This policy belongs to

Tibberton CE Primary School

Part of the Tibberton CE Primary School and St Lawrence Primary School Federation

Calculation Policy

Revised: Spring Term 2023

Consultation with Staff & Governors

and adoption of policy: Spring Term 2023

Review Date: Autumn Term 2024

Intent

At Tibberton CE Primary we want children to think mathematically and develop mathematical language and reasoning so that they become lifelong mathematicians, equipped for the life ahead of them. Instead of learning mathematical principles as a process, we want pupils to develop a deep conceptual understanding, which will enable them to apply appropriate strategies in different situations and problem solve.

We desire our pupils develop a love for maths and a passion for approaching mathematical problems in the real world strategically and with creativity.

A vital part of conceptual understanding in maths is the use of concrete, pictorial and abstract representations. Throughout the school children are given many opportunities to use these representations and talk about them mathematically.

Implementation

The maths curriculum at Tibberton is cumulative. Practitioners use curriculum maps covering the full national curriculum to inform their planning within each cohort. We use the White Rose scheme of work as a vehicle for our planning. Resources are then adapted to meet the needs of learners in each class ensuring suitable support and challenge is always present.

Lessons are divided into three distinct segments:

- Instructional - effective modelling of the mathematical concept to secure fluency, technical vocabulary and notation.
- Qualifying - an emphasis on learning through practice, with regular opportunities for pupils to talk both individually and in groups.
- Thinking Deeply - an expectation that pupils will accept responsibility for their own learning and work independently.

Across the school, learners are asked to tackle a different problem-solving strand every half-term - this is the same for each year group so that we can monitor progression of skills

Impact

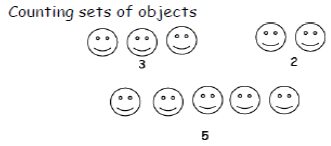
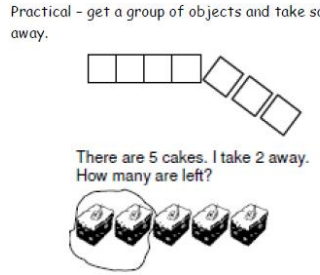
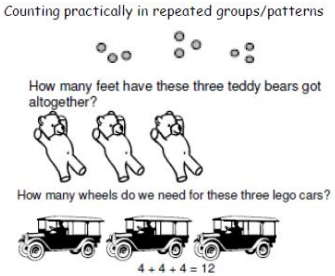
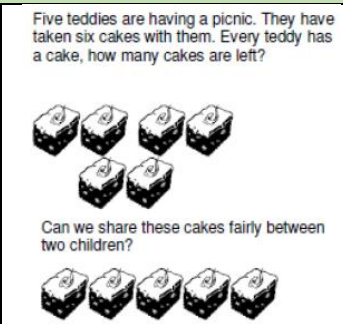
Our curriculum is carefully designed to give children the self-belief, knowledge and skills to be successful mathematicians. We measure the impact of the curriculum through the following methods:

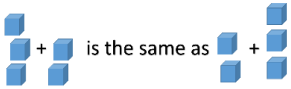
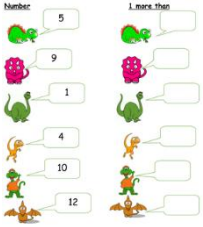
- Pupil book study and discussion about their learning.
- Standardised tests at the end of each term and national statutory testing.

By the time children leave Tibberton we want them to:

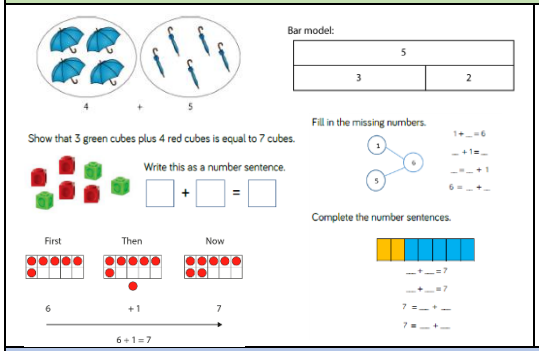
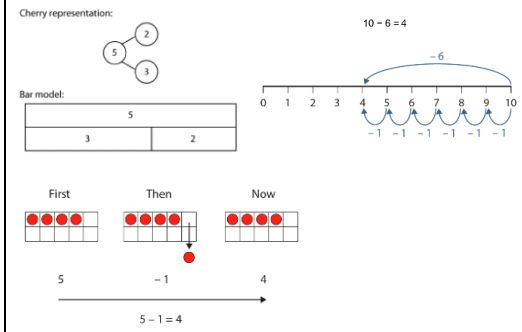
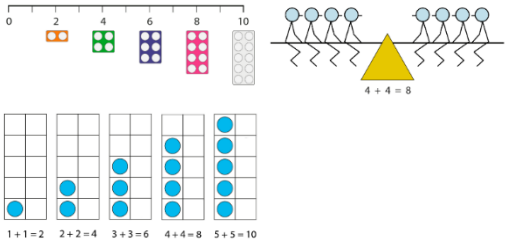
- Become fluent in the fundamentals of mathematics, including varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- Reason mathematically by following a line of enquiry, make conjectures, discover relationships and make generalisations, justify and prove using mathematical language.
- Solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

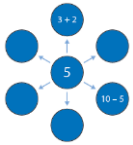
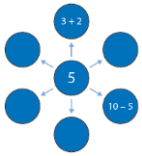
Foundation Stage (Reception)

Addition	Subtraction	Multiplication	Division
✓ Counts objects to 10, and beginning to count beyond 10. ✓ Selects the correct numeral to represent 1 to 10 objects. ✓ Counts an irregular arrangement of up to ten objects. ✓ Estimates how many objects they can see and checks by counting them. ✓ Uses the language of 'more' to compare two sets of objects. ✓ Finds the total number of items in two groups by counting all of them. ✓ Says the number that is one more than a given number. ✓ Begin to combine two sets of objects using concrete manipulatives.	✓ Know that the number gets smaller because objects have been removed. ✓ Uses the language of 'more' and 'fewer' to compare two sets of objects. ✓ Counts backwards on fingers, orally or on number lines. ✓ Begin to use manipulatives to show that subtraction is removing objects from a set. ✓ Finds one more or one less from a group of up to five objects, then ten objects. ✓ In practical activities and discussion, beginning to use the vocabulary involved in subtracting.	✓ Jumping along a number line in steps of 1, 2, 5 and 10. ✓ Repeated addition skills shown. ✓ Know how many groups of 2 there are when shown manipulative sets.	✓ Jumping back using a number line in 1, 2, 5 and 10. ✓ Understanding what halving is. ✓ Sharing manipulatives into equal groups.
What Expected Looks Like			
			
Greater Depth			
✓ Children count reliably with numbers from 1 to 20, place them in order and say which number is one more than a given number. ✓ Using quantities and objects, they add two single-digit numbers and count on to find the answer. ✓ Understanding and talking about the number getting bigger when you add. ✓ Addition is commutative.	✓ Children count reliably with numbers from 1 to 20, place them in order and say which number is one less than a given number. ✓ Using quantities and objects, they subtract two single-digit numbers and count back to find the answer. ✓ Know that the number gets smaller when you 'take away' or subtract. ✓ Verbalise subtraction sentences.	✓ They solve problems, including doubling. ✓ Count objects aloud in 2s, 5s and 10s.	✓ They solve problems, including halving and sharing. ✓ Share objects aloud in 2s, 5s and 10s.

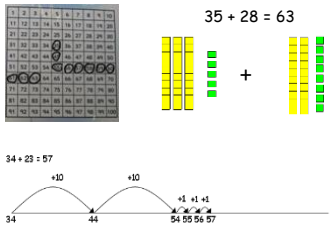
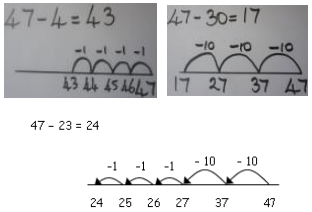
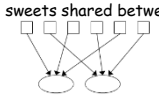
What Greater Depth Looks Like			
 + is the same as + 		If a ladybird has 4 spots on one side and 4 spots on the other side, how many does she have in total? Double 4. 	April made 6 cupcakes and ate half of them. How many did she eat? How many did she have left? Can you draw a picture of the cupcakes April had left? 

Year 1

Addition	Subtraction	Multiplication	Division
✓ Recall addition facts up to 5. ✓ Represent and use number bonds within 10 and 20. ✓ Identify near doubles using doubles already known. ✓ Understand the operation of addition; recognise that addition can be done in any order. ✓ Read, write and interpret mathematical statements involving addition (+) and equals (=) signs. ✓ Add a single digit number to a 2-digit number. ✓ Bridge through 10 and 20 when adding single-digit numbers. ✓ Solve one-step problems that involve and missing number problems such as __ + 6 = 14	✓ Recall subtraction facts up to 5. Represent and use number bonds and related subtraction facts within 10 and 20. ✓ Subtract a single digit number from a 2-digit number. ✓ Read, write and interpret mathematical statements involving subtraction (-) and equals (=) signs. ✓ Solve one-step problems that involve and missing number problems such as ✓ 12 - __ = 5	✓ Recall addition doubles up to 5 + 5. ✓ Understand the x sign. ✓ Count forwards up to 100 in 2s, 5s and 10s. ✓ Solve one-step times tables problems up to 20 (manipulatives).	✓ Understand the ÷ sign. ✓ Count backwards in 2s, 5s and 10s from any number. ✓ Solve one-step division/halving problems up to 20 (manipulatives).
Examples of ARE			
			**If one teddy has two apples, how many apples will three teddies have?** **Here are 10 lego people If 2 people fit into the train carriage, how many carriages do we need?** **How else could 20 sweets be put into bags so that every bag had the same number of sweets?** **How many bags would be packed each time?**
Greater Depth			
✓ Partition into 5 and a bit when adding 6, 7, 8, or 9. ✓ Add 9 to a single–digit number by adding 10 then subtracting 1. ✓ Add 3 single digits up to 20. ✓ Begin to recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems. ✓ Choose and use the appropriate number operation (counting, add, subtract) and mental strategies to solve simple money or 'real life' problems. ✓ Solve one-step problems that involve addition up to 100 (manipulatives). ✓ Solve missing number problems up to 100 (manipulatives).	✓ Begin to recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems. ✓ Choose and use the appropriate number operation (counting, add, subtract) and mental strategies to solve simple money or 'real life' problems. ✓ Solve one-step problems that involve and missing number problems such as 7 = __ - 9 ✓ Solve one-step problems that involve subtraction from up to 100 (manipulatives). ✓ Solve missing number problems up to 100 (manipulatives).	✓ Counting in steps of equal sizes and treating a group of, for example, five objects as one unit of five. ✓ Understanding the commutative property of multiplication, that 2 × 5 is equivalent to 5 × 2.	✓ Solve division problems that require grouping into different sets.

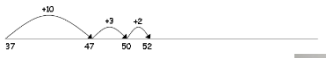
Examples of Greater Depth			
 2 + 4 = 6 4 + 2 = 6 2 + 4 = 4 + 2 		'I can double any number, but I can only halve some numbers'. Do you agree?  4 + 4 = 8 8 – 4 = 4	Captain Conjecture says, 'I can double any number, but I can only halve some numbers'. Do you agree? Explain your reasoning. If you counted back from 50 in tens, would you say 0? Can you explain? How else could 20 sweets be put into bags so that every bag had the same number of sweets? How many bags would be packed each time?

Year 2

Addition	Subtraction	Multiplication	Division
✓ Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100. ✓ Show that the addition of two numbers can be done in any order (commutative). ✓ Add numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s; a 2-digit number and 10s; two 2-digit numbers; adding three 1 digit numbers. ✓ Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems. ✓ Solve addition problems using concrete objects and pictorial representations, including those involving numbers, quantities and measures; applying their increasing knowledge of mental and written methods. ✓ Understand that sum and total indicate addition. ✓ Check addition calculations by adding in a different order or using subtraction (inverse).	✓ Subtraction of one number from another cannot be commutative. ✓ Subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s; a 2-digit number and 10s; two 2-digit numbers; adding three 1 digit numbers. ✓ Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems. ✓ Solve subtraction problems using concrete objects and pictorial representations, including those involving numbers, quantities and measures; applying their increasing knowledge of mental and written methods. ✓ Understand that difference indicates subtraction. ✓ Check subtraction calculations using addition calculations (inverse).	✓ Recall and use multiplication facts for the 2, 5 and 10 times tables. ✓ Recognise odd and even numbers. ✓ Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (x) and equals (=) sign. ✓ Solve problems involving multiplication using materials, arrays, repeated addition, mental methods and multiplication facts, including problems in contexts. ✓ Calculate mentally using multiplication facts for the 2, 5 and 10 multiplication tables.	✓ Recall and use division facts for the 2, 5 and 10 times tables. ✓ Recognise odd and even numbers. ✓ Calculate mathematical statements for division within the multiplication tables and write them using the division (÷) and equals (=) sign. ✓ Solve problems involving division, using materials, arrays, repeated addition, sharing, mental methods and division facts, including problems in contexts. ✓ Calculate mentally using multiplication and division facts for the 2, 5 and 10 multiplication tables.
Examples of ARE			
			Children should have experience of scaling. Exploring concepts such as 'This is twice as long as/ half as long as/ 3 times as tall as'.  6 sweets shared between 2 people, how many do they each get? 
Greater Depth			
✓ Use the inverse relationship between addition and subtraction to solve missing number problems. ✓ Recall addition facts to 20 fluently, deriving related facts to 100. ✓ When adding three or more numbers it is helpful to look for pairs of numbers that are easy to add. For example, given 5 + 8 + 2 it is easier to add 8 + 2 first than to begin with 5 + 8. ✓ Children should have an understanding of calculations with similar digits. For example, 2 + 5 = 7 so 20 + 50 = 70.	✓ Use the inverse relationship between addition and subtraction to solve missing number problems. ✓ Recall subtraction facts to 20 fluently, deriving related facts to 100. ✓ When subtracting tricky numbers, children should use their number bond knowledge to simplify this. For example, 63 – 27 = 50 – 20 and 13 – 7 = 36. ✓ Children should have an understanding of calculations with similar digits. For example, 8 - 5 = 3 so 80 - 50 = 30.	✓ Show that the multiplication of two numbers can be done in any order (commutative). ✓ Use a variety of language to describe multiplication.	✓ Show that the division of one number by another is not commutative. ✓ Use a variety of language to describe division.

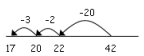
Examples of Greater Depth

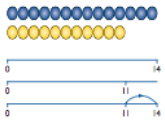
37 + 15 = 52



23 + 34 = 57
20 + 30 = 50
3 + 4 = 7
50 + 7 = 57

42 – 25 = 17





The difference between 11 and 14 is 3.
14 – 11 = 3
11 + □ = 14

Find different ways to find the answer to 12 × 4.

Write these addition sentences as multiplication sentences.

10 + 10 + 10 + 5 + 5 =
2 + 2 + 2 + 4 =
2 + 2 + 4 + 4 =
5 + 5 + 5 + 2 + 3=

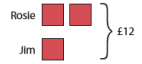
True or false?

5 × 4 = 4 × 5
5 × 4 = 10 × 2
5 × 4 = 2 × 10

Explain your reasoning.

What do you notice?

Together Rosie and Jim have £12.
Rosie has twice as much as Jim.
How much does Jim have?
The bar model can be helpful in solving these types of problems.



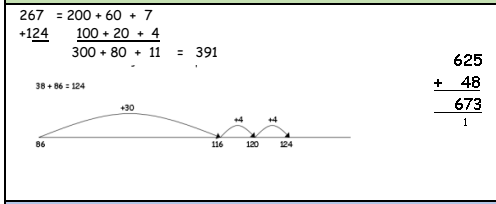
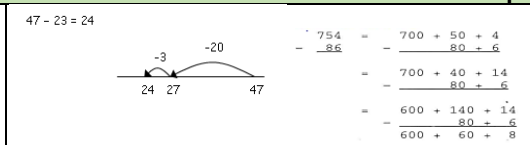
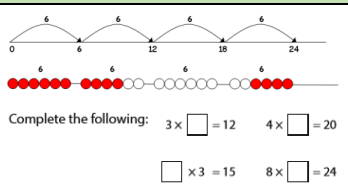
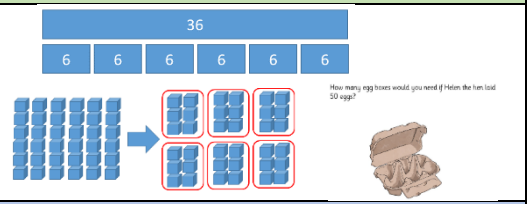
12 ÷ 3 = 4
Jim has £4

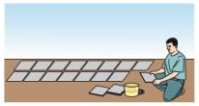
Two friends want to buy some marbles and then share them out equally between them.
They could buy a bag of 13 marbles, a bag of 14 marbles or a bag of 19 marbles.
What size bag should they buy so that they can share them equally?

What other numbers of marbles could be shared equally?

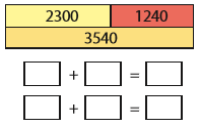
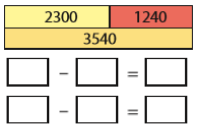
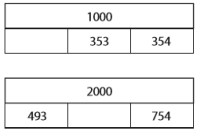
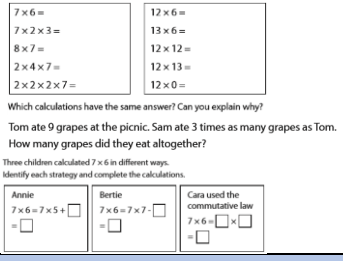
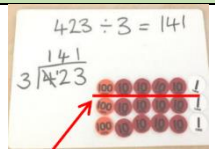
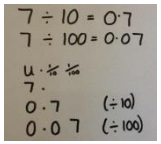
Explain your reasoning.

Year 3

Addition	Subtraction	Multiplication	Division
✓ 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. ✓ Solve problems, including missing number problems, using number facts, place value, and more complex addition. ✓ Add amounts of money to give change, using both £ and p in practical contexts. ✓ Use understanding of place value and partitioning to develop methods for addition with larger numbers. ✓ Understand the structure of situations that require addition. ✓ Continue to use addition facts to 20 and derive related facts up to 100. ✓ Count from 0 in multiples of 100 ✓ Find 10 or 100 more or less than a given number ✓ Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) ✓ Read and write numbers up to 1000 in numerals and in words	✓ Subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three digit number and hundreds. ✓ Subtract numbers with up to three digits, using formal written methods of columnar subtraction. ✓ Solve problems, including missing number problems, using number facts, place value, and more complex subtraction. ✓ Subtract amounts of money to give change, using both £ and p in practical contexts. ✓ Use understanding of place value and partitioning to develop methods for subtraction with larger numbers. ✓	✓ Recall and use multiplication facts for the 3, 4 and 8 multiplication tables. ✓ Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (x) and equals (=) signs. ✓ Solve problems involving multiplication using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in context. ✓ Show that multiplication of two numbers can be done in any order (commutative). ✓ Solve problems including missing number problems involving multiplication and positive integer scaling problems. ✓ Write and calculate mathematical statements for multiplication using the multiplication tables they know, including for two-digit numbers times one-digit numbers, using mental methods and progressing to formal written methods. ✓ Develop recall of number facts linking addition and multiplication. ✓ Count from 0 in multiples of 4, 8 and 50.	✓ Recall and use division facts for the 3, 4 and 8 multiplication tables. ✓ Calculate mathematical statements for division within the multiplication tables and write them using the division (÷) and equals (=) signs. ✓ Solve problems involving division, using materials, arrays, repeated addition, mental methods, and division facts, including problems in context. ✓ Solve problems including missing number problems involving division. ✓ Write and calculate mathematical statements for division using the multiplication tables they know, including for two-digit numbers times one-digit numbers, using mental methods and progressing to formal written methods.
Examples of ARE			
			
Greater Depth			
✓ Check addition calculations using subtraction and addition and subtraction calculations using rounding (*) ✓ Estimate the answer to a calculation and use inverse operations to check answers.	✓ Understand the structure of situations that require subtraction. ✓ Check addition calculations using subtraction and addition and subtraction calculations using rounding (*) ✓ Estimate the answer to a calculation and use inverse operations to check answers.	✓ Understand the structure of situations that require multiplication.	✓ Show that division of one number by another cannot be commutative.

Examples of Greater Depth			
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. Who is correct? Explain how you know. Sophie has five coins in her pocket. How much money might she have? What is the greatest amount she can have? What is the least amount she can have? If all the coins are different: What is the greatest amount she can have? What is the least amount she can have? ☐☐☐ + ☐☐☐ = Throw a 1 to 6 dice and each time record the digit in one of the place holders. The aim is to get the sum as low as possible. Repeat to find different answers. Could you have done it in a different way?	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. Who is correct? Explain how you know. Sophie has five coins in her pocket. How much money might she have? What is the greatest amount she can have? What is the least amount she can have? If all the coins are different: What is the greatest amount she can have? What is the least amount she can have?	 Roger has 96 patio slabs. Using all of the slabs find three different ways that he can arrange the slabs to form a rectangular patio. ☐☐ × ☐ = ? Putting the digits 1, 2 and 3 in the empty boxes, how many different calculations can you make? Which one gives the largest answer? Which one gives the smallest answer? Find the missing digits. 2☐ × 8 = 176 2☐ × ☐ = 112 1☐4 × ☐ = 736	Sam is planting onions in the vegetable plot in his garden. He arranges the onions into rows of 4 and has two left over. He then arranges them into rows of 3 and has none left over. How many onions might he have had? Explain your reasoning.

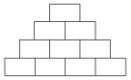
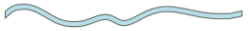
Year 4

Addition	Subtraction	Multiplication	Division
✓ 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 two step problems in contexts, deciding which operations and methods to use and why. ✓ Find 1000 more than a given number ✓ Count in multiples of 1000; through zero to include negative numbers ✓ Recognise the place value of each digit in a four digit number (thousands, hundreds, tens, ones) ✓ Identify, represent and estimate numbers to 10 000 using different representations ✓ Round whole numbers to 10,000 to the nearest 10, 100 or 1000 ✓ Understand the inverse relationship between addition and subtraction ✓ Use commutativity in mental calculations ✓ Use factor pairs in mental calculations ✓ Mentally add pairs of three-digit and four digit numbers ✓ Use addition facts to 100 and derive related facts up to 1000	✓ 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 subtraction two step problems in contexts, deciding which operations and methods to use and why. ✓ Find 1000 less than a given number ✓ Count in multiples of 1000; count backwards through zero to include negative numbers ✓ Recognise the place value of each digit in a four digit ✓ Understand the inverse relationship between addition and subtraction ✓ Use factor pairs in mental calculations ✓ Mentally subtract pairs of three-digit and four digit numbers ✓ Use subtraction facts to 100 and derive related facts up to 1000	✓ Recall and use multiplication facts for multiplication tables up to 12 x 12. ✓ Use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers. ✓ Recognise and use factor pairs and commutatively in mental calculations. ✓ Multiply two digit and three digit numbers by a one digit number using formal written layout. ✓ Count in multiples of 6, 7, 9 and 25. ✓ Use the distributive law to multiply two digit numbers by one digit ✓ Recognise factor pairs. ✓ Check answers to multiplication and division calculations using rounding	✓ Recall and use division facts for multiplication tables up to 12 x 12. ✓ Use place value, known and derived facts to divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers. ✓ Recognise factor pairs. ✓ Divide two digit and three-digit numbers by a one digit number using formal written layout ✓ Check answers to multiplication and division calculations using rounding
Examples of ARE			
 352 + ☐ = 480 70 + 99 + ☐ = 270 Fill in the empty boxes to make the equations correct. 7☐1+☐3☐ = 999 7☐1+☐3☐ = 1000	  ☐ – 55 = 84 ☐ – 3000 = 600		 
Greater Depth			
✓ Solve problems involving multiplying and adding ✓ Check answers to addition and subtraction calculations by estimating and using inverse operations ✓ Solve calculation problems involving two-step addition and subtraction in context, deciding which operations to use and why	✓ Check answers to addition and subtraction calculations by estimating and using inverse operations	✓ Check answers to multiplication and division calculations using rounding	✓ Check answers to multiplication and division calculations using rounding

Examples of Greater Depth			
Find the missing numbers. What do you notice? Make 9999 5000 + ☐ = 9999 4000 + ☐ = 9999 3000 + ☐ = 9999 2000 + ☐ = 9999 1000 + ☐ = 9999 Complete this diagram so that the three numbers in each row and column add up to 140.  Now create your own diagram with a total of 250.	5☐28 – 44☐ = 4788 ☐☐☐0 – 2468 = 5092 1023 + 24 + 24 ◯ 1023 + 48 1232 – 232 ◯ 1355 – 252 1237 – 68 + 32 ◯ 1242 – 69 + 31 Write > < or = to make each number sentence correct.	True or false? 7 × 6 = 7 × 3 × 2 7 × 6 = 7 × 3 + 3 Explain your reasoning.  Sally has 9 times as many football cards as Sam. Together they have 150 cards. How many more cards does Sally have than Sam?	8 girls share 6 bars of chocolate equally. 12 boys share 9 bars of chocolate equally. Clare says each girl got more to eat as there were fewer of them. Rob says each boy got more to eat as they had more chocolate to share. Explain why Clare and Rob are both wrong.

Year 5

Addition	Subtraction	Multiplication	Division
✓ Read, write, order and compare numbers to at least 1000000 and determine the value of each digit. ✓ Count forwards or backwards in steps of powers of 10 for any given number up to 1000000. ✓ Interpret negative numbers in context, count forwards with positive and negative whole numbers including through zero. ✓ Round any number up to 1000000 to the nearest 10, 100, 1000, 10000 and 100000 ✓ Add mentally with increasingly large numbers. ✓ Add whole numbers with more than 4 digits, including using formal written methods (columnar addition) ✓ Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. ✓ Count forwards with positive and negative whole numbers, including through zero ✓ Order and compare numbers to at least 1 000 000	✓ Count forwards or backwards in steps of powers of 10 for any given number up to 1000000. ✓ Round any number up to 1000000 to the nearest 10, 100, 1000, 10000 and 100000 ✓ Subtract mentally with increasingly large numbers. ✓ Subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction) ✓ Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. ✓ Count backwards with positive and negative whole numbers, including through zero ✓ Order and compare numbers to at least 1 000 000 ✓ Continue to develop knowledge of subtraction facts and to derive related facts	✓ Multiply numbers up to 4 digits by a one- or two digit number using a formal written method, including both compact and long multiplication for two-digit numbers ✓ Multiply numbers mentally drawing upon known facts. ✓ Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. ✓ Recognise and use square numbers and cube numbers and the notation for squared (2) and cubed (3) ✓ Solve problems involving multiplication including using their knowledge of factors and multiples, squares and cubes. ✓ Solve problems involving addition and subtraction, multiplication and division and a combination of these, including understanding the use of the equals sign. ✓ Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers. ✓ Establish whether a number up to 100 is prime and recall prime numbers up to 19. ✓ Continue to count in any multiples of 2 to 10, 25 and 50 ✓ Continue to use the distributive law to partition numbers when multiplying them ✓ Multiply whole numbers and those involving decimals by 10, 100 and 1000 ✓ Identify multiples and factors, including all factor pairs of a number, and common factors of 2 numbers	✓ Divide numbers up to 4 digits by a one-digit number using formal written method of short division and interpret remainders appropriately for the context ✓ Divide numbers up to 4 digits by a one digit number using the formal written method of short division and interpret remainders appropriately for the context. ✓ Divide numbers mentally drawing upon known facts. ✓ Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. ✓ Recognise and use square numbers and cube numbers and the notation for squared (2) and cubed (3) ✓ Solve problems involving division including using their knowledge of factors and multiples, squares and cubes. ✓ Solve problems involving addition and subtraction, multiplication and division and a combination of these, including understanding the use of the equals sign. ✓ Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers. ✓ Establish whether a number up to 100 is prime and recall prime numbers up to 19. ✓ Continue to count in any multiples of 2 to 10, 25 and 50 ✓ Divide whole numbers and those involving decimals by 10, 100 and 1000 ✓ Identify multiples and factors, including all factor pairs of a number, and common factors of 2 numbers ✓ Divide one- or two-digit numbers by 1000, identifying the value of the digits in the answer as ones, tenths, hundredths and thousandths
Examples of ARE			
'When working with whole numbers, if you add two 2-digit numbers together the answer cannot be a 4-digit number.' Do you agree? Explain your reasoning. 3254 + ☐ = 7999 2431 = ☐ – 3456 6373 – ☐ = 3581 9·5 (3·8 | 5·7) ☐ + ☐ = ☐ The table shows the cost of train tickets from different cities. What is the total cost for a return journey to York for one adult and two children? How much more does it cost for two adults to make a single journey to Hull than to Leeds? York / Hull / Leeds Adult: Single £13·50 £16·60 £11·00; Return £24·50 £30·00 £20·00 Child: Single £9·75 £11·00 £8·00; Return £15·00 £18·50 £13·50	3254 + ☐ = 7999 2431 = ☐ – 3456 6373 – ☐ = 3581 6719 = ☐ – 4562 9·5 (3·8 | 5·7) ☐ – ☐ = ☐ ☐ – ☐ = ☐	8 is a multiple of 4 and a factor of 16 6 is a multiple of 3 and a factor of ☐ ☐ is a multiple of 5 and a factor of ☐ ☐ is a multiple of ☐ and a factor of ☐ Fill in the missing numbers in this multiplication pyramid. 108 6 3 2	A 50 cm length of wood is cut into 4 cm pieces. How many 4 cm pieces are cut and how much wood is left over?  Fill in the blanks to represent the problem as division: ☐ ÷ ☐ = ☐ remainder ☐ Fill in the blanks to represent the problem as multiplication: ☐ × ☐ + ☐ = 50 Fill in the missing numbers: 8 ÷ 2 = ☐ ÷ 4 = 32 ÷ ☐ = 64 ÷ ☐ Sally's book is 92 pages long. If she reads seven pages each day, how long will she take to finish her book?

Greater Depth			
✓ Solve addition multi-step problems in contexts deciding which operations and methods to use and why. ✓ Continue to develop knowledge of addition facts and derive related facts ✓ Solve addition multi step problems in familiar contexts, deciding which operations and methods to use and why	✓ Solve subtraction multi-step problems in contexts deciding which operations and methods to use and why. ✓ Solve subtraction multi step problems in familiar contexts, deciding which operations and methods to use and why	✓ Solve problems involving scaling by simple fractions and problems involving simple rates ✓ Check answers to calculations using the inverse	✓ Check answers to calculations using the inverse (+)
Examples of Greater Depth			
Using this number statement, 5222 – 3111 = 5223 – 3112 write three more pairs of equivalent calculations.	**'If you keep subtracting 3 from 397 you will eventually reach 0.'** **Do you agree? Explain your reasoning.** Sam and Tom have £67·80 between them. If Sam has £6·20 more than Tom, how much does Tom have?	Put the numbers 1, 2, 3 and 4 in the bottom row of this multiplication pyramid in any order you like. What different numbers can you get on the top of the number pyramid? How can you make the largest number? Explain your reasoning. 	A 1 m piece of ribbon is cut into equal pieces and a piece measuring 4 cm remains. What might the lengths of the equal parts be? In how many different ways can the ribbon be cut into equal pieces? 

Year 6

Addition	Subtraction	Multiplication	Division
✓ Solve problems which require answers to be rounded to specified degrees of accuracy. ✓ Read, write, order and compare numbers up to10 000 000 and determine the value of each digit. ✓ Round any whole number to a required degree of accuracy. ✓ Use negative numbers in context, and calculate intervals across zero. ✓ Solve addition and subtraction multi step problems in contexts, deciding which operations and methods to use and why. ✓ Perform mental calculations, including with mixed operations and large numbers. ✓ Identify common factors, common multiples and prime numbers. ✓ Use their knowledge of the order of operations to carry out calculations involving the four operations. ✓ Solve problems involving addition, subtraction, multiplication and division. ✓ Use estimation to check answers ✓ Read, write, order and compare numbers with up to three decimal places. ✓ Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. ✓ Round decimals with two decimal places to the nearest whole number and to one decimal place. ✓ Solve problems involving number up to three decimal places. ✓ Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. ✓ Read and write numbers to 10 000 000 and determine the value of digits ✓ Order and compare numbers up to 10 000 000 ✓ Round whole numbers to 10 000 000 to a required degree of accuracy ✓ Use knowledge of the order of operations ✓ Perform mental calculations, including with mixed operations and large numbers ✓ Add and subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions.	✓ Solve problems which require answers to be rounded to specified degrees of accuracy. ✓ Read, write, order and compare numbers up to10 000 000 and determine the value of each digit. ✓ Round any whole number to a required degree of accuracy. ✓ Use negative numbers in context, and calculate intervals across zero. ✓ Solve addition and subtraction multi step problems in contexts, deciding which operations and methods to use and why. ✓ Perform mental calculations, including with mixed operations and large numbers. ✓ Identify common factors, common multiples and prime numbers. ✓ Use their knowledge of the order of operations to carry out calculations involving the four operations. ✓ Solve problems involving addition, subtraction, multiplication and division. ✓ Use estimation to check answers ✓ Read, write, order and compare numbers with up to three decimal places. ✓ Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. ✓ Round decimals with two decimal places to the nearest whole number and to one decimal place. ✓ Solve problems involving number up to three decimal places. ✓ Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. ✓ Read and write numbers to 10 000 000 and determine the value of digits ✓ Order and compare numbers up to 10 000 000 ✓ Round whole numbers to 10 000 000 to a required degree of accuracy ✓ Use knowledge of the order of operations ✓ Perform mental calculations, including with mixed operations and large numbers ✓ Add and subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions.	✓ Identify the value of each digit in numbers given to three decimal places and multiply numbers by 10, 100 and 1000 giving answers up to 3 decimal places (dp). ✓ Multiply one digit numbers with up to 2dp by whole numbers. ✓ Use common factors to simplify fractions; use common multiples to express fractions in the same denomination. ✓ Compare and order fractions, including fractions > 1 ✓ Generate and describe linear number sequences (with fractions) ✓ Multiply simple pairs of proper fractions, writing the answer in its simplest form. ✓ Multiply multi-digit number up to 4 digits by a 2 digit number using the formal written method of long multiplication. ✓ Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction. ✓ Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. ✓ Compare and order fractions whose denominators are multiples of the same number. ✓ Identify, name and write equivalent fractions of a given fraction, represented visually including tenths and hundredths. ✓ Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements >1 as a mixed number [for example 2 5 + 4 5 = 6 5 = 1 1 5]. ✓ Add and subtract fractions with the same denominator and denominators that are multiples of the same number. ✓ Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. ✓ Read and write decimal numbers as fractions [for example 0.71 = 71 100]. ✓ Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates. ✓ Consolidate counting in multiples of 2, through to 10, 25 and 50 ✓ Identify common factors, common multiples and prime numbers greater than 100 ✓ Solve multi step addition and subtraction problems in less familiar contexts, deciding which operations and methods to use and why ✓ Multiply multi digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication	✓ Use written division methods in cases where the answer has up to two decimal places ✓ Divide numbers up to 4 digits by a two-digit whole number using the formal methods of short or long division, and interpret remainders as appropriate for the context as whole numbers, fractions or by rounding ✓ Associate a fraction with division ✓ Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places ✓ Consolidate recognition of the percent symbol and understanding that percent relates to 'number of parts per hundred ✓ Divide proper fractions by whole numbers ✓ Divide numbers up to 4 digits by a 2 digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions or by rounding as appropriate for the context. ✓ Divide numbers up to 4 digits by a 2 digit number using the formal written method of short division, interpreting remainders according to context. ✓ Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

Examples of ARE

Calculate 36·2 + 19·8

Choose digits to go in the empty boxes to make these number sentences true.
14 781 – 6 ☐ 53 = 8528
23·12 + 22· ☐ = 45·23

Compare 31 + 9 × 7 and (31 + 9) × 7
What's the same? What's different?

Choose operations to go in the empty boxes to make these number sentences true.
6 ☐ 3 ☐ 7 = 16
6 ☐ 3 ☐ 7 = 27
6 ☐ 3 ☐ 7 = 9

Put brackets in these number sentences so that they are true.
12 – 2 × 5 = 50
12 – 8 – 5 = 9
10 × 8 – 3 × 5 = 250

A shop sells magazines and comics. Freya buys a magazine and a comic. She pays £2·50. Evie buys a magazine and two comics. She pays £3·90. How much does a comic cost? How much does a magazine cost?

A shop sells boxes of chocolates. One box costs £3·99. A second box costs £2·60. A third box costs £6·45. What is the difference in price between the most and least expensive boxes?

The shop also sells packets of sweets. One packet costs £1·39. Ramesh has a £10 note and he wants to buy the chocolates costing £2·60. How many packets of sweets can he also buy?

Two numbers have a difference of 2·38. The smaller number is 3·12. What is the bigger number?

Two numbers have a difference of 2·3. They are both less than 10. What could the numbers be?

It is correct that 273 × 32 = 8736. Use this fact to work out:
- 27·3 × 3·2
- 2·73 × 32 000
- 873·6 ÷ 0·32
- 87·36 ÷ 27·3
- 8736 ÷ 16
- 4368 ÷ 1·6

All the pupils in a school were asked to choose between an adventure park and the seaside for a school trip. They voted, and the result was a ratio of 5:3 in favour of the adventure park. 125 children voted in favour of going to the adventure park. How many children voted in favour of going to the seaside?

Mary and Alan each buy 12 tins of tomatoes. Miriam buys 3 packs each containing 4 tins. A pack of 4 costs £1·40. Alan buys 2 packs each containing 6 cans. A pack of 6 costs £1·90. Who gets the most change from a £5 note?

It is correct that 273 × 32 = 8736. Use this fact to work out:
- 27·3 × 3·2
- 2·73 × 32 000
- 873·6 ÷ 0·32
- 87·36 ÷ 27·3
- 8736 ÷ 16
- 4368 ÷ 1·6

A box of labels costs £24. There are 100 sheets in the box. There are 10 labels on each sheet. Calculate the cost of one label, in pence.

Greater Depth

A shop sells boxes of chocolates costing £2·60. The shop also sells packets of sweets. One packet costs £1·39. Ramesh has a £10 note and he wants to buy one box of chocolates.
Sara says that Ramesh can work out how many packets of sweets he can buy using the number sentence 10 – 2·60 ÷ 1·39.

Do you agree or disagree with Sara?
If you disagree, what number sentence do you think Ramesh should use?

Explain your reasoning.

Can you use five of the digits 1 to 9 to make this number sentence true?
☐☐·☐ + ☐·☐ = 31·7

Can you find other sets of five of the digits 1 to 9 that make the sentence true?

x and *y* represent whole numbers. Their sum is 1000.

Can the difference between *x* and *y* be:
- 100?
- any whole number?
- greater than *x*?

A shop sells magazines and comics. Last week Arthur bought a magazine and a comic. He can't remember exactly what he paid, but he thinks he paid £1·76. Yesterday he bought a magazine and four comics. He paid £4·30.

Do you think he is remembering correctly when he says that he paid £1·76 last week?

Fill in the missing numbers to make these number sentences true.
☐ × ☐ = 864
☐ × ☐ × ☐ = 864

A box of labels costs £63.
There are 140 sheets in the box.
There are 15 labels on each sheet.
Sara, Ramesh and Trevor want to calculate the cost of one label, in pence.
Ramesh uses the number sentence (6300 ÷ 140) × 15.
Sara uses the number sentence 63 ÷ 1·4 ÷ 15.
Trevor uses the number sentence (15 × 140) ÷ 6300.

Who is using the right number sentence? Explain your choice.

Examples of Greater Depth

Can you use five of the digits 1 to 9 to make this number sentence true?
☐☐·☐ + ☐·☐ = 31·7

Can you find other sets of five of the digits 1 to 9 that make the sentence true?

Write different number sentences using the digits 2, 3, 5 and 8 before the equals sign, using:
- **one operation**
- **two operations but no brackets**
- **two operations and brackets.**

Can you write a number sentence using the digits 2, 3, 5 and 8 before the equals sign, which has the same answer as another number sentence using the digits 2, 3, 5 and 8 but which is a different sentence?

Two numbers have a difference of 2·38. What could the numbers be if:
- **the two numbers add up to 6?**
- **one of the numbers is three times as big as the other number?**

Two numbers have a difference of 2·3. To the nearest 10, they are both 10.
What could the numbers be?

A shop sells magazines and comics. Last week Arthur bought a magazine and a comic. He can't remember exactly what he paid, but he thinks he paid £1·76.
Yesterday he bought a magazine and four comics. He paid £4·30.
Do you think he is remembering correctly when he says that he paid £1·76 last week?

Fill in the missing numbers to make these number sentences true.
☐ × ☐ = 864
☐ × ☐ × ☐ = 864

Which calculation is the odd one out?
753 × 1·8
(75·3 × 3) × 6
753 + 753 ÷ 5 × 4
7·53 × 1800
753 × 2 – 753 × 0·2
750 × 1·8 + 3 × 1·8
Explain your reasoning.

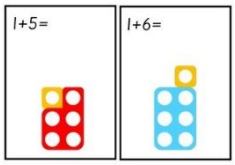
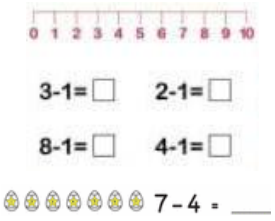
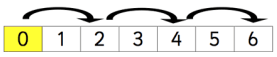
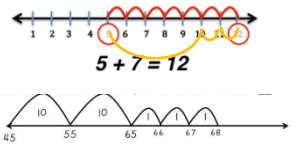
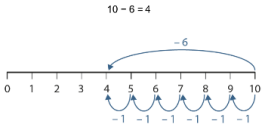
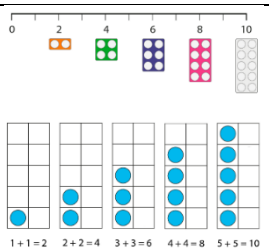
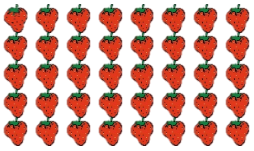
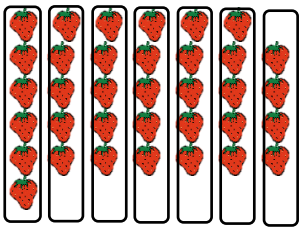
All the pupils in a school were asked to choose between an art gallery and a science museum for a school trip. The result was a ratio of 12:7 in favour of the science museum.
Five pupils were off school and didn't vote.
Every pupil went on the trip to the science museum the following week.
After the trip there is a news headline on the school website that says 'All 700 pupils in the school went to the science museum.'
Do you think that this news headline is correct? Explain your reasoning.

A box of labels costs £63.
There are 140 sheets in the box.
There are 15 labels on each sheet.
Sara, Ramesh and Trevor want to calculate the cost of one label, in pence.
Ramesh uses the number sentence (6300 ÷ 140) × 15.
Sara uses the number sentence 63 ÷ 1·4 ÷ 15.
Trevor uses the number sentence (15 × 140) ÷ 6300.
Who is using the right number sentence? Explain your choice.

Language

	Addition	Subtraction	Multiplication	Division
Reception	**In practical activities and discussion, beginning to use the vocabulary involved in adding.** ✓ more ✓ add	**In practical activities and discussion, beginning to use the vocabulary involved in subtracting.** ✓ less ✓ fewer	**In practical activities and discussion, beginning to use the vocabulary involved in multiplying.** ✓ lots of	**In practical activities and discussion, beginning to use the vocabulary involved in halving.** ✓ share ✓ groups of
Year 1	**Understand the operation of addition (as how many more) and use the related vocabulary.** ✓ total ✓ sum ✓ ten more ✓ digit ✓ numeral ✓ order ✓ a different order ✓ tens ✓ ones ✓ plus ✓ number bonds ✓ number line ✓ make ✓ altogether ✓ equals ✓ is the same as ✓ How many more to make …? ✓ How much more is …?	**Understand the operation of subtraction (as difference) and use the related vocabulary.** ✓ leaves ✓ takeaway ✓ ten less ✓ above ✓ below ✓ difference between ✓ subtract ✓ minus ✓ How many fewer is … than…? ✓ How much less is…? ✓ How many more is…than…?	**Explain what doubling is.** ✓ double ✓ once ✓ twice ✓ times ✓ repeated addition ✓ row	**Explain what halving is.** ✓ half ✓ halve ✓ share ✓ share equally ✓ group in pairs ✓ threes etc. ✓ equal groups of ✓ divided by
Year 2	✓ figure(s) ✓ value ✓ inverse ✓ number facts ✓ place value	✓ compare ✓ halfway between ✓ inverse ✓ left over ✓ difference ✓ number facts ✓ place value	✓ near double ✓ multiply ✓ multiply by ✓ number facts	✓ divide ✓ divided by ✓ grouped into ✓ groups of ✓ number facts
Year 3	✓ column addition ✓ tens ✓ ones ✓ hundreds ✓ estimate ✓ identify	✓ column subtraction ✓ exchange ✓ tens ✓ ones ✓ hundreds ✓ estimate ✓ identify	✓ product ✓ multiple ✓ multiples of… ✓ fifty ✓ one hundred ✓ scale up ✓ times	✓ array ✓ left over ✓ remainder
Year 4	✓ tenths ✓ hundredths ✓ decimal ✓ round ✓ nearest ✓ thousand more ✓ positive ✓ negative ✓ Roman Numerals I to C ✓ solve problems	✓ tenths ✓ hundredths ✓ decimal ✓ round ✓ nearest ✓ thousand less ✓ negative ✓ Roman Numerals I to C ✓ solve problems	✓ multiplication facts ✓ inverse operation ✓ derive ✓ solve problems	✓ division facts ✓ inverse operation ✓ derive ✓ divided into ✓ solve problems
Year 5	✓ written addition method ✓ composite numbers ✓ approximate ✓ calculate statements	✓ written subtraction method ✓ composite numbers ✓ approximate ✓ calculate statements	✓ powers of 10 ✓ factor pairs ✓ prime factors ✓ square number ✓ cubed number ✓ formal written multiplication ✓ prime number ✓ calculate statements	✓ factor pairs ✓ prime factors ✓ prime number ✓ formal written division ✓ calculate statements
Year 6	✓ million ✓ order of operations (BODMAS) ✓ n^{th} term	✓ million ✓ order of operations (BODMAS) ✓ n^{th} term	✓ common factors ✓ common multiples ✓ n^{th} term ✓ order of operations (BODMAS)	✓ common factors ✓ common multiples ✓ n^{th} term ✓ order of operations (BODMAS)

Standard Written Form

	Addition	Subtraction	Multiplication	Division
Reception				
Year 1				
Year 2	59 +43 102	73 -49 24	8 x 5 = 40 	35 ÷ 5 = 7 
Year 3	523 +393 916	523 -393 130	59 x 6 54 (6x9) 300 (6x50) 354	$8\overline{)32}$ = 4
Year 4	1,312 +3,094 4,406	6,273 -1,093 5,180	159 x 16 954 +1,590 2,544	$7\overline{)945}$ = 135
Year 5	13,123 +30,943 44,066	62,743 -10,923 51,820	2259 x 6 54 300 1,200 +12,000 13,554	$6\overline{)1679}$ = 279 r 5

Year 6	613,123 130,943+ 744,066	612,743 100,923- 511,820	2259 46x 13,554 90360+ 103,914	0389.739 23|8964 69- 206 184- 0224 207- 0170 161- 0090 69- 210 207- 003