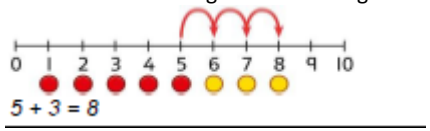
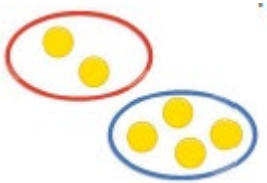
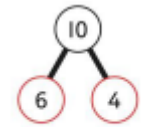
St.Peter's C.E. Primary School

Calculation Policy

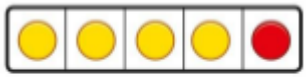
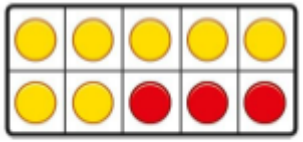
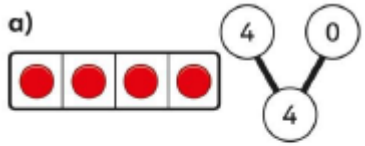
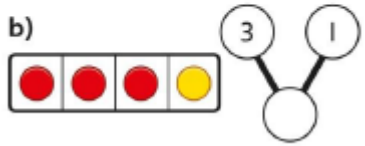
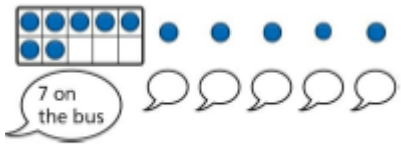
Updated: October 2021

To be reviewed: October 2022

1John 3:18 Dear children, let us not love with words or speech but with actions and in truth

Year	Concrete	Pictorial	Abstract
EYFS Addition	**Counting and adding more** Children add one more person or object to a group to find one more	**Counting and adding more** Children add one more cube or counter to a group to represent one more.  One more than 4 is 5	**Counting and adding more** Use a number line to understand how to link counting on with finding one more.  One more than 6 is 7 7 is one more than 6 Learn to link counting on with adding more than one. 
	Understanding part-whole relationship Sort people and objects into parts and understand the relationship with the whole.  The parts are 2 and 4. The whole is 6.	**Understanding part-whole relationship** Children draw to represent the parts and understand the relationship with the whole.  The parts are 1 and 5. The whole is 6.	**Understanding part-whole relationship** Use a part whole model to represent the numbers   6+ 4 = 10

1John 3:18 Dear children, let us not love with words or speech but with actions and in truth

Year	Concrete	Pictorial	Abstract
EYFS	**Knowing and finding number bonds within 10** Break apart a group and put back together to find and form number bonds  3 + 4 = 7  6 = 2 + 4	**Knowing and finding number bonds within 10** Use five and ten frames to represent key number bonds.  5 = 4 + 1  10 = 7 + 3	**Knowing and finding number bonds within 10** Use a part whole model alongside other representations to find number bonds. Make sure to include examples where one of the parts is zero   4 + 0 = 4 3 + 1 = 4
	Adding by counting on Children use knowledge of counting to 20 to find a total by counting on using people or objects. 	**Adding by counting on** Children use counters to support and represent their counting on strategy. 	**Adding by counting on**

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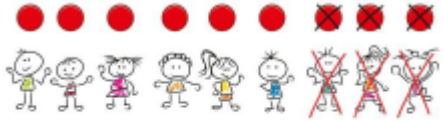
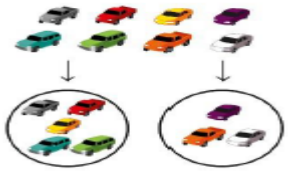
Year	Concrete	Pictorial	Abstract
EYFS Subtraction	**Counting back and taking away** Children arrange objects and remove to find how many are left.  *1 less than 6 is 5.* *6 subtract 1 is 5.*	**Counting back and taking away** Children draw and cross out or use counters to represent objects from a problem  9 – ☐ = ☐ There are ☐ children left.	**Counting back and taking away** Children count back to take away and use a number line or number track  *9 – 3 = 6*
	Finding a missing part, given a whole and a part. Children separate a whole into parts and understand how one part can be found by subtraction.  *8 – 5 = ?*		
	Subtraction within 10. Understand when and how to subtract 1s efficiently Use a bead string to subtract 1s efficiently  *5 – 3 = 2*	**Subtraction within 10.** Understand when and how to subtract 1s efficiently  *5 – 3 = 2*	**Subtraction within 10.** Understand how to use knowledge of bonds within 10 to subtract efficiently 5 – 3 = 2

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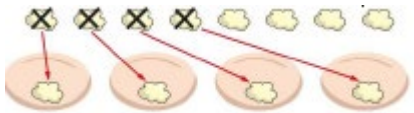
Year	Concrete	Pictorial	Abstract
EYFS Division Double and halving	**Grouping** Learn to make equal groups from a whole and find how many equal groups of a certain size can be made. **Sort a whole set people and objects into equal groups.**  There are 10 children altogether There are 2 in each group. There are 5 groups	**Grouping** Represent a whole and work out how many equal groups.  There are 10 in total. There are 5 in each group. There are 2 groups.	
	Sharing Share a set of objects into equal parts and work out how many are in each part**.** 		•

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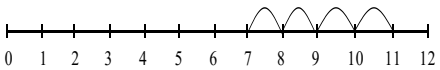
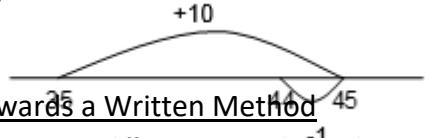
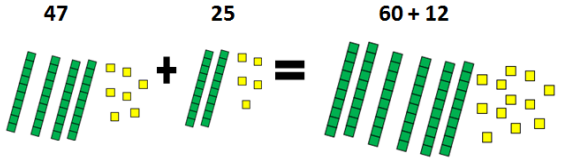
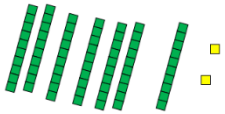
Year	Calculation Layouts	Strategies	Notes
1	Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'. 2 = 1+ 1 2 + 3 = 4 + 1 Missing numbers need to be placed in all possible places. 3 + 4 = □ □ = 3 + 4 3 + □ = 7 7 = □ + 4	Counting and Combining sets of Objects. Combining two sets of objects (aggregation) which will progress onto adding on to a set (augmentation).  Understanding of counting on with a numbertrack.  Understanding of counting on with a numberline (supported by models and images). Counting on above the numberline. 7+ 4  The use of other images is also valuable e.g. Numicon, bundles of straws, Dienes apparatus, multi-link cubes, bead strings.	• Read, write and interpret mathematical statements involving addition (+), subtraction(–) and equals (=) signs • Add one-digit and two-digit numbers to 20, including zero • Solve one-step problems that involve addition using concrete objects and pictorial representations, and missing number problems such as 7 = □ – 9 Vocabulary add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, digit

Year	Calculation Layouts	Strategies	Notes
2	As for year 1, Calculations should be written either side of the equality sign and missing numbers need to be placed in all possible places. 47 +25 = 72 Progressing to 40 + 7 + 20 + 5 60 + 12 = 72	Continue to use numberlines to develop understanding of: • Counting on in tens and ones • Partitioning and bridging through 10. • Adding 9 or 11 by adding 10 and adjusting by 1 • Count back under the numberline e.g. 35+9=44  <u>Towards a Written Method</u> Partitioning in different ways and recombine. 47+25  Leading to **72**  <u>Expanded written method</u> When appropriate, children develop expanded wı methods. 40 + 7 + 20 + 5 60 + 12 = 72	• Solve problems with addition using concrete objects and pictorial representations, including those involving numbers, quantities and measures • Add numbers using concrete objects, pictorial representations, and mentally, including: ○ a two-digit number and ones ○ a two-digit number and tens ○ two two-digit numbers ○ three one-digit numbers Show that addition of two numbers can be done in any order (commutative) • Recording addition in columns supports place value and prepares for formal written methods with larger number <u>Vocabulary</u> add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, digit, sum, tens, units, partition, addition, column, tens boundary, exchange, inverse

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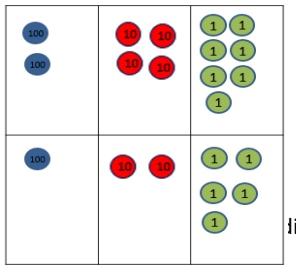
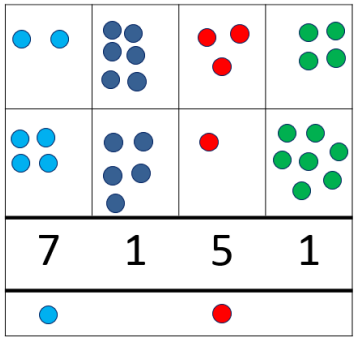
Year	Calculation Layouts	Strategies	Notes
3	Progressing to 789 + 642 becomes 7 8 9 + 6 4 2 1 4 3 1 1 1 Answer: 1431	Written methods Introduce expanded column addition modelled with place value counters (Dienes could be used for those who need a less abstract representation).  200 + 40 + 7 100 + 20 + 5 300 + 60 +12 = 372 I ling of the exchange between tens and ones. Introduced columnar method alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.	• Add numbers with up to three digits using formal methods of columnar addition Vocabulary add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, digit, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds, hundreds boundary, increase, vertical, expanded, compact, columnar.
4	1728 + 546 2274 1 1 1728 + 5546 7274 1 1	Place value counters/Dienes should be used alongside columnar written methods to secure both conceptual understanding and procedural fluency. Progress to numbers with 4 digits.  7 1 5 1 2634 +4517 7151 1 1	• Add numbers with up to 4 digits using the formal written methods of columnar addition Vocabulary add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, digit, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds, hundreds boundary, increase, vertical, expanded, compact, columnar, exchange, inverse, thousands

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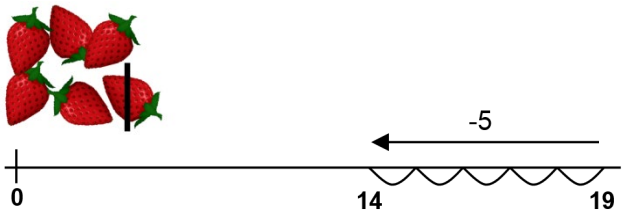
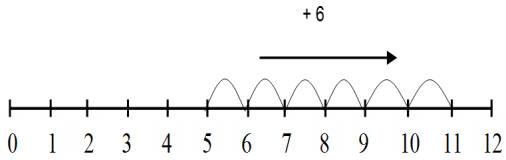
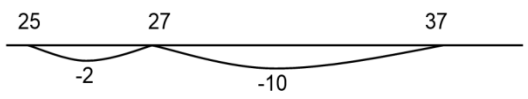
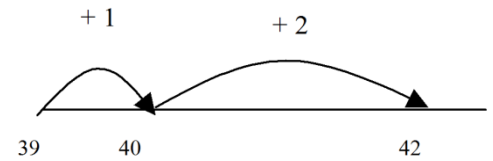
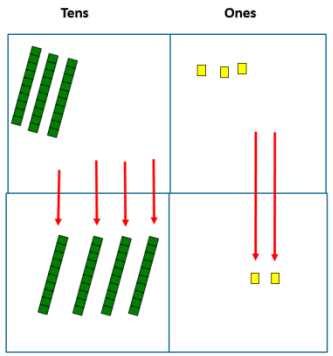
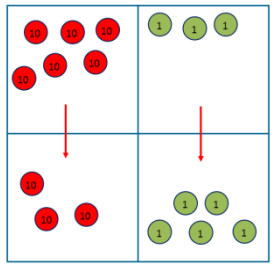
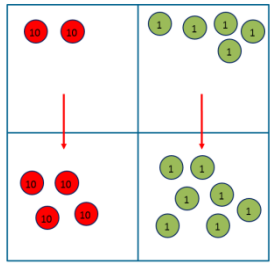
Year	Calculation Layouts	Strategies	Notes
5	172.83 + 54.68 227.51 1 1 1	Children will move on to the formal columnar method for larger whole numbers and decimal numbers.	• Add whole numbers with more than 4 digits, including using columnar addition • Add decimals including a mix of whole numbers and decimals, and decimals with different numbers of decimal places Vocabulary add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, digit, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds, hundreds boundary, increase, vertical, expanded, compact, columnar, exchange, inverse, thousands, decimal places, decimal point, tenths, hundredths, thousandths
6	172.83 + 54.68 227.51 1 1 1	Practise formal columnar method. Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.	• Pupils practise addition for larger numbers, using the formal written methods of columnar addition • Continue calculating with decimals, including those with different numbers of decimal places Vocabulary add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, digit, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds, hundreds boundary, increase, vertical, expanded, compact, columnar, exchange, inverse, thousands, decimal places, decimal point, tenths, hundredths, thousandths

Year	Calculation Layouts	Strategies	Notes
1	Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'. 15 – 7 =8 8 = 15 - 7 Missing number problems e.g. 7 = □ - 9 20 - □ = 9 15 – 9 = □ □ - □ = 11 16 – 0 = □	Understand subtraction as take-away (under the numberline):  U ounting on):  lling subtraction e.g. Numicon, bundles of straws, Dienes apparatus, multi-link cubes, bead strings.	• Read, write and interpret mathematical statements involving addition (+), subtraction(–) and equals (=) signs • subtract one-digit and two-digit numbers to 20, including zero • Solve one-step problems that involve and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ – 9 Vocabulary equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_?, count on

Calculations Policy – Subtraction

2	As for year 1, Calculations should be written either side of the equality sign and missing numbers need to be placed in all possible places.	Continue to use number lines to model take-away and difference. E.g.   <u>Towards written methods</u> Recording subtraction in expanded columns can prepare for efficient written methods with larger numbers. The numbers may be represented with Dienes apparatus. E.g. 75 – 42  70 5 -40 2 30 3	• Solve problems with subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures • Subtract numbers using concrete objects, pictorial representations, and mentally, including: ○ a two-digit number and ones ○ a two-digit number and tens ○ two two-digit numbers • Show that subtraction of one number from another cannot be done in any order • Recording subtraction in columns supports place value and prepares for formal written methods with larger number <u>Vocabulary</u> equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_?, count on, strategy, partition, tens, units, inverse

Calculations Policy – Subtraction

3	Progressing to 874 – 523 becomes 8 7 4 – 5 2 3 3 5 1 Answer: 351 932 – 457 becomes 8 12 1 9 3 2 – 4 5 7 4 7 5 Answer: 475	**Written methods** Introduce expanded column subtraction with no decomposition, modelled with place value counters. (Dienes could be used for those who need a less abstract representation)  90 8 - 30 5 60 3 This will lead to exchanging, modelled using place value counters (or Dienes).  60 ¹ 70 2 - 40 7 20 5 Begin to use a formal columnar algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.	• Subtract numbers with up to three digits using formal methods of columnar subtraction Vocabulary equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_?, count on, strategy, partition, tens, units, inverse, exchange, decrease, hundreds, value, digit

Calculations Policy – Subtraction

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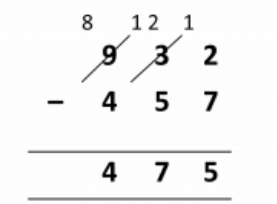
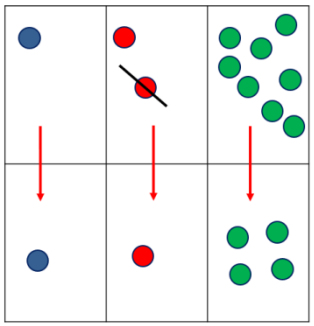
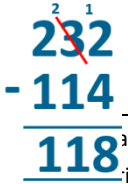
<td>932 – 457 becomes
 
Answer: 475</td>
<td>Place value counters/Dienes should be used to secure both conceptual understanding and procedural fluency with columnar method, including decomposition. Progress to numbers with 4 digits.
 
  </td>
<td>• Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate

Vocabulary
equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_?, count on, strategy, partition, tens. units. inverse. exchange. decrease.</td>
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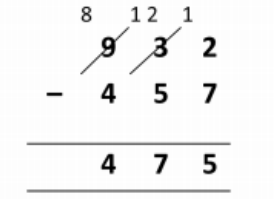
<td>5</td>
<td>932 – 457 becomes
 
Answer: 475</td>
<td>ar method for larger whole numbers and ithm.</td>
<td>• subtract decimals including a mix of whole numbers and decimals, and decimals with different numbers of decimal places

Vocabulary
equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_?, count on, strategy, partition, tens. units. inverse. exchange. decrease.</td>
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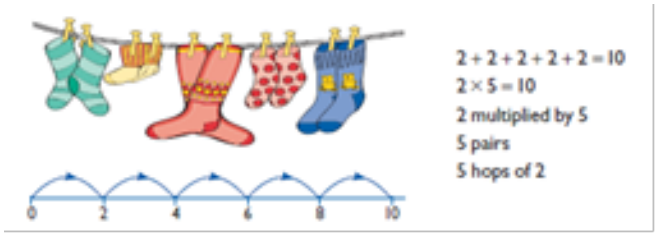
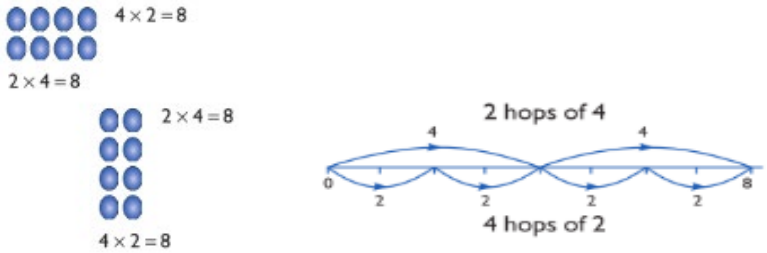
Calculations Policy – Subtraction

6	932 – 457 becomes 8 12 1 9 3 2 – 4 5 7 4 7 5 Answer: 475	Practise formal columnar method. Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.	• Pupils practise subtraction for larger numbers, using the formal written methods of columnar subtraction Vocabulary equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_?, count on, strategy, partition, tens, units, inverse, exchange, decrease, hundreds, value, digit, thousands, tenths, hundredths, thousandths, decimal point.

Calculations Policy – Multiplication

Year	Calculation Layouts	Strategies	Notes
1		Washing line, and other practical resources for counting. Concrete objects. Numicon; bundles of straws, bead strings.  Use Numicon to develop the vocabulary relating to 'times' e.g. Pick up five, 4 times. Use arrays to understand multiplication can be done in any order (commutative).  	• Understand multiplication is related to doubling and combing groups of the same size (repeated addition) • Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher Vocabulary groups of, lots of, times, array, altogether, multiply, count

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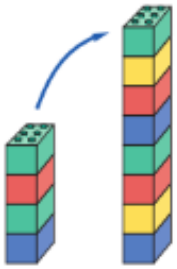
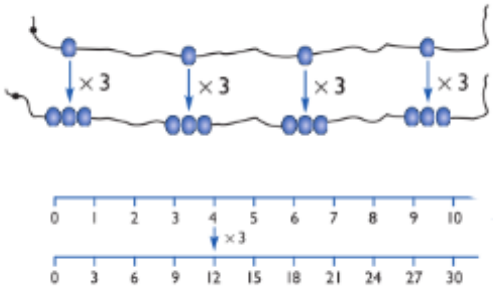
Calculations Policy – Multiplication

Year	Calculation Layouts	Strategies	Notes
2	Express multiplication as a number sentence using x Use understanding of the inverse and practical resources to solve missing number problems. 7 x 2 = □ □ = 2 x 7 7 x □ = 14 14 = □ x 7 □ x 2 = 14 14 = 2 x □ □ x ◯ = 14 14 = □ x ◯	Develop understanding of multiplication using array and number lines. Include multiplications not in the 2, 5 or 10 times tables. Begin to develop understanding of multiplication as scaling (3 times bigger/taller).  double 4 is 8 $4 \times 2 = 8$  	• Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs • Show that multiplication of two numbers can be done in any order (commutative) • Solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts Vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times.

1John 3:18 Dear children, let us not love with words or speech but with actions and in truth

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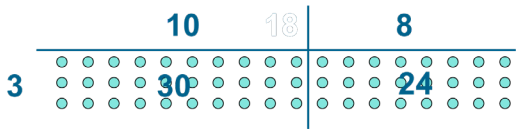
3	3x18= 10 | 8 3 | 30 | 24 30 + 24 =	**Written methods** Developing written methods using understanding of visual images related to arrays. 3x18  Give children opportunities for children to explore this and deepen understanding using Dienes apparatus and place value counters. Leading to grid method for recording 10 | 8 3 | 30 | 24 30 + 24 =	• Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods Vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times, inverse, partition, grid method, multiple,

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Year	Calculation Layouts	Strategies	Notes
4	342 × 7 becomes 3 4 2 × 7 2 3 9 4 2 1 Answer: 2394	Link grid method to expanded method. (Refer back to arrays for children who still need visual cues) 3x18 10 8 3 30 24 30 + 24 = Move children from expanded method to formal short multiplication. 18 X 3 30 (3x10) 24 (3x8) 54 18 X 3 54 2	• Multiply two-digit and three-digit numbers by a one-digit number using formal written method of short multiplication Vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times, inverse, partition, grid method, multiple,

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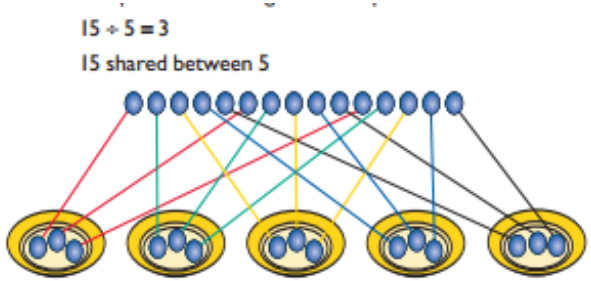
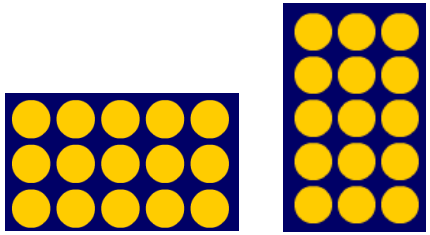
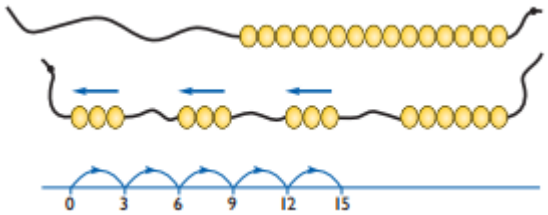
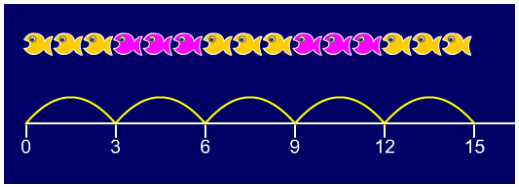
Year	Calculation Layouts	Strategies	Notes
5	2741 × 6 becomes 2 7 4 1 × 6 1 6 4 4 6 4 2 Answer: 16 446 24 × 16 becomes 2 2 4 × 1 6 2 4 0 1 4 4 3 8 4 Answer: 384	Children will practise the formal method of short multiplication for larger whole numbers. Introduce and practise long multiplication.	• Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers Vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times, inverse, partition, grid method, multiple,

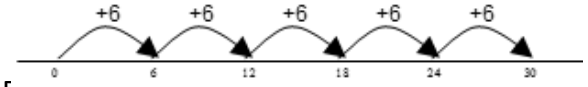
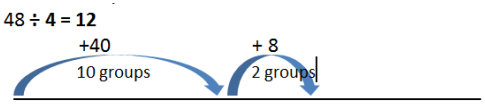
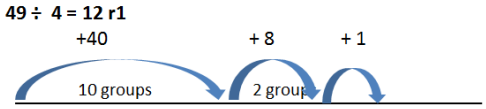
Calculations Policy – Multiplication

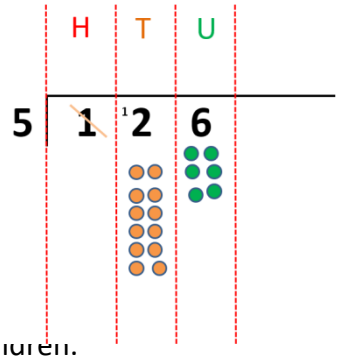
Year	Calculation Layouts	Strategies	Notes
6	124 × 26 becomes 1 2 1 2 4 × 2 6 2 4 8 0 7 4 4 3 2 2 4 1 1 Answer: 3224	Children will practise the formal methods of short and long multiplication for larger whole numbers. Use short division to multiply numb numbers with up to two decimal places by whole numbers with one or two digits. Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.	• Multiplication for larger numbers, using the formal written methods of short and long multiplication • Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • Multiply numbers with up to two decimal places by whole numbers with one or two digits Vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times, inverse, partition, grid method, multiple, product, tens, units, value, decimal, decimal

Year	Calculation Layouts	Strategies	Notes
1		Group AND share small quantities- understanding the difference between the two concepts. <u>Sharing</u> Develops importance of one-to-one correspondence.  Children should be taught to share using concrete apparatus.	• Solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher <u>Vocabulary</u> share, share equally, one each, two each…, group, groups of, lots of, array

Year	Calculation Layouts	Strategies	Notes
1		<u>Grouping</u> Children should apply their counting skills to develop some understanding of grouping.  Use of arrays as a pictorial representation for division. 15 ÷ 3 = 5 There are 5 groups of 3. 15 ÷ 5 = 3 There are 3 groups of 5.  Children should be able to find ½ and ¼ and simple fractions of objects, numbers and quantities.	

Year	Calculation Layouts	Strategies	Notes
2	Expressing division as a number sentence using ÷ Use understanding of the inverse and practical resources to solve missing number problems. 6 ÷ 2 = □ □ = 6 ÷ 2 6 ÷ □ = 3 3 = 6 ÷ □ □ ÷ 2 = 3 3 = □ ÷ 2 □ ÷ ∇ = 3 3 = □ ÷ ∇	Know and understand sharing and grouping- introducing children to the ÷ sign. Children should continue to use grouping and sharing for division using practical apparatus, arrays and pictorial representations. <u>Grouping using a numberline</u> Group from zero in jumps of the divisor to find our 'how many groups of 3 are there in 15?'   Continue work on arrays. Support children to understand how multiplication and division are inverse. Look at an array – what do you see?	• Calculate mathematical statements for division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs • Show that division of one number by another cannot be done in any order • Solve problems involving division, using materials, arrays, repeated addition, mental methods and division facts, including problems, in contexts. <u>Vocabulary</u> share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line. inverse

Year	Calculation Layouts	Strategies	Notes
3	**Short division** 98 ÷ 7 becomes 1 4 7 | 9 2 8 Answer: 14	Grouping How many 6's are in 30? 30 ÷ 6 can be modelled as:  Becoming more efficient using a numberline Children need to be able to partition the dividend in different ways. 48 ÷ **4 = 12**  Remainders **49 ÷ 4 = 12 r1**  Sharing – 49 shared between 4. How many left over? Grouping – How many 4s make 49. How many are left over? Children will continue to explore division as sharing and grouping, and to represent calculations on a number line until they have a secure understanding.	• Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (short division with no remainders) Vocabulary share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, remainder, divisible

Year	Calculation Layouts	Strategies	Notes
3		Formal short division should only be introduced once children have a good understanding of division, its links with multiplication and the idea of 'chunking up' to find a target number (see use of number lines above). Short division to be modelled for understanding using place value counters as shown below. Calculations with 2 and 3-digit dividends.  I of a formal method for some children.	

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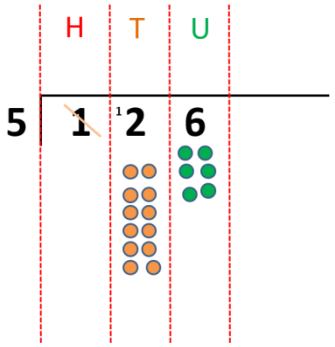
Year	Calculation Layouts	Strategies	Notes
4	**Short division** 98 ÷ 7 becomes 1 4 7 | 9 2 8 Answer: 14	Short division to be modelled for understanding using place value counters as shown below.  Progress to the efficient use of a formal method.	• Divide two-digit and three-digit numbers by a one-digit number using formal written layout (short division – exact answers : no remainders) Vocabulary share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, remainder, multiple, divisible by, factor
5	432 ÷ 5 becomes 8 6 r 2 5 | 4 3 2 Answer: 86 remainder 2	Children will practise the formal method of short division for larger whole numbers. Children should also be able to express reminder as a decimal or fraction – whatever is appropriate for the context. Ensure practical understanding allows children to work through this (e.g. what could I do with this remaining 1? How could I share this between 6 as well?).	• 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 Vocabulary share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, remainder, multiple, divisible by, factor, dividend, quotient, divisor, decimal, fraction

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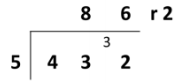
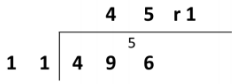
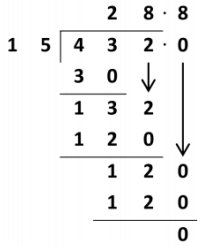
6	432 ÷ 5 becomes  Answer: 86 remainder 2 496 ÷ 11 becomes  Answer: 45 $\frac{1}{11}$ 432 ÷ 15 becomes  Answer: 28·8	Children will practise the formal methods of short and long division for larger whole numbers. Children should also be able to express reminder as a decimal or fraction – whatever is appropriate for the context. Divide numbers with up to two decimal places by whole numbers with one or two digits. Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.	• Pupils practice division for larger numbers, using the formal written methods short and long division • Divide numbers up to 4 digits by a two-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 two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context • Divide numbers with up to two decimal places by whole numbers with one or two digits Vocabulary share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, remainder, multiple, divisible by, factor, dividend, quotient, divisor, decimal, fraction, decimal, decimal point, tenths, hundredths