



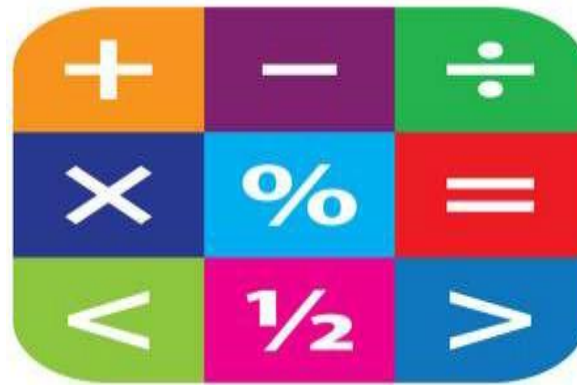
Mundy C of E VC Junior School

'Let love and kindness be the motivation
behind all that you do.' (1 Corinthians
16:14)



How we teach calculations:

Calculation Policy for Mathematics





The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Staff are also encouraged to refer to 'Mathematics programmes of study: key stage 2 National curriculum in England' and Appendix 1 (attached) which provides National examples of formal written methods for addition, subtraction, multiplication and division. Please note that early learning in number and calculation in Reception follows the 'Development Matters' EYFS document, and this calculation policy for our Junior school is designed to build on progressively from the content and methods established in the Early Years Foundation Stage, as well as those of the Key Stage 1 curriculum.

Age stage expectations

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, **however it is vital that pupils are taught according to the stage that they are currently working at**, being moved onto the next level as soon as they are ready, or working at a lower stage until they are secure enough to move on. Any children who are working below our starting age of Year 3 will need to be assessed and work and methodology will need adapting to meet the needs of the individual child.

Providing a context for calculation:

It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

Choosing a calculation method:

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved:

Can I do it in my head using a mental strategy?

Can I use some jottings to help me?

Should I use a written method to work it out?



Year 1



Addition

Add with numbers up to 20

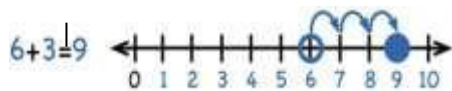
+ = signs and missing numbers

Children to interpret addition number sentences and solve missing box problems, using concrete objects and number line addition to solve them:

$$\begin{array}{ll} 3 + 4 = \square & \square = 3 + 4 \\ 3 + \square = 7 & 7 = \square + 4 \\ \square + 4 = 7 & 7 = 3 + \square \\ \square + \nabla = 7 & 7 = \square + \nabla \end{array}$$

Promote covering up of operations and numbers.

Number lines (numbered)



Record by - drawing jumps on prepared lines.

Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.

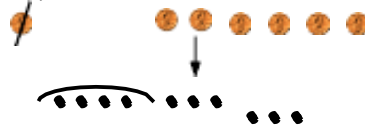


Subtraction

Subtract with numbers up to 20

Pictures and symbols

Sam spent 4p. What was his change from 10p?



- = signs and missing numbers

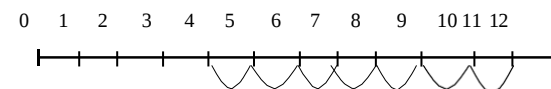
Children to read, write and interpret number sentences with - and = signs.

$$\begin{array}{ll} 7 - 3 = \square & \square = 7 - 3 \\ 7 - \square = 4 & 4 = \square - 3 \\ \square - 3 = 4 & 4 = 7 - \square \\ \square - \nabla = 4 & 4 = \square - \nabla \end{array}$$

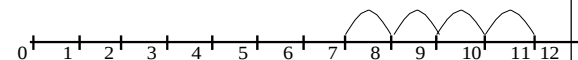
Number lines (numbered)

11 - 7

(Counting back)



The difference between 7 and 11
(Counting up)



Recording by - drawing jumps on prepared

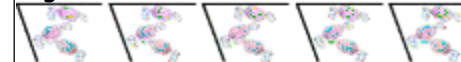


Multiplication

Multiply with concrete objects, arrays and pictorial representations.

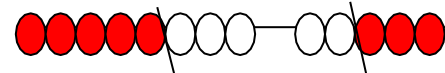
Pictures and symbols

There are 3 sweets in one bag.
How many sweets are there in 5 bags?



(Recording on a number line modelled by the teacher when solving problems)

Use of bead strings to model groups of.



Give children experience of counting equal groups of objects in 2s, 5s and 10s.

Present practical problem solving activities involving counting equal sets or groups, as above.

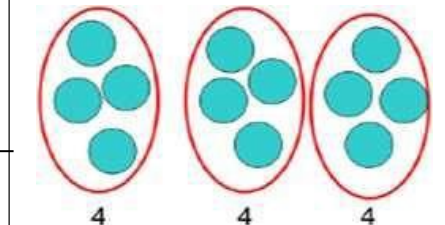


Division

Group and share small quantities

Pictures / marks

How many groups of 4 can be made with 12 stars? = 3



12 shared between 3 is 4

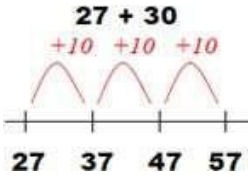
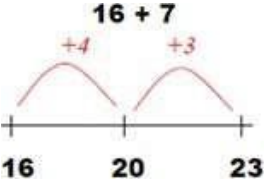
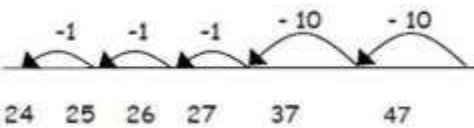
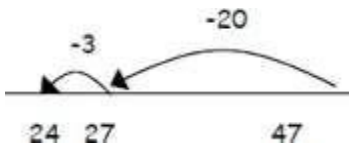
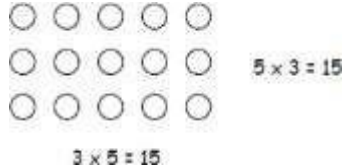
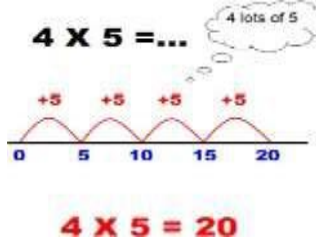
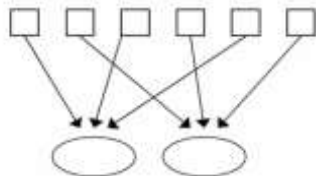
Children to use lots of practical apparatus, arrays and picture representations. Children to begin to count in 2s, 5s and 10s and find half of an amount by sharing equally between 2.



8+5 Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line Key skills for addition at Y1: • Read and write numbers to 100 in numerals, incl. 1—20 in words • Recall bonds to 10 and 20, and addition facts <u>within</u> 20 • Count to and across 100 • Count in multiples of 1 2, 5 and 10 • Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.	lines Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? Key skills for subtraction at Y1: • Given a number, say one more or one less. • Count to and over 100, forward and back, from any number. • Represent and use subtraction facts to 20 and within 20. • Subtract with one-digit and two-digit numbers to 20, including zero. • Solve one-step problems that involve addition and subtraction, using concrete objects (ie bead string, objects, cubes) and pictures, and missing number problems. • Read and write numbers from 0 to 20 in numerals and words.	Key vocabulary: groups of, lots of, times, array, altogether, multiply, count Key skills for multiplication at Y1: • Count in multiples of 2, 5 and 10. • Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. • Make connections between arrays, number patterns, and counting in twos, fives and tens. Begin to understand doubling using concrete objects and pictorial representations.	Key Vocabulary: share, share equally, one each, two each, group, groups of, lots of, array Key number skills for division at Y1: • Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher • Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities. • They make connections between arrays, number patterns, and counting in twos, fives and tens.
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Year 2

 Addition	Subtraction	 Multiplication	 Division
<u>Add with 2-digit numbers Developing mental fluency with addition and place value involving 2-digit numbers, then establish more formal methods.</u> <u>+ = signs and missing numbers</u> Continue using a range of equations as in Year 1 but with appropriate, larger numbers. Extend to $14 + 5 = 10 + \square$ and adding three numbers $32 + \square + \square = 100$ $35 = 1 + \square + 5$ <u>Add 2-digit numbers and tens:</u>  27 + 30 +10 +10 +10 27 37 47 57 <u>Add 2-digit numbers and units:</u>  16 + 7 +4 +3 16 20 23	<u>Subtract with 2-digit numbers</u> <u>- = signs and missing numbers</u> Continue using a range of equations as in Year 1 but with appropriate numbers. Extend to $14 + 5 = 20 - \square$ <u>Subtract on a number line by counting back, aiming to develop mental subtraction skills.</u> This strategy will be used for: 2-digit numbers subtract units (by taking away / counting back) e.g. $36 - 7$ 2-digit numbers subtract tens (by taking away / counting back) e.g. $48 - 30$ - Subtracting pairs of 2-digit numbers (see below): $47 - 23 = 24$ Partition the second number and subtract it in tens and units, as below:  24 25 26 27 37 47 Move towards more efficient jumps back, as below:  24 27 47	<u>Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)</u> <u>x = signs and missing numbers</u> $7 \times 2 = \square \quad \square = 2 \times 7$ $7 \times \square = 14 \quad 14 = \square \times 7$ $\square \times 2 = 14 \quad 14 = 2 \times \square$ $\square \times \nabla = 14 \quad 14 = \square \times \nabla$ <u>Arrays and repeated addition</u>  $3 \times 5 = 15$ or repeated addition  $4 \times 5 = 20$ Use practical apparatus	<u>Group and share, using the ÷ and = sign</u> Use objects, arrays, diagrams and pictorial representations, and grouping on a number line. <u>÷ = signs and missing numbers</u> $6 \div 2 = \square \quad \square = 6 \div 2$ $6 \div \square = 3 \quad 3 = 6 \div \square$ $\square \div 2 = 3 \quad 3 = \square \div 2$ $\square \div \nabla = 3 \quad 3 = \square \div \nabla$ <u>Understand division as sharing and grouping</u> There are 6 sweets, how many people can have 2 sweets each?  6 sweets shared between 2 people, how many do they each get? 



63 + 16

A horizontal number line with tick marks at 63, 73, and 79. Above the line, a red arc connects 63 to 73, labeled $+10$. Another red arc connects 73 to 79, labeled $+6$.

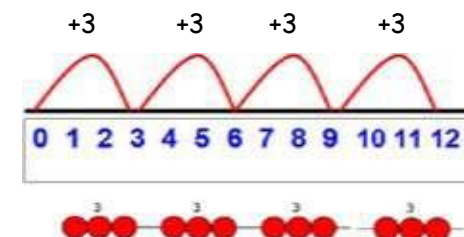
$$\begin{array}{r} 20 + 3 \\ + 30 + 4 \\ \hline 50 + 7 \\ = \underline{\underline{57}} \end{array}$$

Once children can add a multiple of ten to a 2-digit number mentally (e.g. $80+11$), they are ready for adding pairs of 2-digit numbers that DO cross the tens boundary (e.g. $58 + 43$).

$$\begin{array}{r} 50 + 8 \\ 40 + 3 \\ \hline 90 + 11 \\ \hline = 101 \end{array}$$

A diagram of a linked list with three nodes: 25, 26, and 35. Node 25 is on the left, node 26 is in the middle, and node 35 is on the right. A curved arrow points from node 25 to node 26, labeled with the value +1. Another curved arrow points from node 26 to node 35, labeled with the value 10.

How many groups of 3 in 12?
Jump along the number line in groups of the divisor.



$$12 \div 3 = 4$$



Mundy C of E VC Junior School Calculation Policy Guidance

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary

Key skills for addition at Y2:

- Add a 2-digit number and ones (e.g. $27 + 6$)
- Add a 2-digit number and tens (e.g. $23 + 40$)
- Add pairs of 2-digit numbers (e.g. $35 + 47$)
- Add three single-digit numbers (e.g. $5 + 9 + 7$)
- Show that adding can be done in any order (the commutative law).
- Recall bonds to 20 and bonds of tens to 100 ($30 + 70$ etc.)
- Count in steps of 2, 3 and 5 and count in tens from any number.
- Understand the place value of 2-digit numbers (tens and ones)
- Compare and order numbers to 100 using $<$, $>$ and $=$ signs.
- Read and write numbers to at least 100 in numerals and words.
- Solve problems with addition, using concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is? difference, count on, strategy, partition, tens, units

Key skills for subtraction at Y2:

- Recognise the place value of each digit in a two-digit number.
- Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Subtract using concrete objects, pictorial representations, 100 squares and mentally, including: a two-digit number and ones, a two-digit number and tens, and two two-digit numbers.
- Show that subtraction of one number from another cannot be done in any order.
- Recognise and use inverse relationship between addition and subtraction, using this to check calculations and missing number problems.
- Solve simple addition and subtraction problems including measures, using concrete objects, pictorial representation, and also applying their increasing knowledge of mental and written methods.
- Read and write numbers to at least 100 in numerals and in words.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times...

Key skills for multiplication at Y2:

- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the 2, 5 and 10 multiplication tables, including recognising odds and evens.
- Write and calculate number statements using the $\times$ and $=$ signs.
- Show that multiplication can be done in any order (commutative).
- Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.
- Pupils use a variety of language to discuss and describe multiplication.

Key Vocabulary: share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over

Key number skills for division at Y2:

- Count in steps of 2, 3, and 5 from 0
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the $\times$, $\div$ and $=$ signs.
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.



Year 3



Addition

Add numbers with up to 3-digits

Introduce the expanded column addition method:

$$353 + 268$$

$$300 + 50 + 3$$

$$200 + 60 + 8$$

$$600 + 20 + 1 = 621$$

In order to carry out this method of addition:
Children need to recognise the value of the hundreds, tens and units without recording the partitioning.

Pupils need to be able to add in columns. Add units first in preparation for column method.

Move to the compact column addition method, with 'carrying':

$$\begin{array}{r} 236 \\ + 73 \\ \hline 309 \\ 1 \end{array}$$

Add the units first, and carry numbers underneath the bottom line.

Subtraction

Subtracting with 2 and 3-digit numbers.

Find a small difference by counting up

Continue as in Year 2 but with appropriate numbers e.g. $102 - 97 = 5$. With 2 digit numbers start at the smaller number and count on in tens first, then count on in units to find the rest of the difference.

Subtract mentally a 'near multiple of 10' to or from a two-digit number

Continue as in Year 2 but with appropriate numbers e.g. $78 - 49$ is the same as $78 - 50 + 1$

Introduce partitioned column subtraction method.

STEP 1: introduce this method with examples where no exchanging is required.

$$89 - 35 = 54$$

$$80 + 9$$

$$- 30 + 5$$

$$50 + 4$$

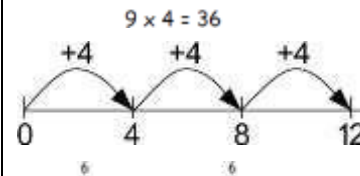
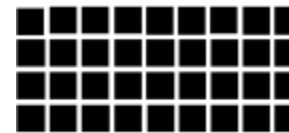


Multiplication

Multiply 2-digits by a single digit number

Arrays and repeated addition

Continue to understand multiplication as repeated addition and continue to use arrays, number lines & bead strings (as in Year 2).



Introduce the grid method for multiplying 2-digit by single-digits:

Eg. $23 \times 8 = 184$

X	20	3
8	160	24

$$160 + 24 = 184$$



Division

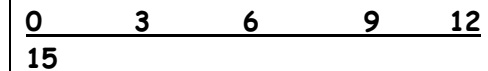
Divide 2-digit numbers by a single digit (where there is no remainder in the final answer)

Understand division as sharing and grouping

$15 \div 3$ can be modelled as:

Sharing - 15 shared between 3 (see Year 2 diagram)

OR

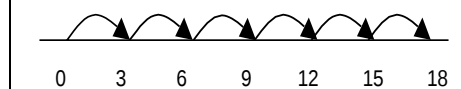


Or

$18 \div 3$ can be modelled as:

Sharing - 18 shared between 3 (see Year 2 diagram)

Grouping - How many 3's make 18?



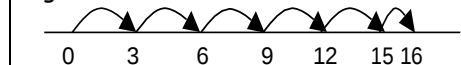
Concept of Remainders

$16 \div 3 = 5 \text{ r}1$

Sharing - 16 shared between 3, how many left over?

Grouping - How many 3's make 16, how many left over?

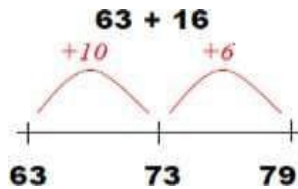
e.g.





Re-introduce the Number Line addition:

Children make use of their knowledge of number bonds to 20 to help them to partition and add along a number line mentally.



STEP 2: introduce 'exchanging' through practical subtraction. Make the larger number with Base10, then subtract 47 from it.

$$72 - 47$$



Before subtracting '7' from the 72 blocks, they will need to exchange a row of 10 for ten units. Then subtract 7, and subtract 4 tens.

$$\begin{array}{r} 70 \uparrow 2 \\ - 40 + 7 \\ \hline 20 + 5 = \underline{25} \end{array}$$

STEP 3: Once pupils are secure with the understanding of "exchanging", they can use the partitioned and compacted column method to subtract any 2 and 3-digit numbers.

To do this, children must be able to:

- Partition numbers into tens and units
- Multiply multiples of ten by a single digit (e.g. 20×4) using their knowledge of multiplication facts and place value
- Recall and work out multiplication facts in the 2, 3, 4, 5, 8 and 10 times tables.

Short multiplication Year 3:

Once children are confident in their knowledge of grid method and have secure understanding of the place value of the multiplier and multiplicand then move onto short multiplication.

24×6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ 2 \end{array}$$

Answer: 144

Short division:

STEP 1: Limit numbers to NO remainders in the answer OR carried (each digit must be a multiple of the divisor).

Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., short division for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all.

STEP 2: Limit numbers to NO remainders in the final answer, but with remainders occurring within the sum.

Once children demonstrate a full understanding of remainders, and also the short division method taught, they can be taught how to use the method when remainders occur within the calculation (e.g. $96/4$), and be taught to 'carry' the remainder onto the next digit. If needed, children should use the number line to work out individual division facts that occur which they are not yet able to recall mentally.



Mundy C of E VC Junior School Calculation Policy Guidance

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, Increase, vertical, 'carry', expanded, compact

Key skills for addition at Y3:

- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- Add a three-digit number and ones mentally ($175 + 8$)
- Add a three-digit number and tens mentally ($249 + 50$)
- Add a three-digit number and hundreds mentally ($381 + 400$)
- Estimate answers to calculations, using inverse to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex addition.
- Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones.)
- Continue to practise a wide range of mental addition strategies, ie. number bonds, adding the nearest multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining.

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit

Key skills for subtraction at Y3:

- Subtract mentally a: 3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds.
- Estimate answers and use inverse operations to check.
- Solve problems, including missing number problems.
- Find 10 or 100 more or less than a given number.
- Recognise the place value of each digit in a 3-digit number.
- Counting up differences as a mental strategy when numbers are close together or near multiples of 10
- Read and write numbers up to 1000 in numerals and words.
- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value

Key skills for multiplication at Y3:

- Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including 2-digit $\times$ single-digit, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g. using commutativity ($4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and for missing number problems
 $\times 5 = 20, \quad 3 \times \quad = 18,$

Key Vocabulary: share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple

Key number skills for division at Y3:

- Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through doubling, connect the 2, 4 and 8s).
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
- Solve problems, in contexts, and including missing number problems, involving multiplication and division.
- Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 \times 3 = 6$) to derive related facts ($30 \times 2 = 60$, so $60 \div 3 = 20$ and $20 \times 3 = 60$).
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.



Year 4



Addition

Add numbers with up to 4 digitsCompact column method

Move from expanded addition to the compact column method, adding units first, and 'carrying' numbers underneath the calculation. Also include money and measures contexts.

$$\begin{array}{r} 3517 \\ + 396 \\ \hline 3913 \end{array}$$

Reinforce correct place value by reminding them the actual value is 5 hundreds add 3 hundreds, not 5 add 3, for example.



Subtraction

Subtract with up to 4-digit numbersPartitioned column subtraction with exchanging.

$$\begin{array}{r} 2754 - 1562 = 1192 \\ 2000 + 700 + 50 + 4 \\ - 1000 + 500 + 60 + 2 \\ \hline 1000 + 100 + 90 + 2 \end{array}$$

Move onto:

Compact column subtraction.

$$\begin{array}{r} 2754 \\ - 1562 \\ \hline 1192 \end{array}$$

Give plenty of opportunities to apply this to money and measures.



Multiplication

Multiply 2 and 3-digits by a single digit, using all multiplication tables up to 12 x 12

Develop the grid method:

Eg. $136 \times 5 = 680$

X	100	30	6
5	500	150	30

500

150

+ 30

680

Children should be able to :

- Approximate before they calculate, and make this a regular part of their calculating, going back to the approximation to check the reasonableness of their answer. e.g:

349x9 is approximately 359x10

Record the approximation to check against final answer.



Division

Divide up to 3-digit numbers by a single digit (without remainders initially)

Develop short division:

$$\begin{array}{r} 18 \\ 4 \overline{) 732} \end{array}$$

STEP 1: Pupils must be secure with the process of short division for dividing 2-digit numbers by a single digit (those that do not result in a final remainder see Y3)

But must be able to calculate remainders within the calculation.

STEP 2: Pupils move onto dividing numbers with up to 3-digits by a single digit, however problems and calculations provided should not result in a final answer with remainder at this stage. Children who exceed this expectation may progress to Y5 level.



- Multiply multiples of ten and one hundred by a single-digit, using their multiplication table knowledge.
- Rapidly recall all times tables **up to 12×12**

Short Multiplication Year 4:

Once children are confident in their knowledge of grid method and have secure understanding of the place value of the multiplier and multiplicand then move onto short multiplication.

342×7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ \hline 21 \end{array}$$

Answer: 2394

When the answer for the first column is zero ($1 \div 5$, as in example), children could initially write a zero above to acknowledge its place, and must always 'carry' the number (1) over to the next digit as a remainder.

$$\begin{array}{r} 037 \\ 5 \overline{)1835} \\ \underline{5} \\ 18 \\ \underline{15} \\ 35 \\ \underline{35} \\ 0 \end{array}$$



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Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, **thousands, hundreds, digits, inverse**

Key skills for addition at Y4:

- Select most appropriate method: mental, jottings or written and explain why.
- Recognise the place value of each digit in a four-digit number.
- Round any number to the nearest 10, 100 or 1000.
- Estimate and use inverse operations to check answers.
- Solve 2-step problems in context, deciding which operations and methods to use and why.
- Find 1000 more or less than a given number.
- Continue to practise a wide range of mental addition strategies, ie. number bonds, add the nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and recombining.
- Add numbers with up to 4 digits using the formal written method of column addition
- Solve 2-step problems in contexts, deciding which operations and methods to use and why.
- Estimate and use inverse operations to check answers to a calculation.

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is _? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, **inverse**

Key skills for subtraction at Y4:

- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.
- Children select the most appropriate and efficient methods for given subtraction calculations.
- Estimate and use inverse operations to check answers.
- Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.
- Solve simple measure and money problems involving fractions and decimals to two decimal places.
- Find 1000 more or less than a given number.
- Count backwards through zero, including negative numbers.
- Recognise place value of each digit in a 4-digit number Round any number to the nearest 10, 100 or 1000
- Solve number and practical problems that involve the above, with increasingly large positive numbers.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, groups of, sets of, lots of, equal groups, times, multiply, times as big as, once, twice, three times... partition, grid method, total, multiple, product, set of, **inverse**

Key skills for multiplication at Y4:

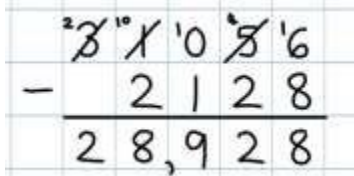
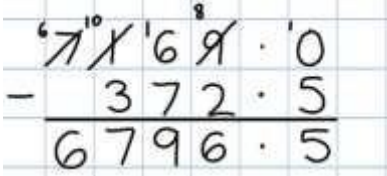
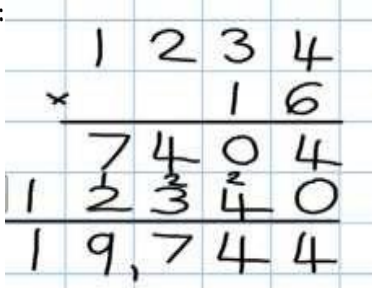
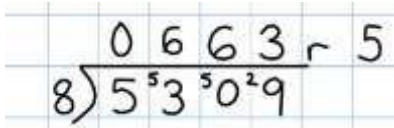
- Count in multiples of 6, 7, 9, 25 and 1000
- Recall multiplication facts for all multiplication tables up to 12 x 12.
- Recognise place value of digits in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.
- Use commutativity and other strategies mentally $3 \times 6 = 6 \times 3$, $2 \times 6 \times 5 = 10 \times 6$, $39 \times 7 = 30 \times 7 + 9 \times 7$.
- Solve problems with increasingly complex multiplication in a range of contexts.
- Count in multiples of 6, 7, 9, 25 and 1000
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)

Key Vocabulary: share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, carry', remainder, multiple, **divisible by, factor**

Key number skills for division at Y4:

- Recall multiplication and division facts for all numbers up to 12 x 12.
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.
- Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example $200 \times 3 = 600$ so $600 \div 3 = 200$
- Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.



Year 5			
 Addition	 Subtraction	 Multiplication	 Division
Add numbers with more than 4 digits including money, measures and decimals with different numbers of decimal places.  The decimal point should be aligned in the same way as the other place value columns, and must be in the same column in the answer. Numbers should exceed 4 digits.  Pupils should be able to add more than two values, carefully aligning place value columns. Children should understand the place value of tenths and hundredths and use this to align numbers with different numbers of decimal places.	Subtract with at least 4-digit numbers including money, measures, decimals. <u>Compact Column Subtraction</u>  Subtract with decimal values, including mixtures of integers and decimals, aligning the decimal point. 	Multiply up to 4-digits by 1 or 2 digits. <u>Column Multiplication</u> - Introduce by comparing a grid method calculation to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method. - Children need to be taught to approximate first, e.g. for 72×38, they will use rounding: 72×38 is approximately $70 \times 40 = 2800$, and use the approximation to check the reasonableness of their answer against. Short multiplication for multiplying by a single digit:  Long multiplication for multiplying by 2 digits: 	Divide up to 4 digits by a single digit including those with remainders. <u>Short division</u> Including remainder answers  Short division with remainders: Now that pupils are introduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where pupils consider the meaning of the remainder and how to express it, ie. as a fraction, a decimal, or as a rounded number or value, depending upon the context of the problem. <u>Long Division</u> Basic long division may be encountered in Year 5. See Year 6 for the methodology.



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$$\begin{array}{r} 1928.27 \\ + 4293.55 \\ \hline 6221.82 \end{array}$$

18 $\times$ 3 on the first row -
3 $\times$ 8 = 24 , carry the 2 for twenty
then 1 $\times$ 3.

18 $\times$ 10 on the second row -
Put a zero in units first, then 1 $\times$ 8,
1 $\times$ 1

More complex :

$$\begin{array}{r} 3652 \\ \times \quad 8 \\ \hline 29216 \\ 541 \end{array}$$



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Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, 'carry', expanded, compact, vertical, thousands, hundreds, digits, inverse & decimal places, decimal point, tenths, hundredths, thousandths

Key skills for addition at Y5:

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 100 and adjust; use near doubles, inverse, partitioning and recombining; using number bonds.
- Use rounding to check answers and accuracy.
- Solve multi-step problems in contexts, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.
- Add numbers with more than 4 digits using formal written method of columnar addition.

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is?, difference, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal

Key skills for subtraction at Y5:

- Subtract numbers mentally with increasingly large numbers.
- Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy.
- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Count forwards or backwards in steps of powers of 10 for any given number up to 1 million.
- Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through 0.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.

Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, as big as, once, twice, three times..., partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short/long multiplication, carry

Key skills for multiplication at Y5:

- Identify multiples and factors, using knowledge of multiplication tables to 12x12.
- Solve problems where larger numbers are decomposed into their factors
- Multiply and divide integers and decimals by 10, 100 and 1000
- Recognise and use square and cube numbers and their notation
- Solve problems involving combinations of operations, choosing and using calculations and methods appropriately

Key Vocabulary: share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple, divisible by, factor, inverse, quotient, prime number, prime factors, composite number (non-prime)

Key number skills for division at Y5:

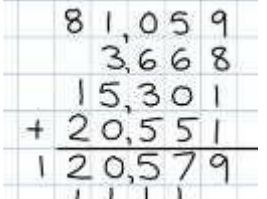
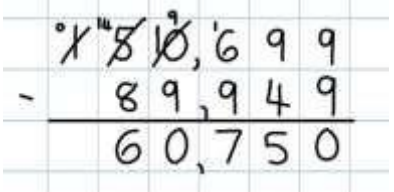
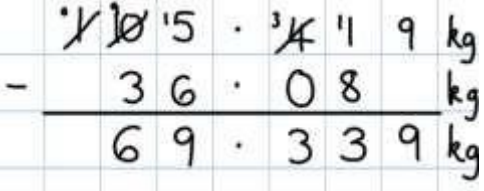
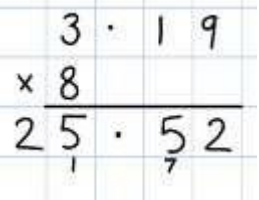
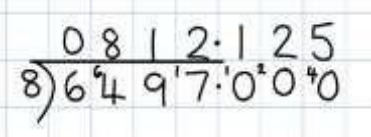
- Multiply and divide numbers mentally, drawing upon known facts.
- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number.
- Solve problems involving multiplication and division where larger numbers are decomposed into their factors.
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
- Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.
- Work out whether a number up to 100 is prime, and recall prime numbers to 19.
- 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
- Use multiplication and division as



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			inverses. • Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. $98 \div 4 = 24 \text{ r } 2 = 24\frac{1}{2} = 24.5 \approx 25$). • Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.
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Year 6			
 Addition	 Subtraction	 Multiplication	 Division
<u>Add several numbers of increasing complexity</u>  Adding several numbers with different numbers of decimal places (including money and measures): - Tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically including in the answer row. - Zeros could be added into any empty decimal places, to show there is no value to add.  Adding several numbers with more than 4 digits.	<u>Subtracting with increasingly large and more complex numbers and decimal values.</u>  Using the compact column method to subtract more complex integers.  Using the compact column method to subtract money and measures, including decimals with different numbers of decimal places.	<u>Short and long multiplication as in Y5, and multiply decimals with up to 2d.p by a single digit.</u>  Remind children that the single digit belongs in the units column. Children will be able to: - Use rounding and place value to make approximations before calculating and use these to check answers against. - Use short multiplication (see Y5) to multiply numbers with more than 4-digits by a single digit; to multiply money and measures, and to multiply decimals with up to 2d.p. by a single digit. - Use long multiplication (see Y5) to multiply numbers with at least 4 digits by a 2-digit number.	<u>Divide at least 4 digits by both single-digit and 2-digit numbers (including decimal numbers and quantities)</u>  Short division with remainders: Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder. Calculating a decimal remainder: In this example, rather than expressing the remainder as r 1, a decimal point is added after the units because there is still a remainder, and the one remainder is carried onto zeros after the decimal point (to show there was no decimal value in the original number). Keep dividing to an appropriate degree of accuracy for the problem being solved.



Long division by chunking for dividing by 2 digits.

$$\begin{array}{r} 27 \\ 36 \overline{) 972} \\ \underline{- 720} \\ 252 \\ \underline{- 252} \\ 0 \end{array}$$

Answer : 27

20x
7x

Find out how many 36's are in 972 by taking away 'chunks' of 36 until 0 is reached.

Children to write a 'useful' list first at the side to help them decide what 'chunks' to use. E.g.

$$1x = 36$$

$$10x = 360$$

$$100x = 3600$$

Start with $\times 10$ $\times 100$ and then encourage children to use other/more efficient 'chunks' e.g. $\times 20 \times 5 \times 7$

Where remainders occur, pupils should express them as fractions, decimals or use rounding, depending upon the problem.

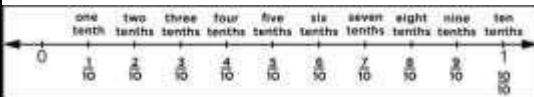
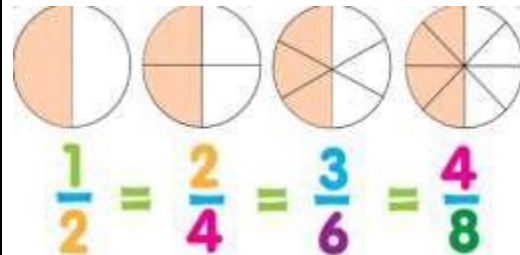
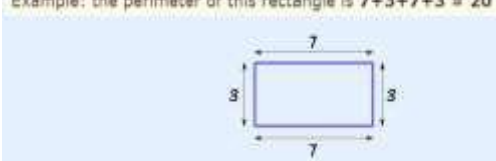
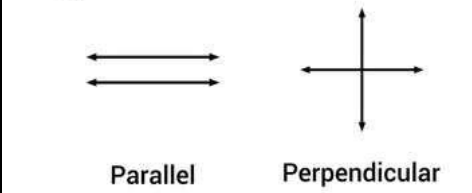
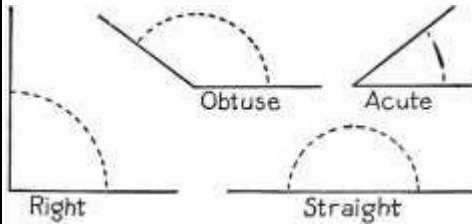
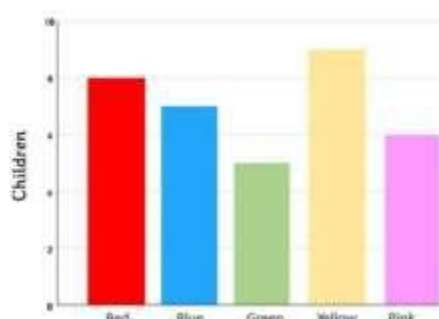


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Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, 'carry', expanded, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths Key skills for addition at Y6: • Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies. • Solve multi-step problems in context, deciding which operations and methods to use and why. • Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. • Read, write, order and compare numbers up to 10 million and determine the value of each digit. • Round any whole number to a required degree of accuracy. • Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.	Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal Key skills for subtraction at Y6: • Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why. • Read, write, order and compare numbers up to 10 million 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. • Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.	Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times...partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long multiplication, 'carry', tenths, hundredths, decimal Key skills for multiplication at Y6: • Recall multiplication facts for all times tables up to 12 x 12 (as Y4 and Y5). • Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication. • Perform mental calculations with mixed operations and large numbers. • Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods. • Estimate answers using round and approximation and determine levels of accuracy. • Round any integer to a required degree of accuracy.	Key Vocabulary: As previously Y5 , & common factor Key number skills for division at Y6: • Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations • 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. Use short division where appropriate. • Perform mental calculations, including with mixed operations and large numbers. • Identify common factors, common multiples and prime numbers. • Solve problems involving all 4 operations. • Use estimation to check answers to calculations and determine accuracy, in the context of a problem. • Use written division methods in cases where the answer has up to two decimal places. • Solve problems which require answers to be rounded to specified degrees of accuracy.
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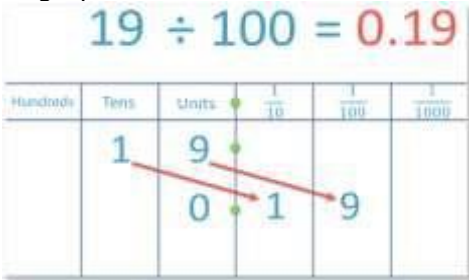
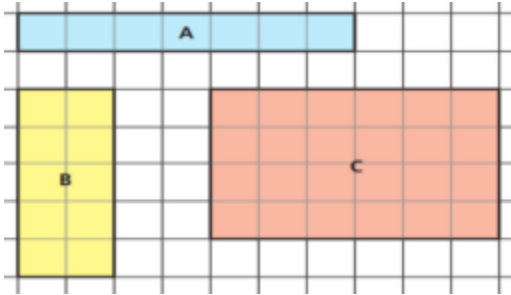
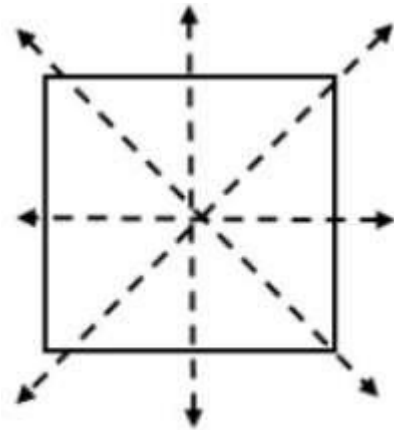
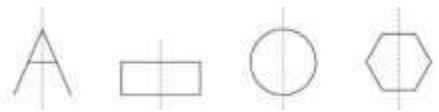
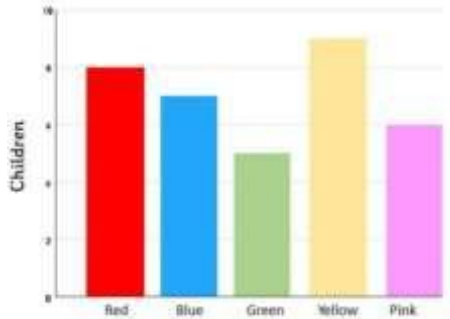


Year 3

Year 3													
Fraction	Measurement	Geometry	Statistic S										
<u>Adding unit fraction</u> Children can count up and down in tenths using a number Line/ Maths stick and can identify the tenths represented by each interval.  Can use > and < to compare unit fractions with different denominators Add and subtract fraction with the same denominator $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$ Able to show equivalent fraction using diagrams 	Measure the perimeter of simple 2d shapes by making use addition skills learnt Example: the perimeter of this rectangle is $7+3+7+3 = 20$  Compare durations of events [for example to calculate the time taken by events or tasks]. 30 minutes + 50 minutes = 80 minutes 80 minutes = 1 hour 20 minutes	Identify horizontal and vertical lines and pairs of perpendicular and parallel lines  Parallel Perpendicular Children can recognise a right angle and then can estimate correctly if angle is larger (obtuse) or smaller (acute) than a right angle.  Right Obtuse Acute	Can interpret data in scaled bar graph and a pictograph. Favourite Colour  Children Red Blue Green Yellow Pink 2 more picked yellow as their favourite colour than blue. <table><tr><th>Flavor</th><th>Number of children</th></tr><tr><td>Cheese</td><td></td></tr><tr><td>Pepperoni</td><td></td></tr><tr><td>Margherita</td><td></td></tr><tr><td>BBQ Chicken</td><td></td></tr></table> Key :  Represents 4 children 4 less children chose BBQ chicken than pepperoni.	Flavor	Number of children	Cheese		Pepperoni		Margherita		BBQ Chicken	
Flavor	Number of children												
Cheese													
Pepperoni													
Margherita													
BBQ Chicken													



Year 4

Fraction	Measurement	Geometry	Statistics
Add and subtract fraction with the same denominator $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$ Finding fractions of a whole number by dividing the whole number by the denominator and then multiplying your answer by the numerator. $\frac{2}{3} \text{ of } 24 = 16$ $24 \div 3 = 8$ $8 \times 2 = 16$ Dividing 1-digit or 2-digit numbers by 10 or 100: Count the number of placeholders in your divisor and move all digits that many spaces down the place value graph. 	Measure the perimeter of simple 2d shapes by making use addition skills learnt (see Year 3) Work out the area of a shape: Children to count the number of squares inside a shape to find the correct area, this may include half squares.  $A = 7cm^2$ $B = 10cm^2$ $C = 16cm^2$	Identify lines of symmetry in 2-D shapes presented in different orientations  4 lines of symmetry Mirror a simple symmetric shape regarding a line of symmetry. 	solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs. Favourite Colour  35 children voted altogether $8 + 7 + 5 + 9 + 6 = 35$ Yellow has the most votes, 4 more than green with the fewest votes. $9 - 5 = 4$



Year 5 and Year 6																																												
Fraction	Measurement	Geometry	Statistic S																																									
<u>Add and Subtract fraction with different denominators.</u> First find the equivalent fractions of two or more fractions. Once you have the same denominators follow the steps set out during Year 4 Using improper and mixed fractions in equations. Convert from mixed to improper fractions. Once denominators are the same perform the given operation. $2\frac{1}{2}$ Mixed fraction $\rightarrow$ $\frac{5}{2}$ Improper fraction For interactions between fractions and whole numbers see the Year 4 section	Measure the perimeter of simple 2d shapes by making use addition skills learnt (see Year 3) <u>Work out the area of a 2D shape:</u> Children measure the length and the width then multiply by each other. This only applies to quadrilaterals. When given more complex shapes children may have to use the same calculation and separate section by section. <u>Work out the volume of a 3D shape:</u> Multiply the height, width and depth of a 3D shape to find the volume.	Use Knowledge of shapes such as triangles and quadrilaterals to solve problems involving geometry. Right angled triangle One right angle $90+55+35 = 180^\circ$ Isosceles triangle Two equal sides & angles $72+72+36 = 180^\circ$ Equilateral triangle Three equal sides & angles $60+60+60 = 180^\circ$ Scalene triangle All sides & angles different $83+68+29 = 180^\circ$ Solve problems on about angles on a point using the keys facts of a circle=360, Straight line= 180 and a right angle= 90.	Solve comparison, sum and difference problems using information presented in a line graph. Complete, read and interpret information in tables, including timetables. <table><tr><td>Aytown Central</td><td>d.</td><td>0624</td><td>0658</td><td>0728</td></tr><tr><td>Bishops' Halt</td><td>d.</td><td>0638</td><td>0712</td><td>0742</td></tr><tr><td>Cayleigh Bridge</td><td>d.</td><td>0654</td><td>0728</td><td>0758</td></tr><tr><td>Dozy Bank</td><td>d.</td><td>0712</td><td>0746</td><td>0816</td></tr><tr><td>Eyreville</td><td>a.</td><td>0732</td><td>0806</td><td>0836</td></tr><tr><td>Foul Street</td><td>d.</td><td>0749</td><td>-</td><td>0853</td></tr><tr><td>Gravillenot</td><td>d.</td><td>0808</td><td>-</td><td>0912</td></tr><tr><td>High Brow</td><td>a.</td><td>0827</td><td>-</td><td>0931</td></tr></table>		Aytown Central	d.	0624	0658	0728	Bishops' Halt	d.	0638	0712	0742	Cayleigh Bridge	d.	0654	0728	0758	Dozy Bank	d.	0712	0746	0816	Eyreville	a.	0732	0806	0836	Foul Street	d.	0749	-	0853	Gravillenot	d.	0808	-	0912	High Brow	a.	0827	-	0931
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