



Ashford Oaks Primary School Calculation Policy




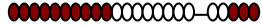

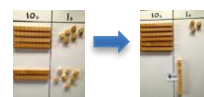
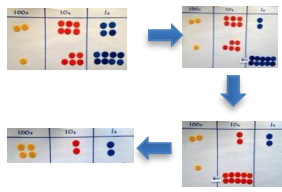

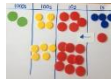
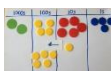

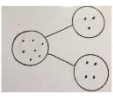
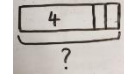
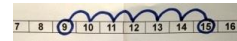

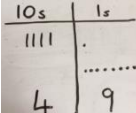
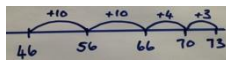
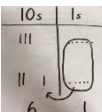
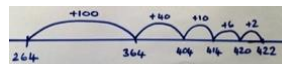

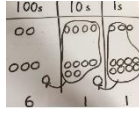
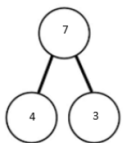
January 2023

This calculation policy is designed to support teachers and parents in understanding the expectations of the national curriculum in terms of mathematical fluency, and the progression of calculation in a child's mathematical development.

Whilst this calculation policy suggests ways to develop proficiency with the expected formal methods by the end of year 6, readers should be aware that the ultimate goal of the maths curriculum is for children to be able to mentally solve problems, rather than solely relying on a written method.




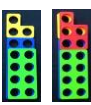
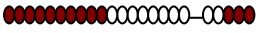
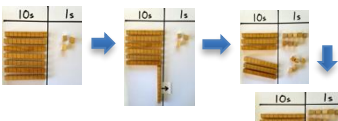
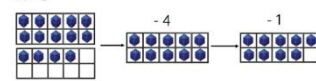
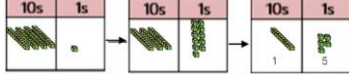






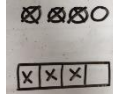
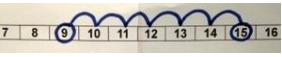
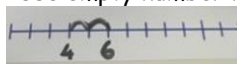
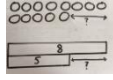

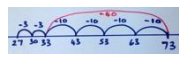
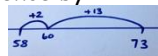
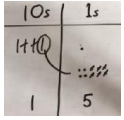
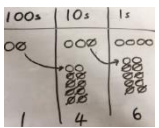
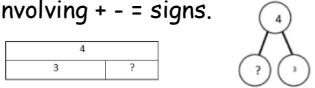
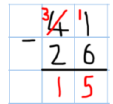
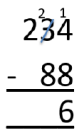
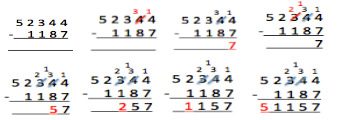
The policy highlights the key areas for each year group in terms of addition, subtraction, multiplication and division. Teachers should identify which stage individual children are working at to best support their learning. Where necessary, teachers should use earlier approaches and materials to bridge any gaps in a child's understanding. For this reason, teachers should have an understanding of the expectations and progression in mathematics for all stages of development, regardless of the year group they teach.

Addition

Skill Progression					
Concrete	<p>-Show number bonds with ten frame or Numicon:</p>  <p>-Count all objects:</p>  <p>-Count on objects:</p> 	<p>-Use a number track/ line/ beadstring to count on:</p>  <p>-Partition using resources to represent 10s and 1s:</p>  <p>-Partition and recombine:</p> $46 + 27 = 60 + 13 = 73$ 	<p>-Place value counters:</p> $264 + 158$  <p>(also use £, 10p and 1p coins)</p>	<p>-Place value counters:</p> <p>Show 2458 and 596.</p>  <p>Combine 1s. Exchange for a 10.</p>  <p>Combine 10s. Exchange for 100.</p>  <p>Combine 100s. Exchange for a 1000 and read final answer.</p> 	<p>-Be able to use appropriate resources to display the working out for an addition calculation. Explain how the resources show the process.</p>
Pictorial	<p>-Represent objects using dots or crosses</p> <p>-Draw a part-whole model</p>  <p>-Draw a bar model to count on rather than count all:</p>  <p>-Count on in 1s on a number track:</p> 	<p>-Use place value:</p>  <p>-Draw lines and dots to represent base 10:</p>  <p>-Count in 10s and bridge:</p> 	<p>-Represent base 10 in place value chart:</p>  <p>-Use numberline:</p>  <p>-Round and adjust on numberline:</p> 	<p>-Represent counters on a place value chart and circle when they exchange:</p> 	<p>-Be able to draw an appropriate diagram to display the working out for an addition calculation. Explain how the diagram shows the process.</p>
Abstract	<p>-Read, write and interpret mathematical statements involving + - = signs.</p> <p>-Solve missing number problems such as $7 = ? + 4$</p> 	<p>-Round and adjust:</p> $25 + 29 \text{ (add 30 then - 1)}$ <p>-Look for ways to make 10:</p> $\begin{array}{l} 36 + 25 = \\ \swarrow \quad \searrow \\ 1 \quad 5 \quad \quad 36 \end{array}$ <p>$30 + 20 = 50$ $5 + 5 = 10$ $50 + 10 + 1 = 61$</p> <p>-Add numbers: 2digit and ones, 2digit and tens, two 2digits, three 1digit.</p>	<p>-Add numbers: 3digit and ones, 3digit and tens, 3digit and hundreds</p>	<p>-Formal written methods where appropriate:</p> $\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ 1 \quad 1 \end{array}$ <p>-2-step word problems. Choose which methods to use and why.</p>	<p>-Use column addition:</p> $\begin{array}{r} 23454 \\ +596 \\ \hline 24050 \\ 1 \quad 1 \quad 1 \end{array}$ <p>-Perform mental calculations, including mixed operations and large numbers.</p> <p>-Multi-step word problems.</p>


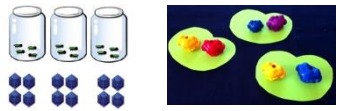
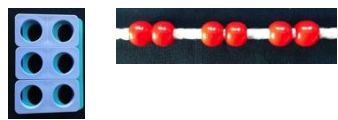
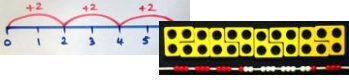

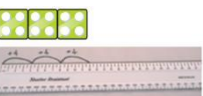
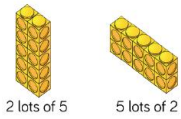
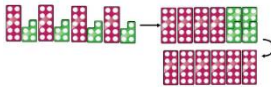
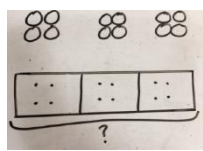
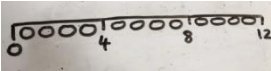
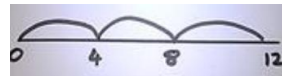
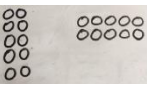

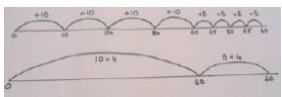
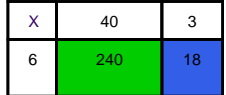
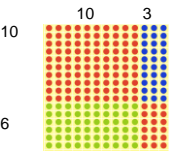

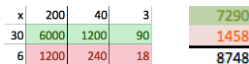

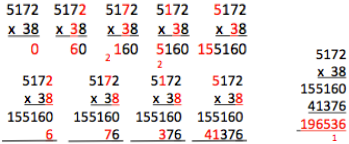
Conceptual Variation	Different ways to ask children to solve 21 + 34												
	<div><div><div><div><div>?</div><div>21</div><div>34</div></div><div><div>?</div><div>21</div><div>34</div></div></div><div><div><div>21</div><div>34</div></div></div></div><div><div><div>21</div><div>+34</div><div></div></div><div>21 + 34 =</div><div><div></div><div>= 21 + 34</div></div></div><div><div>Calculate the sum of twenty-one and thirty-four.</div></div><div><div><div><div><div></div><div></div><div></div><div></div><div></div></div><div></div></div><div>+</div><div><div><div><div></div><div></div><div></div><div></div><div></div></div><div></div></div><div><div><div></div><div></div><div></div><div></div><div></div></div><div></div></div></div></div><div>Missing digit problems:</div><div><table><tr><th>10s</th><th>1s</th></tr><tr><td><div><div>10</div><div>20</div></div></td><td><div><div>1</div></div></td></tr><tr><td><div><div>30</div><div>40</div><div>50</div></div></td><td><div><div>?</div></div></td></tr><tr><td><div><div>?</div></div></td><td><div><div>5</div></div></td></tr></table></div></div></div>						10s	1s	<div><div>10</div><div>20</div></div>	<div><div>1</div></div>	<div><div>30</div><div>40</div><div>50</div></div>	<div><div>?</div></div>	<div><div>?</div></div>
10s	1s												
<div><div>10</div><div>20</div></div>	<div><div>1</div></div>												
<div><div>30</div><div>40</div><div>50</div></div>	<div><div>?</div></div>												
<div><div>?</div></div>	<div><div>5</div></div>												
Need to know	<div><div>Year 1</div><div><div>•1 more</div><div>•Number bonds to 10</div><div>•Add 10</div><div>•Doubles to 10</div><div>•Ten plus ones</div></div></div>	<div><div>Year 2</div><div><div>• 10 more</div><div>• Number bonds to 20</div><div>• Partition 2nd number, add tens then ones</div><div>• Add 10 and multiples</div><div>• Doubles to 20</div><div>• Add near multiples of 10</div></div></div>	<div><div>Year 3</div><div><div>• Add multiples of 10, 100</div><div>• Add 1 digit bridging boundaries</div><div>• Partition 2nd number to add</div><div>• Use near doubles to add</div><div>• Add near multiples of 10, 100 by rounding and adjusting</div><div>• Partition and recombine</div></div></div>	<div><div>Year 4</div><div><div>• Add multiples of 10, 100, 1000</div><div>• Fluency in 2digit + 2digit</div><div>• Decimal pairs of 10 and 1</div><div>• Use near doubles to add</div><div>• Adjust both numbers before adding</div><div>• Add near multiples</div><div>• Partition and recombine</div><div>• Partition 2nd number</div></div></div>	<div><div>Year 5</div><div><div>• Add multiples of 10, 100, 1000, tenths</div><div>• Fluency in 2digit + 2digit with decimals</div><div>• Partition 2nd number</div><div>• Use number facts, bridging and place value</div><div>• Adjust numbers to add</div><div>• Partition and recombine</div></div></div>	<div><div>Year 6</div><div><div>• Add multiples of 10, 100, 1000, tenths, hundredths</div><div>• Fluency in 2digit + 2digit with decimals</div><div>• Partition 2nd number</div><div>• Use number facts, bridging and place value</div><div>• Adjust numbers to add</div><div>• Partition and recombine</div></div></div>							

Subtraction

Skill Progression 					
Concrete	<ul style="list-style-type: none"> -Physically take away objects. -Show difference between numbers:  -Count out, then count how many are left:  -Find the difference between numbers with Numicon:  	<ul style="list-style-type: none"> -Use a numberline, number track, or beadstring to count back:  -Taking away and exchanging:  -Use ten frames:  	<ul style="list-style-type: none"> -Use base 10 and be able to exchange:  	<ul style="list-style-type: none"> -Use place value counters to model exchanging: 344- 187 Where's the 187?  Exchange to make 300 and 30 and 14.  Take away 7  Exchange to make 200, 13 tens and 7.  Take away 80  Take away 100.  	<ul style="list-style-type: none"> -Be able to use appropriate resources to display the working out for a subtraction calculation. Explain how the resources show the process.
Pictorial	<ul style="list-style-type: none"> -Draw the resources and cross out the correct amount:  -Count back on a number track, then a number line:  -Use empty number lines:  	<ul style="list-style-type: none"> -Draw cubes, or use bar model to show calculation:  -Represent base 10:  -Use a numberline to count back in jumps:  -Find the difference by counting up:  	<ul style="list-style-type: none"> -Represent base 10 and show the exchange:  	<ul style="list-style-type: none"> -Represent place value counters and show the exchange:  	<ul style="list-style-type: none"> -Be able to draw an appropriate diagram to display the working out for a subtraction calculation. Explain how the diagram shows the process.
Abstract	<ul style="list-style-type: none"> -Read, write and interpret mathematical statements involving + - = signs.  -Solve missing number problems: 7 = 9 - ? 	<ul style="list-style-type: none"> -Subtract numbers: 2digit and ones, 2digit and tens, two 2digit. 	<ul style="list-style-type: none"> -Formal written methods where appropriate.  -Subtract numbers: 3digit and ones, 3digit and tens, 3digit and hundreds 	<ul style="list-style-type: none"> -Column subtraction: Must understand what has happened when they cross out the digits.  -2-step word problems. 	<ul style="list-style-type: none"> -Use column subtraction:  -Perform mental calculations, including mixed operations and large numbers. -Multi-step word problems.

<div>Conceptual Variation</div>	<div>Different ways to ask children to solve 391 - 186</div> <div><div><div><div>391</div><div><div>?</div>186</div></div></div><div><div><div>391</div><div>186</div><div>?</div></div></div><div><div>Raj spent £391, Timmy spent £186. How much more did Raj spend?</div><div>Calculate the difference between 391 and 186.</div></div><div><div><div><div><div><div></div></div></div><div>= 391 - 186</div></div><div><div>391</div><div>-186</div><div></div></div><div>What is 186 less than 391?</div></div><div><div>Missing digit calculations</div><div><div><div><div>39</div><div><div></div><div></div></div><div>6</div></div><div><div></div>05</div></div></div></div></div></div>					
<div>Need to know</div>	<div><div>Year 1</div><div><div>• 1 less</div><div>• Number bonds from 10</div><div>• Count back</div><div>• Subtract 10</div><div>• Teens subtract 10</div><div>• Difference between</div></div></div>	<div><div>Year 2</div><div><div>• 10 less</div><div>• Number bonds from 20</div><div>• Subtract 1digit from 2digit by bridging</div><div>• Partition 2nd number, count back in 10s then 1s</div><div>• Subtract 10 and multiples of 10</div><div>• Subtract near multiples of 10</div><div>• Difference between</div></div></div>	<div><div>Year 3</div><div><div>• Subtract multiples of 10, 100</div><div>• Subtract 1digit by bridging through boundaries</div><div>• Partition 2nd number</div><div>• Difference between</div><div>• Subtract near multiples of 10 and 100 by rounding and adjusting</div><div>• Difference between</div></div></div>	<div><div>Year 4</div><div><div>• Subtract multiples of 10, 100, 1000</div><div>• Fluency 2digit - 2digit</div><div>• Decimal subtraction from 10 or 1</div><div>• Partition 2nd number</div><div>• Difference between</div><div>• Subtract near multiples by rounding and adjusting</div><div>• Difference between</div></div></div>	<div><div>Year 5</div><div><div>• Subtract multiples of 10, 100, 1000, tenths</div><div>• Fluency 2digit - 2digit with decimals</div><div>• Partition 2nd number</div><div>• Difference between</div><div>• Adjust numbers to subtract</div></div></div>	<div><div>Year 6</div><div><div>• Subtract multiples of 10, 100, 1000, tenths, hundredths</div><div>• Fluency 2digit - 2digit with decimals</div><div>• Partition 2nd number</div><div>• Use number facts, bridging and place value</div><div>• Adjust numbers to subtract</div><div>• Difference between</div></div></div>

Multiplication

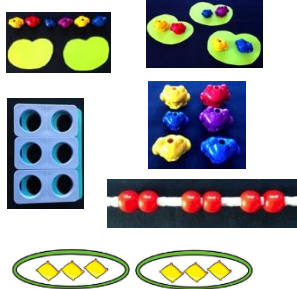
Skill Progression 					
Concrete	<p>-Repeated grouping/ repeated addition:</p>  	<p>-Use a numberline to show repeated addition:</p>  <p>-Build tables on counting sticks:</p>  <p>-Use numicon or cuisenaire to show repeated groups:</p> 	<p>-Use arrays with counters or objects) to show commutativity:</p>  <p>2 lots of 5 5 lots of 2</p>	<p>-Partition to multiply using numicon, base 10 or cuisenaire:</p> 	<p>-Be able to use appropriate resources to display the working out for a multiplication calculation. Explain how the resources show the process.</p>
Pictorial	<p>-Represent the resources and use a bar model:</p> 	<p>-Represent the groups along a numberline:</p>  <p>-Empty numberline showing jumps:</p> 	<p>-Represent arrays:</p>  <p>-Use arrays and start to partition.</p> <p>$13 \times 4 = 10 \times 4 + 3 \times 4$</p>  <p>-Use numberlines:</p> 	<p>-Use arrays and partitioning:</p>  	<p>-Be able to draw an appropriate diagram to display the working out for a multiplication calculation. Explain how the diagram shows the process.</p>
Abstract	<p>-multiplication: $3 \times 4 = 12$</p> <p>-repeated addition:</p> <p>$4 + 4 + 4 = 12$</p> <p>-Solve 1-step x problems</p>	<p>-Understand multiplication is commutative and division is not.</p>	<p>-Use arrays to write a range of calculations:</p> <p>$10 = 2 \times 5, 5 \times 2 = 10$</p> <p>$10 = 5 + 5$</p> <p>$2 + 2 + 2 + 2 + 2 = 10$</p> <p>-Use partitioning:</p>  <p>-Multiply numbers: 2digit times 1digit</p>	<p>-Use arrays to support grid method:</p>  <p>-Formal column short multiplication.</p>  <p>-Multiply three numbers.</p> <p>-Multiply by 0 and 1.</p> <p>-Use factor pairs.</p>	<p>-Formal long multiplication:</p>  <p>-X whole numbers and decimals by 10, 100, 1000</p> <p>-Find factor pairs, and common factors.</p> <p>-Prime numbers.</p>

Conceptual Variation	<div>Different ways to ask children to solve 6×23</div> <div><div><table><tr><td>23</td><td>23</td><td>23</td><td>23</td><td>23</td><td>23</td></tr></table><div>?</div></div><div>Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week?</div><div>With the counters, prove that $6 \times 23 = 138$</div></div> <div><div>Find the product of 6 and 23</div><div>$6 \times 23 =$</div><div><div><div><div></div></div><div>$= 6 \times 23$</div></div><div><div><div>6</div><div>23</div></div><div><div>$\times \underline{23}$</div><div>$\times \underline{6}$</div></div></div></div><div><div>What is the calculation?</div><div>What is the product?</div><div><table><tr><th>100s</th><th>10s</th><th>1s</th></tr><tr><td></td><td><div><div></div><div></div><div></div><div></div><div></div><div></div></div></td><td><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div></td></tr></table></div></div></div>						23	23	23	23	23	23	100s	10s	1s		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>
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Need to know	<div><u>Year 1</u></div> <div><ul style="list-style-type: none">Count in 2s, 5s, 10sDoubles to 10Double multiples of 10</div>	<div><u>Year 2</u></div> <div><ul style="list-style-type: none">2, 5, 10 x tableCount in 3sDoubles to 20Multiples of 5</div>	<div><u>Year 3</u></div> <div><ul style="list-style-type: none">Review 2, 5, 10 x table4, 8, 3, 6 x tableDouble 2digit numbers</div>	<div><u>Year 4</u></div> <div><ul style="list-style-type: none">All multiplication facts to 12 x 12Double larger numbers and decimals</div>	<div><u>Year 5</u></div> <div><ul style="list-style-type: none">All multiplication facts to 12 x 12100, 1000 times bigger10, 100, 10000 times smallerDouble larger numbers and decimalsPartition to multiply mentally</div>	<div><u>Year 6</u></div> <div><ul style="list-style-type: none">All multiplication facts to 12 x 12Partition to multiply mentallyDouble larger numbers and decimals</div>												

Skill Progression

Concrete

-Sharing objects in groups:



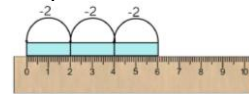
-Sharing: $15 \div 3 = 5$ in a group



-Grouping: $15 \div 3 = 5$ groups of 3



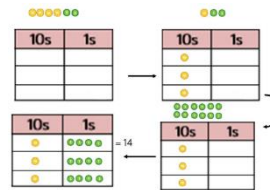
-Repeated subtraction:



-Use rods to divide with remainders: $13 \div 4$

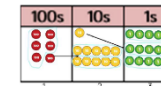


-Sharing using place value counters: $42 \div 3 = 14$



-Short division using place value counters to group: $615 \div 5$

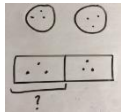
Group into 5 hundreds. Exchange. Group into 5 tens. Exchange. Group into 5 ones.



-Be able to use appropriate resources to display the working out for a division calculation. Explain how the resources show the process.

Pictorial

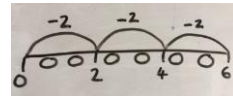
-Represent the sharing:



-Represent objects with dots and share equally:



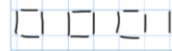
-Represent repeated subtraction:



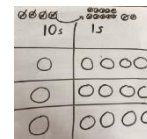
-Abstract numberline to represent equal groups:



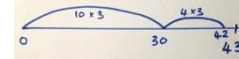
-Represent rods pictorially:



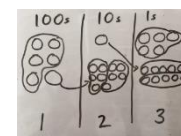
-Represent place value counters:



-Grouping using partitioning:



-Represent counters and show exchanging:



-Chunking on numberline:



-Be able to draw an appropriate diagram to display the working out for a division calculation. Explain how the diagram shows the process.

Abstract

-Halving: $6 \div 2 = 3$



-Solve 1 step \div problems

-Understand multiplication is commutative and division is not.

-Grouping using partitioning:

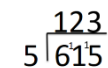


-Calculate mathematical statements for division using times table knowledge.

-Group using partitioning: $196 \div 6$.



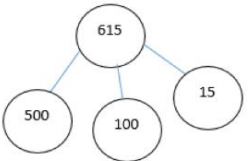
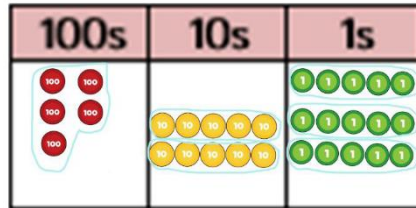
-Formal short division:



-Use factor pairs.
-Divide by 1.
-Divide by 1 and 0

-Long division by chunking or using short division method.

- \div whole numbers and decimals by 10, 100, 1000

Conceptual Variation	<div> <p>Different ways to ask the children to solve $615 \div 5$</p> <div> <p>Using the part whole model below, how can you divide 615 by 5 without using short division?</p>  </div> <div> <p>I have £615 and share it equally between 5 bank accounts. How much will be in each account?</p> <p>615 pupils need to be put into 5 groups. How many will be in each group?</p> </div> <div> $5 \overline{)615}$ <p>$615 \div 5 =$</p> <p>$\square = 615 \div 5$</p> </div> <div> <p>What is the calculation? What is the answer?</p>  </div> </div>					
Need to know	<p><u>Year 1</u></p> <ul style="list-style-type: none"> Count back in 2s, 5s, 10s Halves to 10 Halve multiples of 10 How many 2s? 5s? 10s? 	<p><u>Year 2</u></p> <ul style="list-style-type: none"> Division facts 2, 5, 10 x tables Halves to 20 Count back in 3s 	<p><u>Year 3</u></p> <ul style="list-style-type: none"> Review division facts 2, 5, 10 x tables Division facts 4, 8, 3, 6 x table Halve 2digit numbers 	<p><u>Year 4</u></p> <ul style="list-style-type: none"> Division facts to 12×12 Halve larger numbers and decimals 	<p><u>Year 5</u></p> <ul style="list-style-type: none"> Division facts to 12×12 100, 1000 times smaller Partition to divide mentally Halve larger numbers and decimals 	<p><u>Year 6</u></p> <ul style="list-style-type: none"> Division facts to 12×12 Partition to divide mentally Halve larger numbers and decimals

Maths Vocabulary

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1 more/ 1 less Equal to More than/Less than Most/Least Add/Put together/Total/ Altogether Take away/Distance between/Difference between Doubling/Halving Groups of Half/Quarter Part of a whole Long/Short Heavy/Light Full/ Empty/Half Full Earlier/Later Quicker/Slower Hours/Minutes/Seconds Pounds/Pence Before/After/First/Next Today/Tomorrow/Yesterday Morning/Afternoon/Evening Days/Weeks/Months/Years Hour/Half Past/ O'clock Common 2d shapes Common 3d shapes Whole turn/Half turn/ Quarter turn/ $\frac{3}{4}$ turn	<u>Year 1 vocabulary +</u> Partition Place holder Add Subtract Inverse Sum Difference Odd/Even Multiply Divide Arrays Repeated addition Repeated subtraction Grouping/Sharing Third/One quarter/Three quarters m/ cm kg/ g l/ ml °C Finding change Analogue Minutes to/ Minutes past Line symmetry Sides of a 2d shape Edges/ Faces/ Vertices Quadrilateral/ Polygon Rotation Clockwise/ Anti-clockwise Pictogram/Tally Chart/Tables/ Block diagrams	<u>Year 1 & 2 vocabulary +</u> Column addition Column subtraction Estimate Tenths Equivalent fractions Denominator m/ cm/ mm Perimeter Roman numerals Digital/ Analogue Am/ Pm Noon/ Midnight Years/ Leap years Angles Right angles/ Acute/ Obtuse Greater than/ Less than Horizontal/ Vertical Perpendicular/ Parallel Bar charts How many more? How many fewer?	<u>Year 1, 2 & 3 vocabulary +</u> 1000 more/ 1000 less Negative numbers Rounding Factor pairs Hundredths Fractions of a length Fractions of a shape Simplify fractions Decimals Ones/ Tenths/ Hundredths 1 decimal place/ 2 decimal places Factors/ Multiples m/ km Area Isosceles/Equilateral/ Right-angled/ Scalene Protractor Co-ordinates Translations	<u>Year 1,2,3 & 4 vocabulary +</u> Power of ten Common factors Prime numbers Prime factors Composite numbers Square numbers Cube numbers Mixed numbers Improper fractions Thousandths 3 decimal places Percentage % Proportion Imperial measurements/ Inches/ Pounds (lb)/ Pints Volume Capacity Reflex angles Reflection Line graph Timetables	<u>Year 1,2,3,4 & 5 vocabulary +</u> Common multiples Order of operations/ Brackets Ratio Scale factor Algebra Formula/ Equation Variables Miles Radius/ Diameter/ Circumference Nets Pie charts Mean/ Median/ Mode