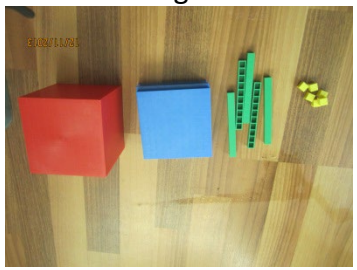
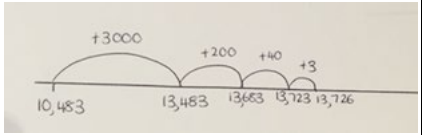
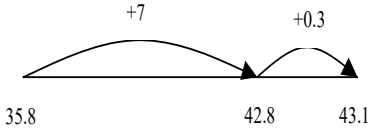
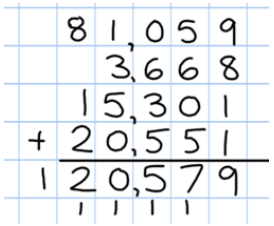
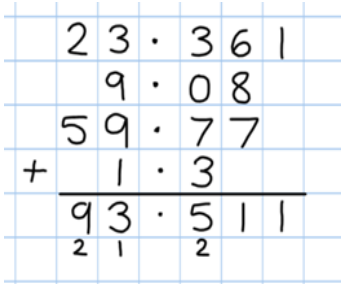
Addition and subtraction

Year 5	Concrete	Pictorial	Conceptual	Using and applying
Add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)	Follow process shown in Year 3 & 4. • Addition crossing one boundary. • Addition crossing more than one boundary. • Subtraction with exchanging through one boundary. • Subtraction with exchanging through more than one boundary. • Subtraction with exchanging through zero. 	Addition Number line 10,483 + 3,243 = 	Addition Formal written method. 10,483 + 3243 = 10483 + 3243 13726 11 Revert to horizontal expansion methods if the children experience any difficulty – refer to year 4. Missing numbers. 12,352 + 3,165 = □ □ + 2,265 = 12,517 3,522 + □ = 15,517 Addition of money and decimals.  	I travelled to 3 different cities. The distances of my journeys were: 1982 m, 15642 m and 12108m. What was the total distance travelled in metres? How far did I travel in km? Use the digits 3, 4, 6 and 7. Make a 4-digit number and subtract it from 10,000. What are the largest and smallest answers? Which answer is closest to 5000? Find the digital roots of your answers. What do you notice?

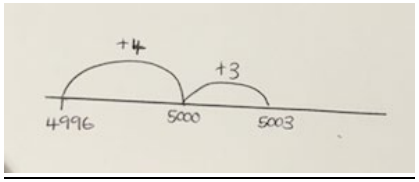
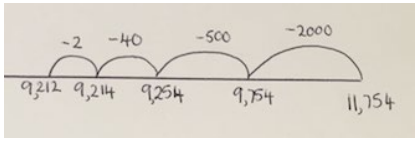
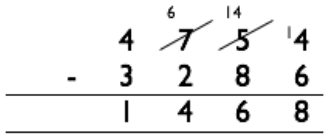
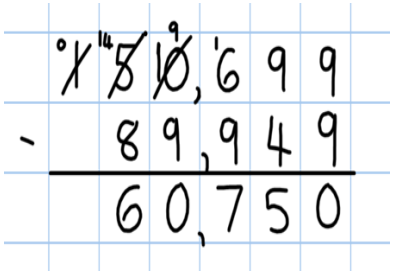
Addition and subtraction

		Subtraction **Counting on when finding a small difference** e.g. 5003 – 4996 = 7  Counting back to subtract Use of number facts to count back to find the difference. 11,754 – 2,542 = 9,212  	Subtraction Compact decomposition  **It is still vital that the correct language of place value is used. The tens are REPARTITIONED (not "'borrow' a 1" and it is not "7 takeaway 2" but "700 takeaway/subtract/ minus 200").**  Revert to expanded decomposition methods if the children experience any difficulty – refer to year 4. Missing numbers. 1352 - 165 = □ □ - 2265 = 1517 3522 - □ = 1517 Subtraction of decimals.  	Use the digits 0 to 7. Make two decimals (units, tenths, hundredths and thousandths). Add them and find the nearest whole number to your answer. How many totals can you find where the nearest whole numbers is…4, 5, 12? Etc.

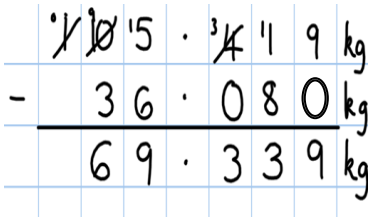
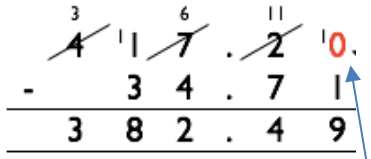
Addition and subtraction

Year 6	Concrete	Pictorial	Conceptual	Using and applying
Continue to add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)	Follow process shown in Year 3 & 4. • Addition crossing one boundary. • Addition crossing more than one boundary. • Subtraction with exchanging through one boundary. • Subtraction with exchanging through more than one boundary. • Subtraction with exchanging through zero. 	Addition Number line 10,483 + 3,243 =  **Partition into hundreds, tens, ones and decimal fractions and recombine** Either partition both numbers and recombine or partition the second number only e.g. 35.8 + 7.3 = 35.8 + 7 + 0.3 = 42.8 + 0.3 = 43.1  Subtraction **Counting on when finding a small difference** e.g. 5003 – 4996 = 7	Addition Formal written method.  Revert to horizontal expansion methods if the children experience any difficulty – refer to year 4. Missing numbers. 12,352 + 3,165 = □ □ + 2,265 = 12,517 3,522 + □ = 15,517 Addition of money and decimals. 	I travelled to 3 different cities. The distances of my journeys were: 1982 m, 15642 m and 12108m. What was the total distance travelled in metres? How far did I travel in km? My friend travelled 31.9km, how much further did he travel than me?

Addition and subtraction

		 <u>Counting back to subtract</u> Use of number facts to count back to find the difference. 11,754 – 2,542 = 9,212 	<u>Subtraction</u> <u>Compact decomposition</u>  **It is still vital that the correct language of place value is used. The tens are REPARTITIONED (not "'borrow' a 1" and it is not "7 takeaway 2" but "700 takeaway/subtract/ minus 200").**  Revert to expanded decomposition methods if the children experience any difficulty – refer to year 4.	Use the digits 3, 4, 6 and 7. Make a 4 digit number and subtract it from 10,000. What are the largest and smallest answers? Which answer is closest to 5000? Find the digital roots of your answers. What do you notice? Use the digits 1 to 9. Make a 4 digit and a 5 digit number. Find the difference. Which pairs of numbers give you an answer closest to…80000, 75000, 70000 etc?

Addition and subtraction

			Missing numbers. 1352 - 165 = □ □ - 2265 = 1517 3522 - □ = 1517 Subtraction of decimals.   When subtracting decimals with different numbers of decimal places, children should be taught and encouraged to make them the same through identification that 2 tenths is the same value as 0.20.	Use the digits 1 to 9. Make 2 decimals (unit, tenths, hundredths and thousandths). Find the difference. How many differences can you find which equal 1.234?

Addition and subtraction