Heath Mount School Calculation Policy 2023

Calculation Policy

Heath Mount School

This policy supports Herts For Learning, Essential Maths, PA Plus and White Rose maths scheme which are used throughout the school up to Year 6. Progression within each area of calculation is in line with the programme of study in the updated 2021 National Curriculum.

This calculation policy should be used to support children to develop a deep understanding of number and calculation. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations.

- Concrete representation— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.
- Pictorial representation – a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations, such as a diagram or picture of the problem.
- Abstract representation—a pupil is now capable of representing problems by using mathematical notation, for example 12 x 2 = 24. It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations.

Mathematics Mastery

This approach to the teaching of mathematics is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used in Years 1 to Year 6 and the skills continued to be applied in Years 7 and 8.

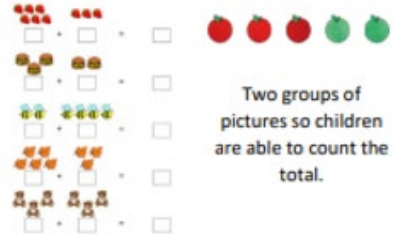
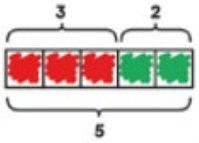
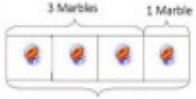
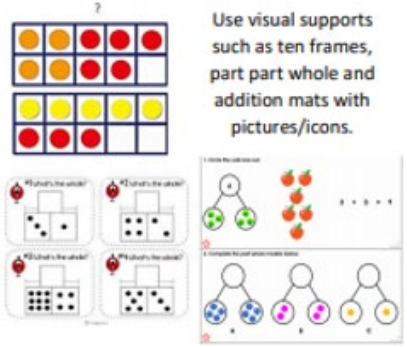
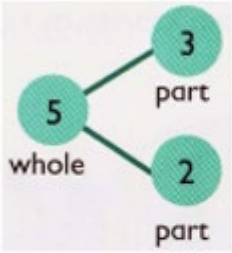
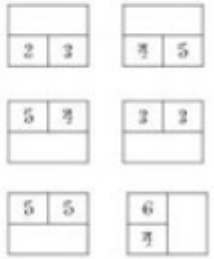
Using this Policy

This mathematics policy is a guide for all staff at Heath Mount School. All teachers have been given long term and medium term plans that are supported by the daily lesson plans for the White Rose Maths Hub (Yr3-6) and Herts for Learning PAPlus and Essential Maths (EYFS-Yr2). Teachers are able to use their professional judgement, adapting methods and teaching style, while incorporating the CPA approach, in order to gain efficient and reliable calculation methods based on the ability and needs of pupils in their class. Subsequently, pupils are able to use methods outside of this policy provided they are using clear, follow able methodology reliably and efficiently. For each of the four rules of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach (Make it, Draw it, Write it) is for children to have a true understanding of a mathematical concept, they need to master all three phases within a year group's scheme of work.

Addition

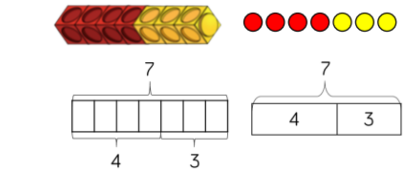
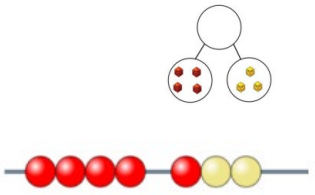
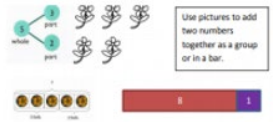
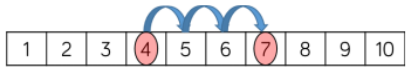
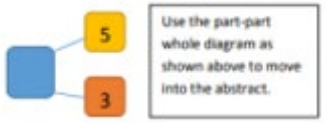
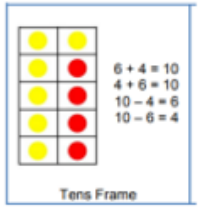
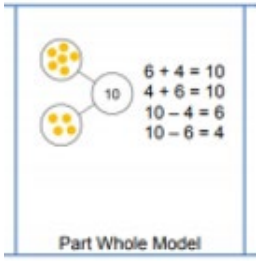
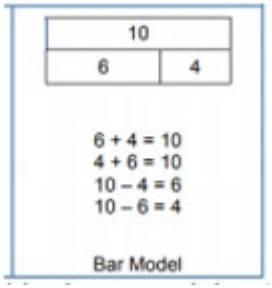
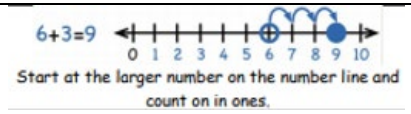
Calculation Policy

Heath Mount School

EYFS - Addition			
Objectives	**Concrete**	**Pictorial**	**Abstract**
Knows that a group of things can change in quantity when something is added Find the total number of items in two groups by counting all of them Says the number that is one more than a given number Finds one more than a group of up to 5 objects, then 10 objects In practical activities, begin to use the vocabulary associated with addition Using quantities and objects, they add two single digit numbers and count on to find the answer Solve problems including doubling	 Use toys and general classroom resources for children to physically manipulate, group/regroup.  Use specific maths resources such as counters, snap cubes, Numicon etc.    Use visual supports such as ten frames, part part whole and addition mats, with the physical objects and resources that can be manipulated.	 Two groups of pictures so children are able to count the total.  Bar model using visuals, pictures/icons or colours.  Use visual supports such as ten frames, part part whole and addition mats with pictures/icons.  Pupils can also choose their own way to show their recording	A focus on symbols and numbers to form a calculation. 5+2=7   * No expectation for children to be able to record a number sentence/addition calculation.
Vocabulary	**Total, (understand cardinality) (be able to subitise) altogether, count, count on, accurate, how many, double, none, zero, nothing**		

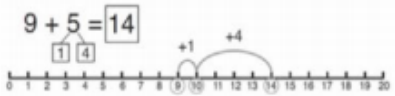
Calculation Policy

Heath Mount School

Year 1- Addition				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
Combine two-parts to make a whole (use part-whole model)	 	 The Bar Model will be continued from EYFS as a method to support problem solving involving addition, continuing with the concrete representations and moving onto using pictorial representations of objects. Some children will also move onto the abstract.  Pictorial (concrete) Abstract 	 **4 + 3 = 7** **7 = 4 + 3**	When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.
Represent and use number bonds and related subtraction facts within 20	 (Some children may need to initially use real objects then move onto the representation, egg boxes may also be used to support this)		 Bar model and part-whole model to be used alongside abstract	
Addition of 1-digit and 2-digit numbers to 20	 Start with the larger number and count on	 Start at the larger number on the number line and count on in ones.	6 + 11 = 17 17 = 11 + 6 Place the larger number in your head and count on the smaller number to find your answer.	

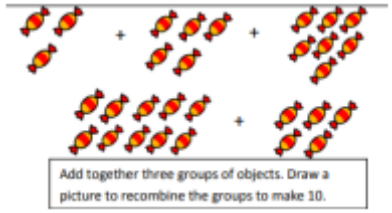
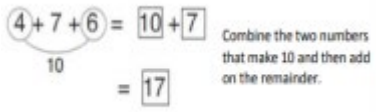
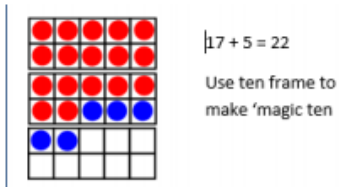
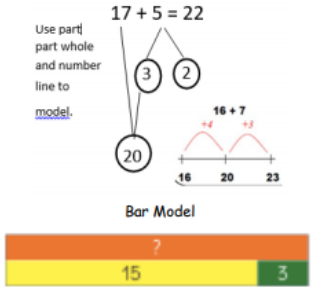
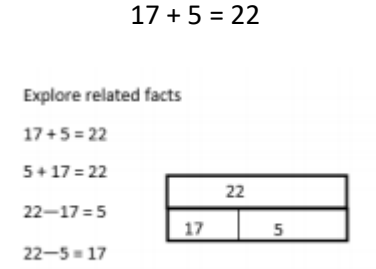
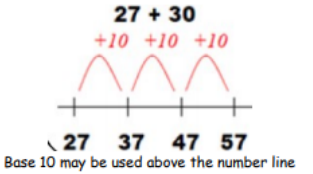
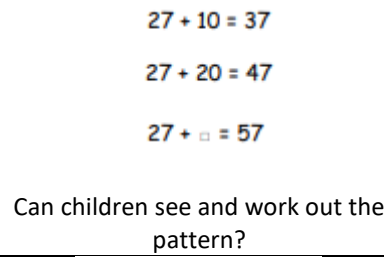
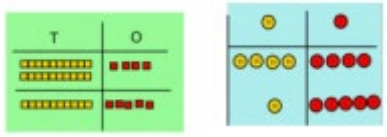
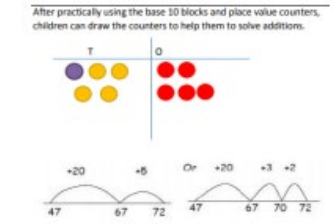
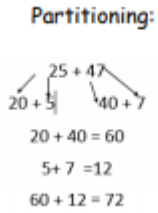
Calculation Policy

Heath Mount School

Regrouping to make 10	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10. Use ten frames.	Use pictures or a number line. Regroup or Partition the smaller number using the part part whole model to make 10. 	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?	
Vocabulary	**Add, addition, plus, more than, altogether, equal to, number bonds, number pairs, addition/subtraction facts, count on**			

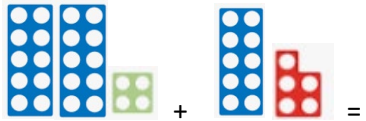
Calculation Policy

Heath Mount School

Year 2 - Addition				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
Adding 3 1-digit numbers	 Following on from making 10 with 2 of the digits, then add on the third digit.			When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps. When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. They should also apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43.
Adding a single digit to a 2-digit number				
Adding a 2-digit number to multiples of 10				
Adding 2-digit numbers (no-regrouping)	 Add together the ones first, then the tens.Use the base blocks first before moving onto PV counters.			

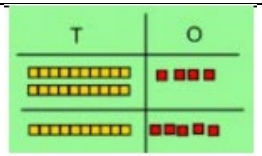
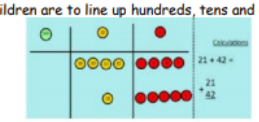
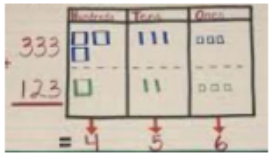
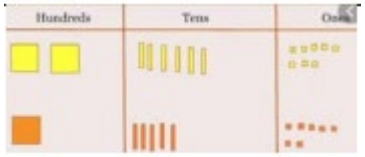
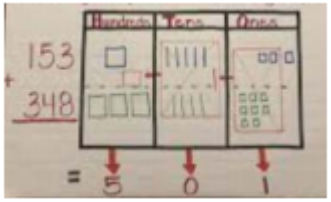
Calculation Policy

Heath Mount School

	Numicon may also be used for children who are not ready to use PV counters. 	Use number line and bridge ten using part whole if necessary. Base 10 may be used above the number line. The calculation will be shown alongside the number line to see the connection **Model** | **Calculation**	*Recording addition in columns supports place value and prepares for formal written methods with larger numbers.* Toward the end of the year, children move to more formal recording using partitioning method: 40 + 7 30 + 5 70 + 12	Hundred squares and straws can support children to find the number bond to 10.
Vocabulary	**Add, addition, more, plus, and, make, altogether, equal to, equals, most, count on, partition, column, ones, tens, number bonds, doubles, greater value.**			

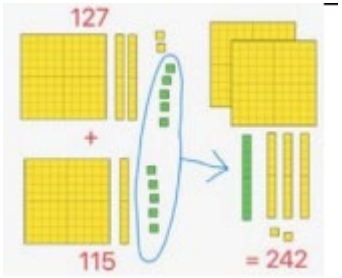
Calculation Policy

Heath Mount School

Year 3 - Addition				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
Add numbers with up to 3 digits Column Addition (no re-grouping)	 Using manipulatives (dienes, numicon, counters), children are to line up hundreds, tens and ones.  Children should be secure with using PV counters before moving onto pictorial. The calculation will be shown alongside the model used to see the connection **Model** | **Calculation**	 Children are to draw, in a PV frame, the manipulatives, that they are using. Secure knowledge of representation with the PV columns. The calculation will be shown alongside the model to see the connection **Model** | **Calculation**	2 2 3 + 1 1 4 3 3 7 Children to move onto recording more formally. Some children may need to use the expanded method (see below).	At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient. Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.
Column Addition (re-grouping)	 	 Children can draw a representation of the grid to further support their understanding, carrying the ten ***underneath*** the line.	20 + 5 40 + 8 60 + 13 = 73 Children are to begin with the abstract: expanded form. For those children, that are confident after AFL, the below method should be used. 536 + 85 621 1 1	

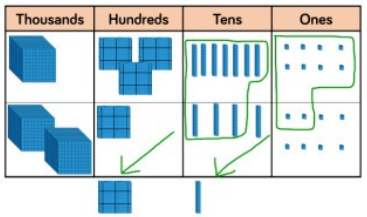
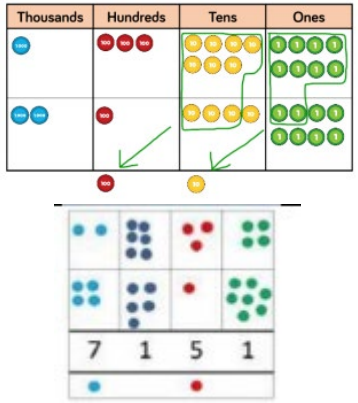
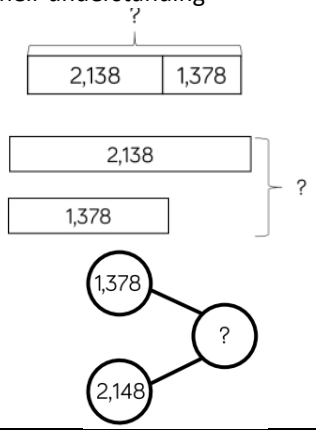
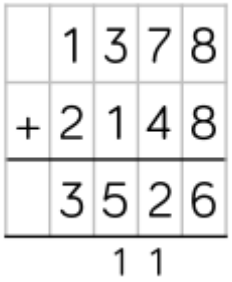
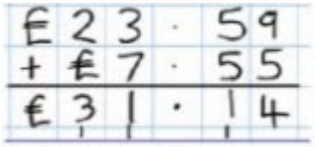
Calculation Policy

Heath Mount School

				Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.
Vocabulary	**Add, addition, more, sum, plus, and, make, altogether, equal to, equals, most, count on, partition, column, near double, double, halve,**			

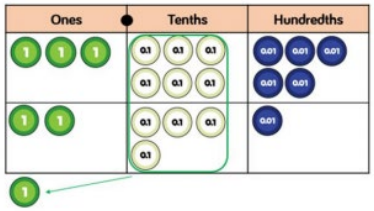
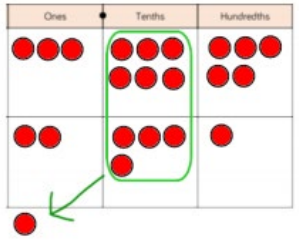
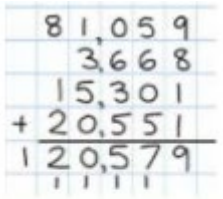
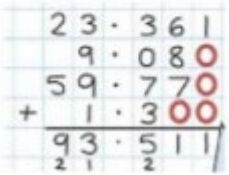
Calculation Policy

Heath Mount School

Year 4 - Addition				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
Add numbers with up to 4 digits Use formal method: Column addition Addition with decimal places		 Children can use their own pictorial recordings to further their understanding 	 As children move on introduce decimals with the same and different number of decimal places.  Ensure children have experience of adding decimals in a variety of contexts: money, measures	Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.
Vocabulary	**addition add, more, and make, sum, total, altogether, double, near double, half, halve, tens boundary, hundreds boundary, decimal, decimal point**			

Calculation Policy

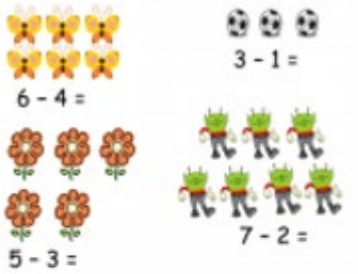
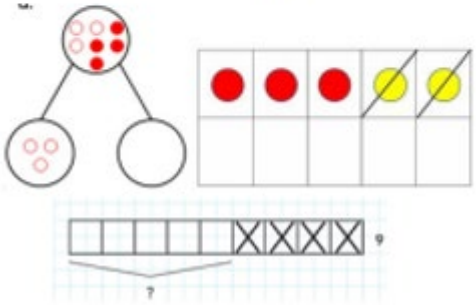
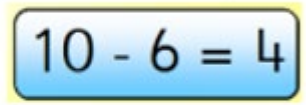
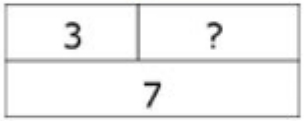
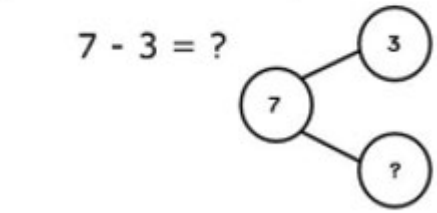
Heath Mount School

Year 5/6 - Addition				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
Addition with Decimals			3.65 + 2.41 6.06 1   Insert zeros as place value holders	Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.
Vocabulary	**addition add, more, and make, sum, total, altogether, double, near double, half, halve, tens boundary, hundreds boundary, decimal, decimal point**			

Subtraction

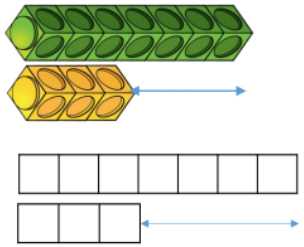
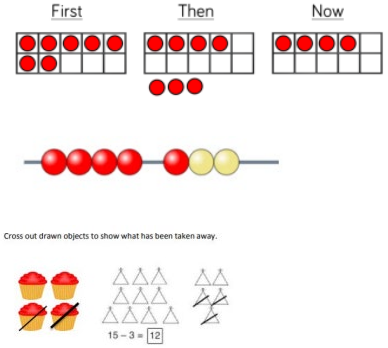
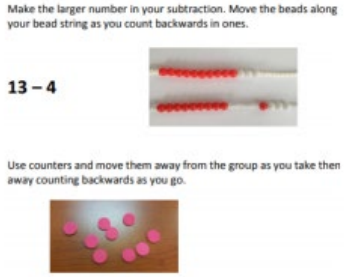
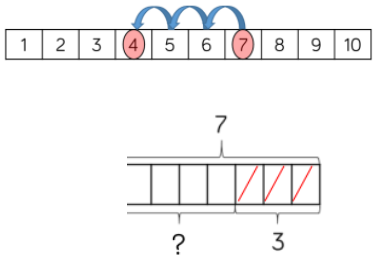
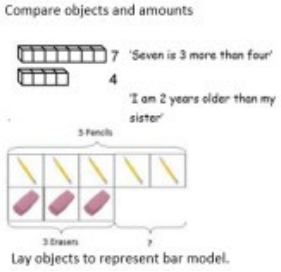
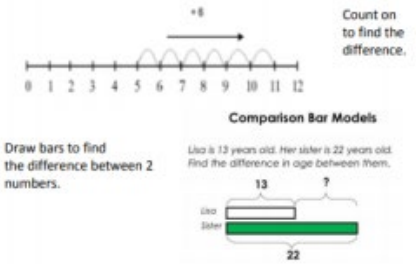
Calculation Policy

Heath Mount School

EYFS - Subtraction			
Objectives	**Concrete**	**Pictorial**	**Abstract**
Know that a group of things change in quantity when something is taken away Find 1 less from a group of 5 objects, then 10 objects In practical activities and discussion begin to use the vocabulary appropriate to subtraction Using quantities and objects they subtract two single digit numbers and count back to find the answer	 Use toys and general classroom resources for children to physically manipulate, group/regroup.   Use specific maths resources such as snap cubes, Numicon, bead strings etc.  Use visual supports such as ten frames, part part whole and subtraction mats, with the physical objects and resources that can be manipulated.	  A group of pictures for children to cross out or cover quantities to support subtraction.  Use visual supports such as ten frames, part part whole and bar model with pictures/icons.	A focus on symbols and numbers to form a calculation.     * No expectation for children to be able to record a number sentence/addition calculation.
Vocabulary	**Subtract, take-away, less than, left, fewer, equals**		

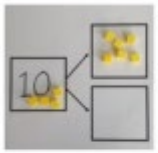
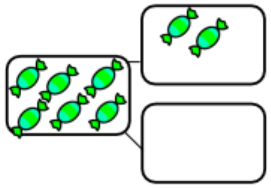
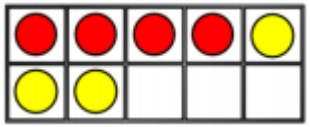
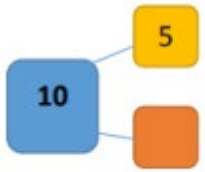
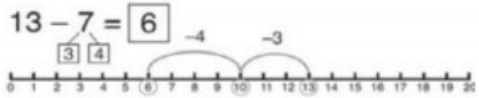
Calculation Policy

Heath Mount School

Year 1 - Subtraction				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
Subtract one-digit and two-digit numbers to 20, including 0. Taking away ones	 Use physical objects to show how they can be taken away		7—4 = 3 16—9 = 7	Part-whole models, bar models, ten frames and number shapes support partitioning. Ten frames, number tracks, single bar models and bead strings support reduction. Cubes and bar models with two bars can support finding the difference. When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.
Counting Back			Put 13 in your head, count back 4. What number are you at? (Use your fingers to help you)	
Find the difference	 Lay objects to represent bar model.		Hannah has12 sweets and her sister has 5. How many more does Hannah have than her sister?	

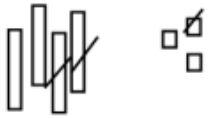
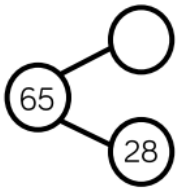
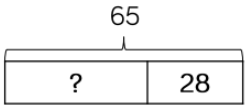
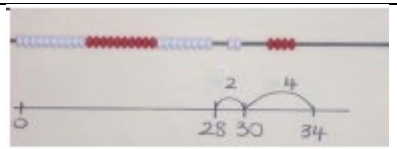
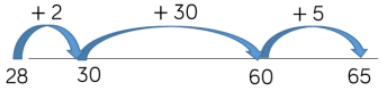
Calculation Policy

Heath Mount School

Represent and use number bonds and related subtraction facts within 20 Part-part whole model	 Link to addition. Use PPW model to model the inverse. If 10 is the whole and 6 is one of the arts, what s the other part? 10—6 = 4	 Use a pictorial representation of objects to show the part-part whole model 	 Move to using numbers within the part whole model.	Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.
Make 10	**14 – 9 =**  Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	 Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.	16 – 8= How many do we take off to reach the next 10? How many do we have left to take off?	
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, first, now, then….**			

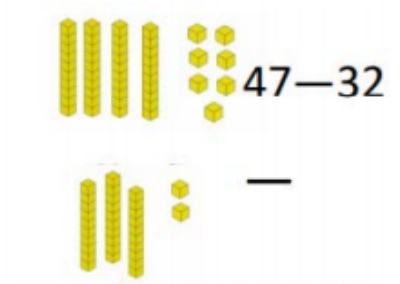
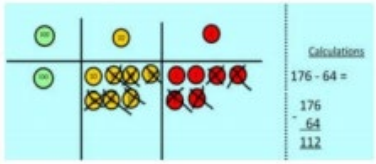
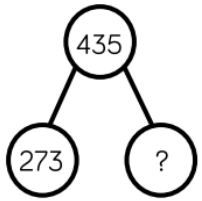
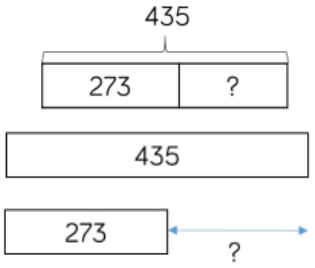
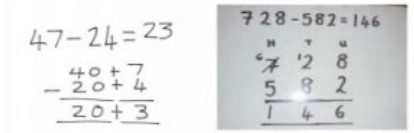
Calculation Policy

Heath Mount School

Year 2 - Subtraction				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
Subtract a two-digit number and ones, a 2-digit number and tens, two two-digit numbers Partitioning to subtract without re-grouping: 'Friendly numbers'	34—13 = 21  Use Dienes to show how to par-tition the number when subtracting without regroup-ing.   The calculation will be shown alongside the manipulative used Model | Calculation	Children draw representations of Dienes and cross off.  43—21 = 22   	43—21 = 22 *Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers.* Toward the end of the year, children move to more formal recording using partitioning method: e.g. 43-21=22 40 and 3 -20 and 1 20 and 2	At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient. Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.
Make a ten strategy	 34—28 Use a bead bar or bead strings to model counting to next ten and the rest.	 Use a number line to count on to next ten and then the rest.	93—76 = 17	
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**			

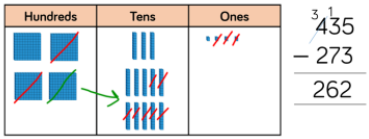
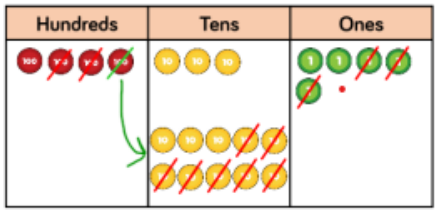
Calculation Policy

Heath Mount School

Year 3 - Subtraction				
Objectives	**Concrete**	**Pictorial**	**Abstract**	
To subtract numbers with up to three-digits, using formal written methods of columnar subtraction Column subtraction (without exchanging)	 Use base 10 or Numicon to model The calculation will be shown alongside the model chosen to see the connection **Model** | **Calculation**	Children are to be secure with use of PV counters before moving onto abstract.   	Children should begin with the expanded form. Moving onto a more formal way as below. 	Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

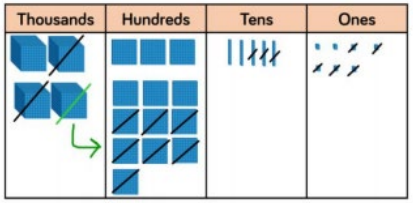
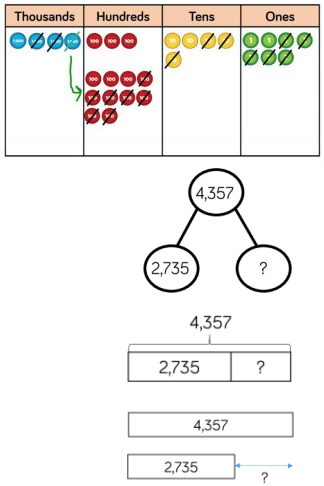
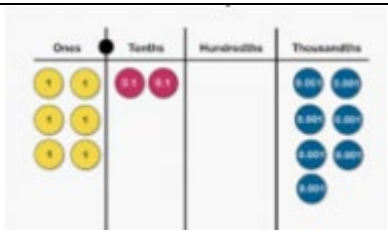
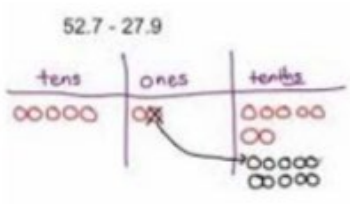
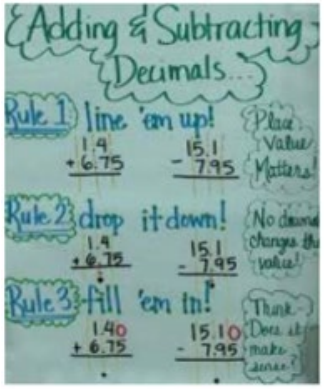
Calculation Policy

Heath Mount School

	Concrete	Pictorial	Abstract	
Column Subtraction with exchanging		 435 – 273 = 262	 	
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**			

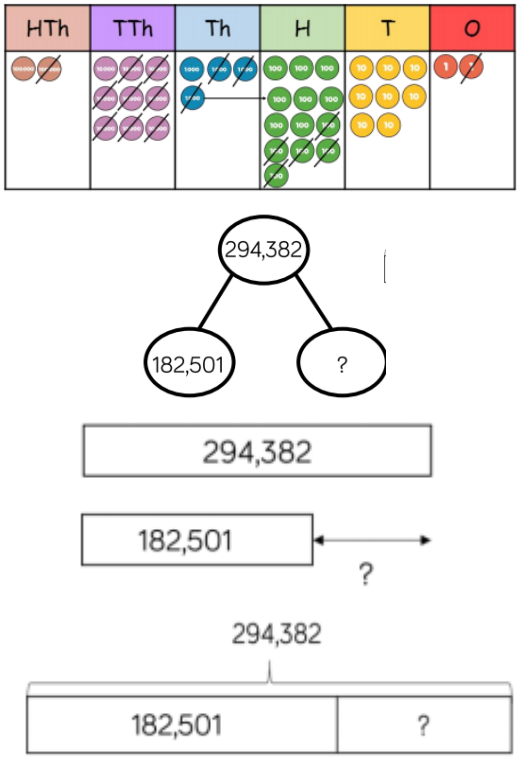
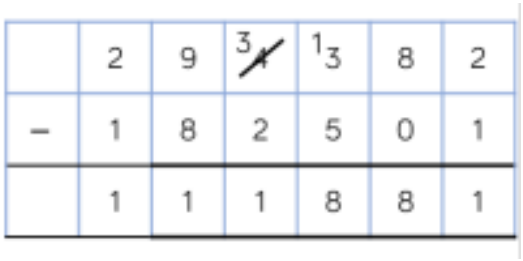
Calculation Policy

Heath Mount School

Year 4 - Subtraction				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Subtract numbers with up to 4 digits using the formal written method of column subtraction			3 1 4357 − 2735 1622	Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.
Decimal Subtraction **(use context of money)**	 **Children should be encouraged to use PV counters**	 **When confident, children should find their own ways to record**		
Vocabulary	Equal to, take away, less, minus, subtract, leaves, difference between, how many more, how many left, how many fewer/less than, count back, count on, least.			

Calculation Policy

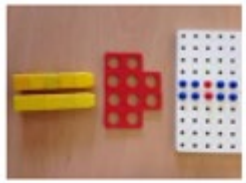
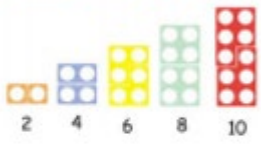
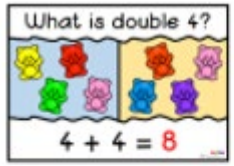
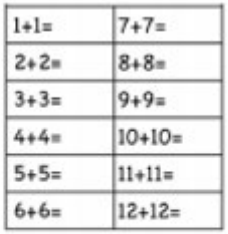
Heath Mount School

Year 5/6 - Subtraction				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Subtract with at least 4 digits **Include: money and measures** **Subtract with more complex numbers and decimal values**			 **At this stage children should be encouraged to work in the abstract using the grid method.**	Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.
Vocabulary	**Equal to, take away, less, minus, subtract, leaves, difference between, how many more, how many left, how many fewer/less than, count back, count on, least, partition, ones, tens…**			

Multiplication

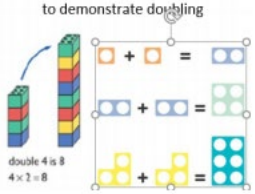
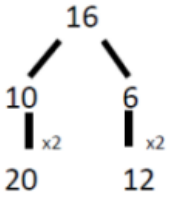
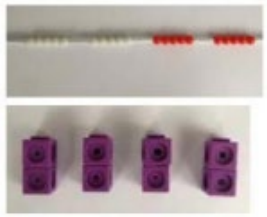
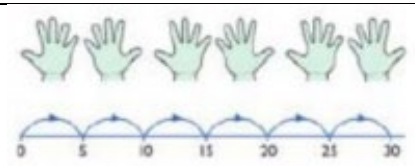
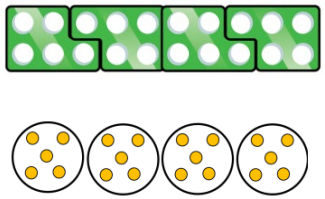
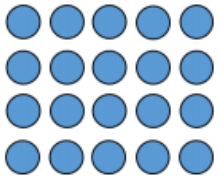
Calculation Policy

Heath Mount School

EYFS - Multiplication			
Objectives	**Concrete**	**Pictorial**	**Abstract**
Solve problems involving doubling	   Counting and other maths resources for children to make 2 equal groups.   Physical and real life examples that encourage children to see concept of doubling as adding two equal groups.	    Pictures and icons that encourage children to see concept of doubling as adding two equal groups.	 Addition calculations to model adding two equal groups.
Vocabulary	**Doubles, groups of, equal groups…**		

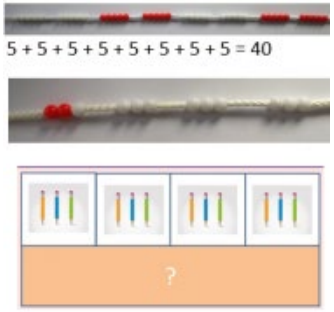
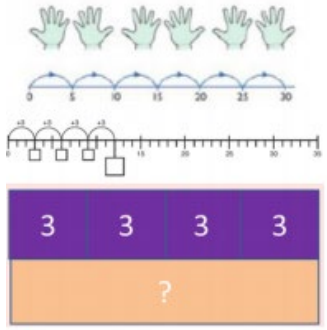
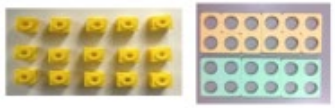
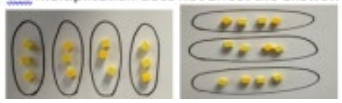
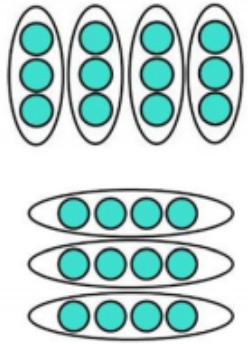
Calculation Policy

Heath Mount School

Year 1 - Multiplication				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Doubling	Use practical activities using manip-ultives including cubes and Numicon to demonstrate doubling 	 Draw pictures to show how to double quantities	Partition a number and then double each part before recombining it back together. 	Children represent multiplication as repeated addition in many different ways. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.
Counting in Multiples			Count in multiples of a number aloud. Write sequences with multiples of numbers. **2, 4, 6, 8, 10** **5, 10, 15, 20, 25, 30**	
Repeated Addition		 Use pictorial number lines to solve problems	$5 + 5 + 5 + 5 = 20$ $4 \times 5 = 20$ $5 \times 4 = 20$	
Understand Arrays	Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc.		 **4 x 5 = 20**	
Vocabulary	**Groups of, lots of, times, array, altogether, multiply**			

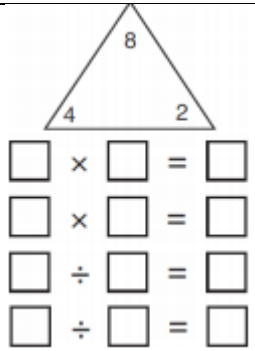
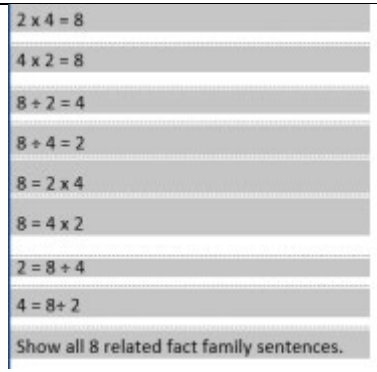
Calculation Policy

Heath Mount School

Year 2 - Multiplication				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Counting in multiples of 2, 3, 4, 5, 10 from 0 (repeated addition)	 Count the groups as children are skip counting, they may use their fingers and the bar method.	 Number lines, counting sticks and bar models should be used to show representation of counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25 , 30 $4 \times 3 = \square$	In Year 2, children are introduced to the multiplication symbol.
Multiplication is commutative	Create arrays using counters and cubes and Numicon.   Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer. 	Use representations of arrays to show different calculations and explore commutativity. 	$12 = 3 \times 4$ $12 = 4 \times 3$ Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15	

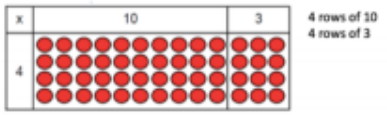
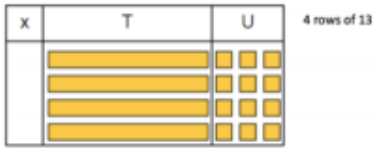
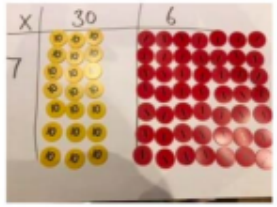
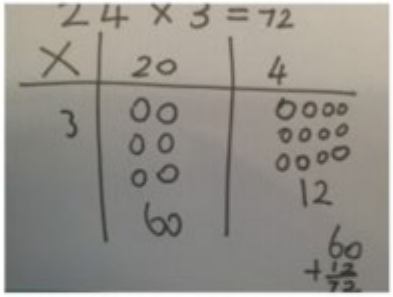
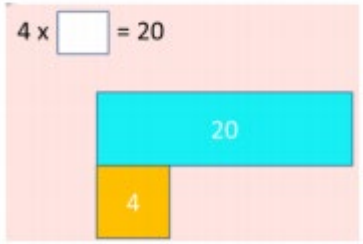
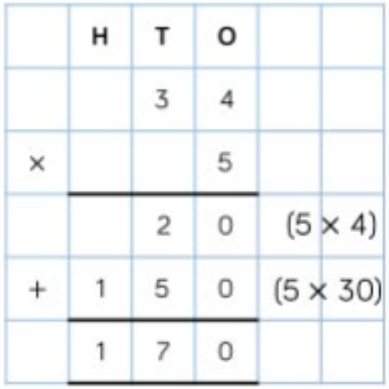
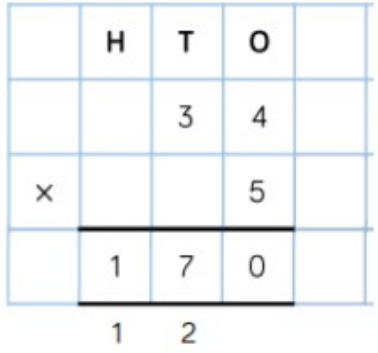
Calculation Policy

Heath Mount School

Using the Inverse This should be taught alongside division, so pupils learn how they work alongside each other.				
Vocabulary	**Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative.**			

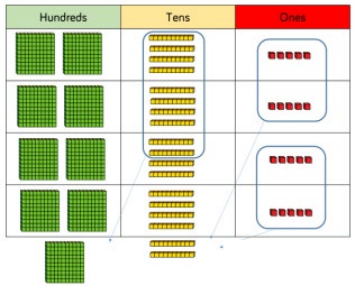
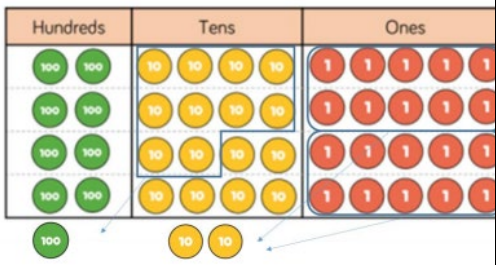
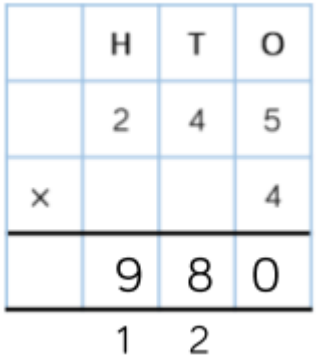
Calculation Policy

Heath Mount School

Year 3 - Multiplication				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Multiplying two-digit numbers by a one-digit number Grid method progressing to the formal method. Solving problems including missing number problems, integer scaling problems.	Show the link with arrays to first introduce the grid method.  Move on to using Base 10 to move towards a more compact method.  Move on to place value counters to show how we are finding groups of a number.  Add up each column, starting with the ones making any exchanges needed. The calculation will be shown alongside the model chosen to see the connection **Model** | **Calculation**	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.  Bar model are used to explore missing numbers  	**1.**  **2.**  	Teachers may decide to first look at the expanded column method before moving on to the short multiplication method. The place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.
Vocabulary	**Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, product, multiples of, scale up**			

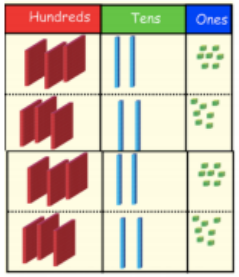
Calculation Policy

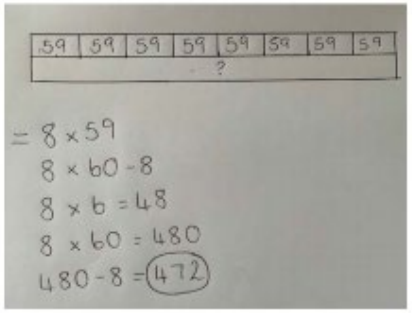
Heath Mount School

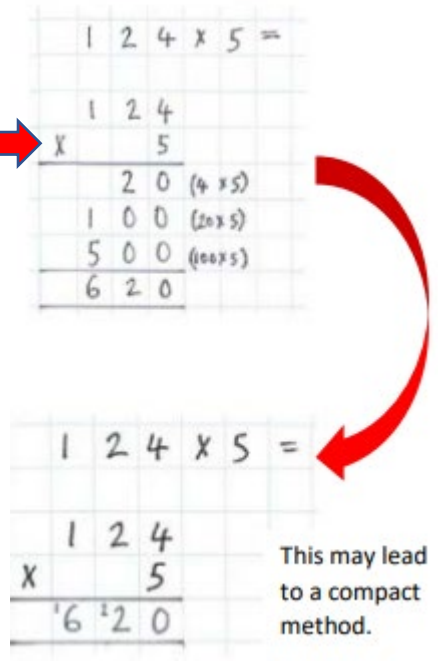
Year 4 - Multiplication				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Multiply two-digit and three-digit numbers by a one-digit number using formal written layout Grid method recap from year 3 for 2 digits x 1 digit Multiplying numbers by 1 digit (year 4 expectation)	 $245 \times 4 = 980$			When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method. Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

Calculation Policy

Heath Mount School

<table>
<tr>
<td>Column multiplication</td>
<td>
Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. 321 x 2 = 642


It is important at this stage that they always multiply the ones first.
The corresponding long multiplication is modelled alongside
<table>
<tr><th>Model</th><th>Calculation</th></tr>
<tr><td></td><td></td></tr>
</table>
</td>
<td>
This grid method may be used to show how this relates to a formal written method.
<table>
<tr><th>x</th><th>100</th><th>20</th><th>4</th></tr>
<tr><td>5</td><td>500</td><td>100</td><td>20</td></tr>
</table>


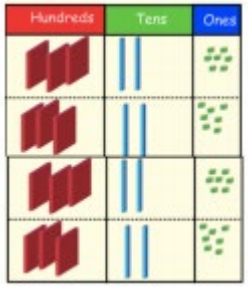
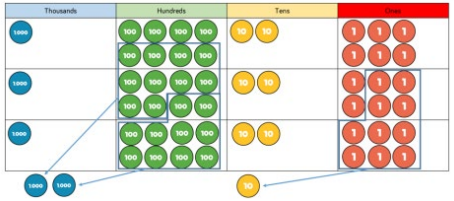
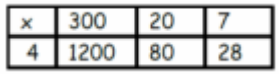
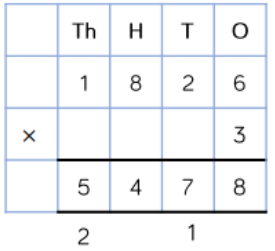
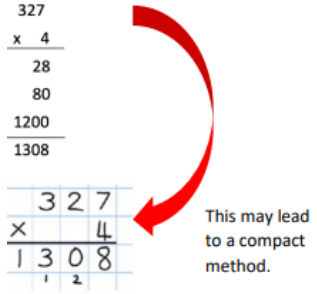
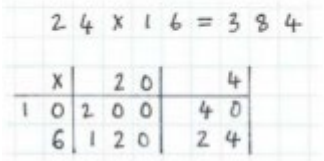
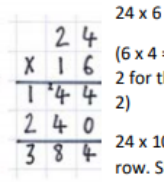
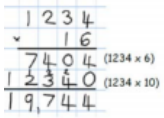
Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.
</td>
<td>


This may lead to a compact method.
</td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td colspan="4">Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, product, multiples of, scale up, inverse, derive</td>
</tr>
</table>

Calculation Policy

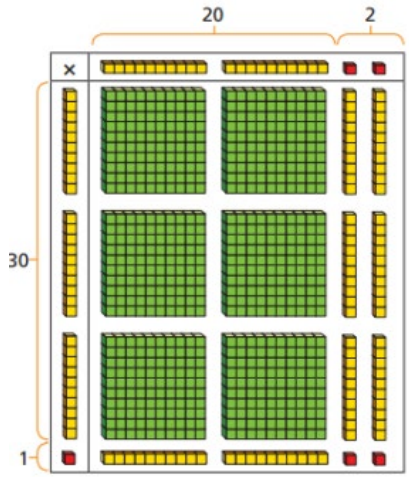
Heath Mount School

Year 5 - Multiplication

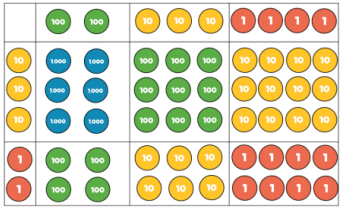
Objective	Concrete	Pictorial	Abstract	
Multiply numbers up to 4-digits by a one-digit number using the format written method, including long multiplication for 2-digit numbers Column multiplication for 3 and 4 digits x 1 digit	 Children can continue to be supported by PV counters. It is important that they always multiply the ones first. The corresponding long multiplication should be modelled alongside.	 	  This may lead to a compact method.	When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method. If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.
Column multiplication (long multiplication)	Manipulatives may still be used with the corresponding long multiplication modelled alongside Model / Calculation	Moving forward, multiply by a 2 digit number showing the different rows within the grid method. 	 24 x 6 on the first row. (6 x 4 = 24, carrying the 2 for the 20, then 6 x 2) 24 x 10 on the second row. Show multiplying by 10 by putting zero in the units first. 	

Calculation Policy

Heath Mount School



×	20	2
30	600	60
1	20	2



×	200	30	4
30	6,000	900	120
2	400	60	8

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

Th	H	T	O
	2	3	4
×		3	2
	4	6	8
$^{1}7$	$^{1}0$	2	0
7	4	8	8

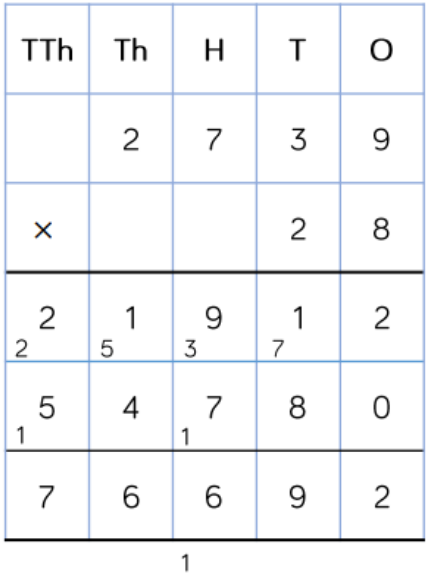
When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10.
The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

Children can continue to use the area model when multiplying 3-digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers.

Encourage children to move towards the formal written method, seeing the links with the grid method.

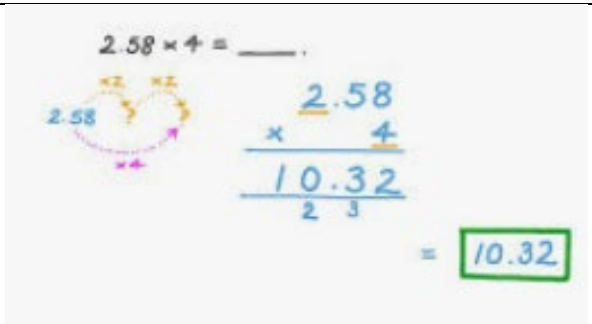
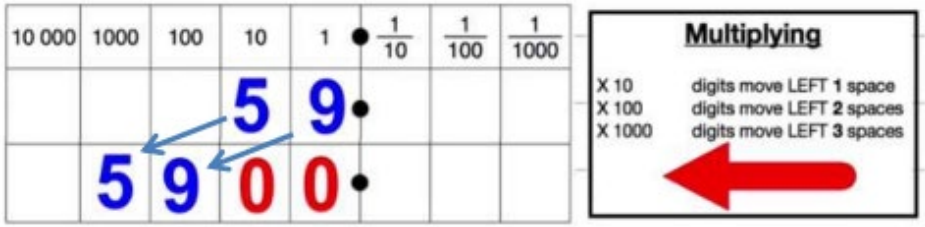
Calculation Policy

Heath Mount School

Year 6 - Multiplication				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Multiplying 4 digit numbers by 2 digits				When multiplying 4-digits by 2-digits, children should be confident in the written method. If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method. Consider where exchanged digits are placed and make sure this is consistent.
Vocabulary	**Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, product, multiples of, scale up, inverse, derive, factor pairs, composite numbers, prime number, factors, squared, cubed**			

Calculation Policy

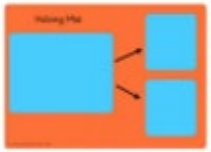
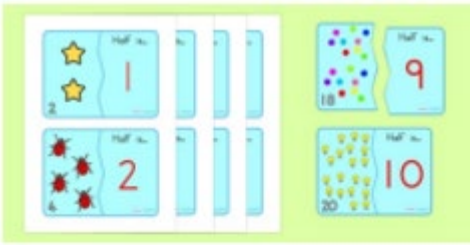
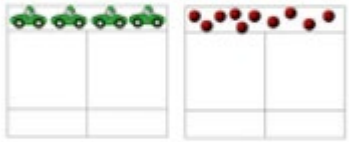
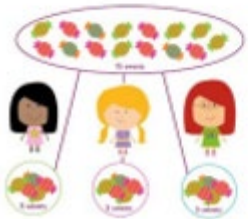
Heath Mount School

Year 6 - Multiplication	
Objective	**Abstract**
Multiplying decimals – up to 2 decimal places with a single digit	
Multiplying with decimals by: 10, 100, 1000	Please do not add zeros as this leads to confusion when working with decimals. Moving the decimal point is also mathematically incorrect. Using the place value grid and increasing numbers by 1 space to the left for x10, 2 spaces for x 100 etc. e.g. 

Division

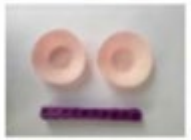
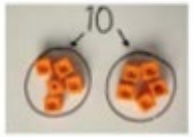
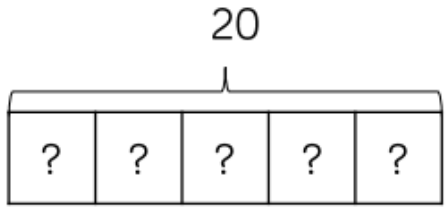
Calculation Policy

Heath Mount School

EYFS - Division			
Objectives	**Concrete**	**Pictorial**	**Abstract**
Solve problems including halving and sharing Halving a whole Halving a quantity of objects Sharing a quantity of objects equally	   Children have the opportunity to physically cut objects, food or shapes in half.  Counting and other maths resources for children to share into two equal groups.   Use visual supports such as halving mats and part part whole, with the physical objects and resources that can be manipulated.  Counting and other maths resources for children to explore sharing between 3 or more.	 Pictures and icons that encourage children to see concept of halving in relation to subitising, addition and subtraction knowledge. i.e. Knowing 4 is made of 2 groups of 2, so half of 4 is 2.  Bar model with pictures or icons to support understanding of finding 2 equal parts of a number, to further understand how two halves make a whole.  Pictures for children to create and visualise 3 or more equal groups.	
Vocabulary	**Sharing, equal groups, divide between, share between, halve, half, whole, part….**		

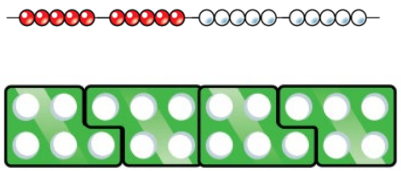
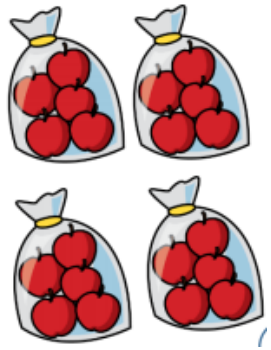
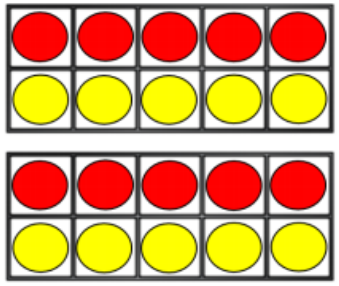
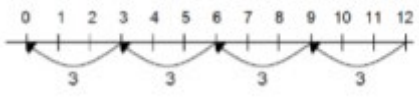
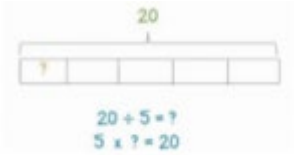
Calculation Policy

Heath Mount School

Year 1 - Division				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Solve one step problems using division (grouping)	   I have 10 cubes, can you share them equally in 2 groups? 	Children use pictures or shapes to share quantities.  $8 \div 2 = 4$  Children use bar modelling to show and support understanding.  $12 \div 4 = 3$		Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally. Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.
Vocabulary	**Sharing, divide equally, division, equal groups….**			

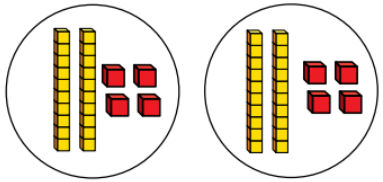
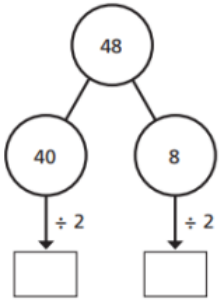
Calculation Policy

Heath Mount School

Year 2 - Division				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Division as grouping	   (20 ÷ 5 = 4)	Use a number line to show jumps in groups.  Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be in each group.  	**28 ÷ 7 = 4** **Divide 28 into 7 groups. How many are in each group?**	In Year 2, children are introduced to the division symbol. Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

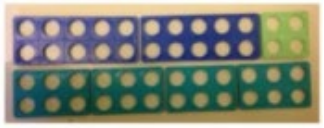
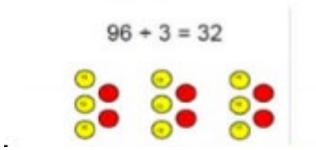
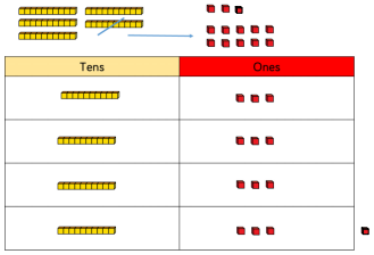
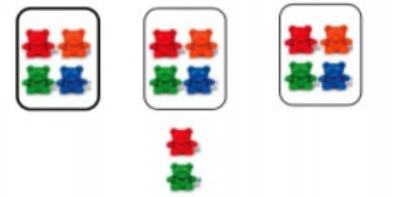
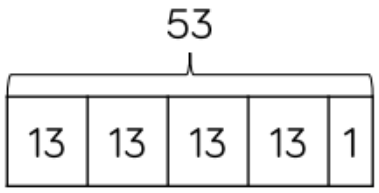
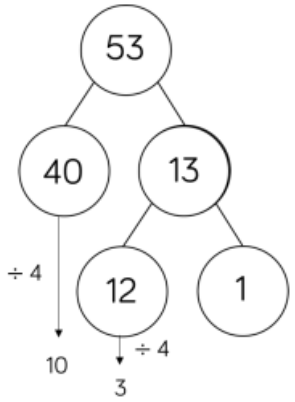
Calculation Policy

Heath Mount School

			48 ÷2 = 24	When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, Base 10 and place value counters can all be used to share numbers into equal groups. Part-whole models can provide children with a clear written method that matches the concrete representation.
Vocabulary	**Sharing, divide equally, divided by, divided into, division, part, whole, partition, equal groups, lots of, array, , grouping, number line, left, left over….**			

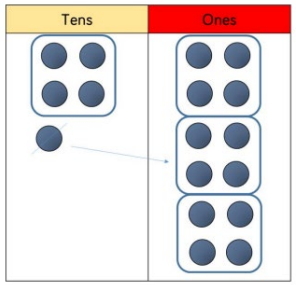
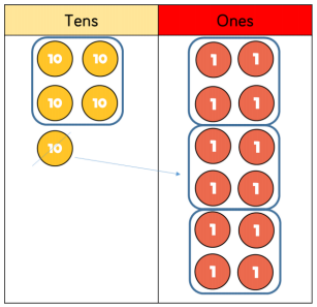
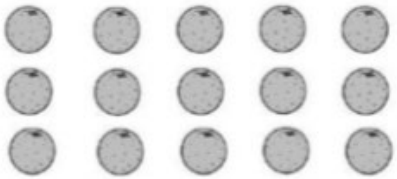
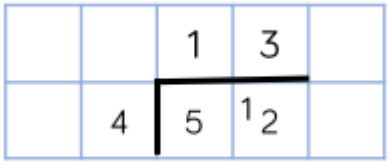
Calculation Policy

Heath Mount School

Year 3 - Division				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Dividing 2-digit numbers by 1 digit **With remainders**	Use cubes, counters, objects or place value counters to aid understanding.  24 divided into groups of 6 = 4   14 ÷ 3 = 4 r 2 Divide objects between groups and see how much is left over 	 Continue with bar modelling 	$53 \div 4 = 13\ r1$	When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows. Flexible partitioning in a part-whole model supports this method.

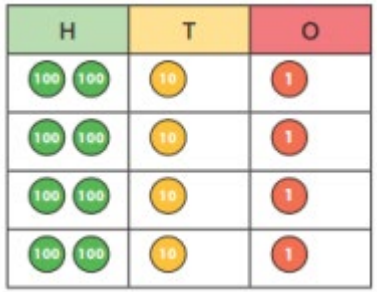
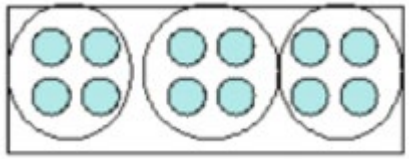
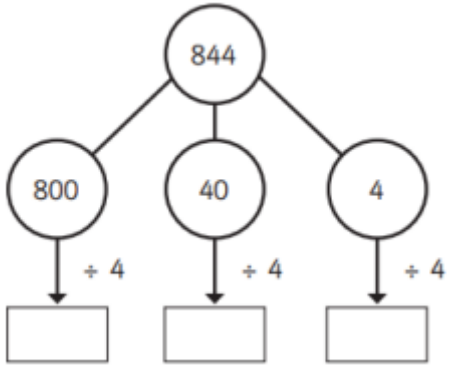
Calculation Policy

Heath Mount School

Divide 2-digits by 1-digit using grouping		 Draw an array and use lines to split the array into groups to make multiplication and division sentences 	 Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4	When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made. Flexible partitioning in a part-whole model supports this method.
Vocabulary	**share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, product**			

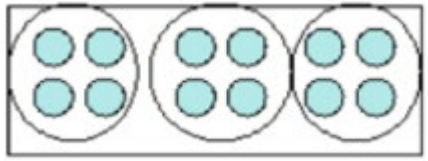
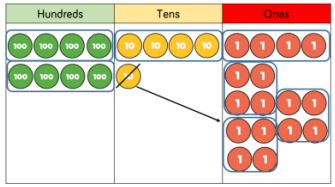
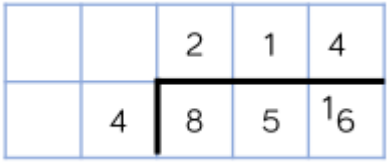
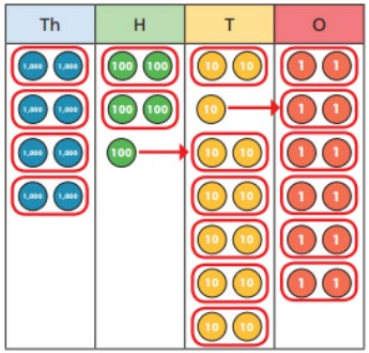
Calculation Policy

Heath Mount School

Year 4 - Division				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Short Division **Dividing up to 3-digit numbers**	844 ÷ 4 = 211  Children can continue to use PV counters to share 3-digit numbers into equal groups	 They can also draw their own counters and group them through a more pictorial method. Encourage children to count in multiples to divide more efficiently.	 	Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning in a part-whole model supports this method.
Vocabulary	**Share, equally, groups of, lots of, array, divided by/into, division, grouping, division facts, inverse, derive, formal method**			

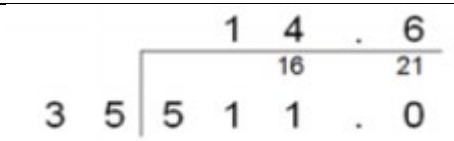
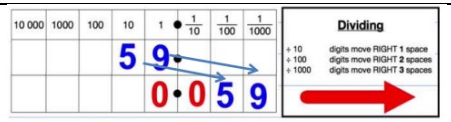
Calculation Policy

Heath Mount School

Year 5 - Division				
Objective	**Concrete**	**Pictorial**	**Abstract**	
Short Division **Dividing 3-digit numbers by 1 digit**		 They can also draw their own counters and group them through a more pictorial method. Encourage children to count in multiples to divide more efficiently. 		Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number. Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.
Dividing 4 digits by 1 digit (grouping)			 8,532 ÷ 2 = 4,266	Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

Calculation Policy

Heath Mount School

Dividing with decimals			 Move into decimals to divide more accurately.	
Dividing with decimals by 10, 100, 1000			 Moving the decimal point is mathematically incorrect, as with multiplication. Using the place value grid and decreasing numbers by 1 space to the right for ÷ 10, 2 spaces for ÷ 100 etc.	
Vocabulary	**Share, equally, groups of, lots of, array, divided by/into, division, grouping, division facts, inverse, derive, formal method**			

<table>
<tr><th colspan="2">Year 6 – Division</th></tr>
<tr><td>Objective</td><td>Abstract</td></tr>
<tr><td>Short Division</td><td>
At this point concrete and pictorial methods are less effective. Children can write our multiples to support their calculations with larger remainders.
<table>
<tr><td></td><td></td><td>0</td><td>3</td><td>6</td></tr>
<tr><td></td><td>12</td><td>4</td><td>$^{4}3$</td><td>$^{7}2$</td></tr>
</table>
$432 \div 12 = 36$

$7,335 \div 15 = 489$
<table>
<tr><td></td><td>0</td><td>4</td><td>8</td><td>9</td></tr>
<tr><td>15</td><td>7</td><td>$^{7}3$</td><td>$^{13}3$</td><td>$^{13}5$</td></tr>
</table>
<table>
<tr><td>15</td><td>30</td><td>45</td><td>60</td><td>75</td><td>90</td><td>105</td><td>120</td><td>135</td><td>150</td></tr>
</table>
</td></tr>
</table>

Calculation Policy

Heath Mount School

Objective	Abstract
Long Division	**Dividing multi-digits by two digits: Children can also use long multiplication when dividing by 2 digits.**

		0	3	6
1	2	4	3	2
	–	3	6	0
			7	2
	–		7	2
				0

(×30)

(×6)

$12 \times 1 = 12$
$12 \times 2 = 24$
$12 \times 3 = 36$
$12 \times 4 = 48$
$12 \times 5 = 60$
$12 \times 6 = 72$
$12 \times 7 = 84$
$12 \times 8 = 96$
$12 \times 7 = 108$
$12 \times 10 = 120$

$$432 \div 12 = 36$$

$$7{,}335 \div 15 = 489$$

	0	4	8	9
15	7	3	3	5
–	6	0	0	0
	1	3	3	5
–	1	2	0	0
		1	3	5
–		1	3	5
				0

(×400

(×80)

(×9)

$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

Calculation Policy

Heath Mount School

Long Division with remainders	**When a remainder is left at the end pf a calculation, children can either leave it as a remainder or convert it into a fraction.**

$372 \div 15 = 24 \text{ r}12$

			2	4	r	1	2
1	5	3	7	2			
	–	3	0	0			
			7	2			
	–		6	0			
			1	2			

$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

			2	4	$\frac{4}{5}$
1	5	3	7	2	
	–	3	0	0	
			7	2	
	–		6	0	
			1	2	

$372 \div 15 = 24\frac{4}{5}$

Calculation Policy

Heath Mount School

Fractions

Adding and Subtracting Fractions

THE DENOMINATORS MUST BE THE SAME

Write out a times table sequence for each fraction.

Look for ones with the same denominator

Use these to change the original question

Calculate $1\frac{2}{5}-\frac{6}{7}$ first change $1\frac{2}{5}$ to an improper fraction

$$\frac{7}{5}=\frac{14}{10}=\frac{21}{15}=\frac{28}{20}=\frac{35}{25}=\frac{42}{30}=\frac{49}{35}$$

$$\frac{6}{7}=\frac{12}{14}=\frac{18}{21}=\frac{24}{28}=\frac{30}{35}$$

Hence $1\frac{2}{5}-\frac{6}{7}$ becomes $\frac{49}{35}-\frac{30}{35}=\frac{19}{35}$

Dividing by a Fraction

THE DENOMINATORS MUST BE THE SAME

Write out a times table sequence for each fraction.

Look for ones with the same denominator

Use these to change the original question

Calculate $\frac{3}{4}\div\frac{4}{5}$

$$\frac{3}{4}=\frac{6}{8}=\frac{9}{12}=\frac{12}{16}=\frac{15}{20}$$

$$\frac{4}{5}=\frac{8}{10}=\frac{12}{15}=\frac{16}{20}$$

Hence $\frac{3}{4}\div\frac{4}{5}$ **becomes** $\frac{15}{20}\div\frac{16}{20}=\frac{15}{16}$ **get the same denominators.**

Write the top numbers as a fraction

Multiplying Fractions

If you have a mixed fraction change it to an improper fraction first

Then multiply the numerators (the top numbers)

Multiply the denominators (the bottom numbers)

(a) $1\frac{2}{5}\times 2\frac{1}{3}$ becomes $\frac{7}{5}\times\frac{7}{3}=\frac{49}{15}=3\frac{4}{15}$

Calculation Policy

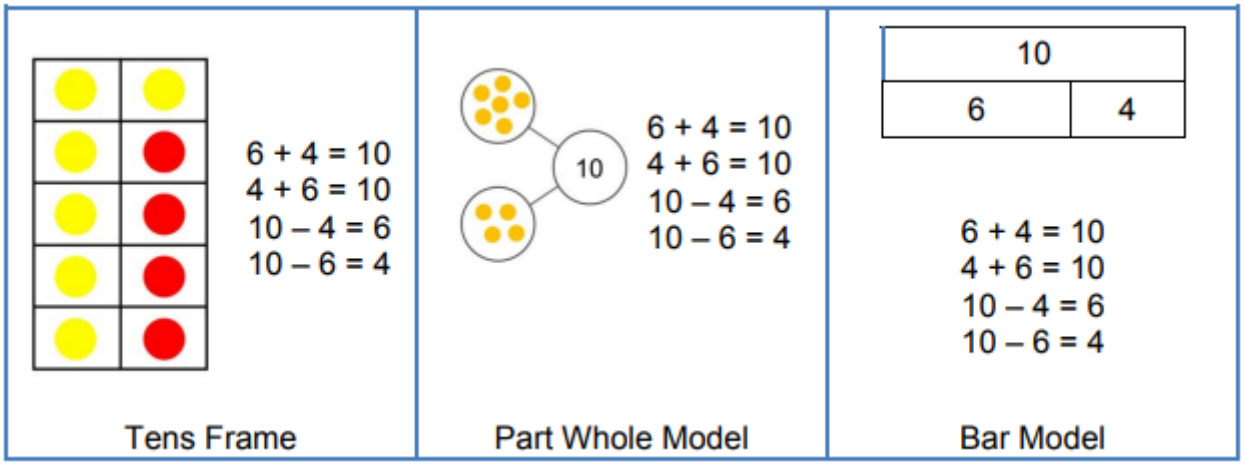
Heath Mount School

BIDMAS			
Objective	**Concrete**	**Pictorial**	**Abstract**
To follow the order of operations	**At this primary stage the following rules will be followed:** **1 brackets (solve them first or add them in)** **2.indices** **3. division** **4. multiplication** **5. addition** **6. subtraction** **e.g.** **6÷2+7 would become: (6÷2) + 7** **5 + 3 – 2 would become (5 + 3) – 2** **6 + 5 X 7 would become 6 + (5 x 7)** **20 – 4 x 3 would become 20 – (4 x 3)**		
STATISTICS			
Objective			
Creating points on a graph **Plotting co-ordinates**	**ALWAYS use a small cross to plot points and co-ordinates on a graph. The point where the lines intercept needs to depict the co-ordinates or amount on a graph**		

Calculation Policy

Heath Mount School

Glossary



Calculation Policy

Heath Mount School

Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor

Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation - increasing a quantity or measure by another quantity.

Commutative – numbers can be added in any order.

Complement – in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference – the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange – Change a number or expression for another of an equal value.

Minuend – A quantity or number from which another is subtracted.

Partitioning – Splitting a number into its component parts.

Reduction – Subtraction as take away.

Subitise – Instantly recognise the number of objects in a small group without needing to count.

Subtrahend - A number to be subtracted from another.

Sum - The result of an addition.

Total – The aggregate or the sum found by addition.

References:

White Rose Maths https://whiterosemaths.com/resources/primary-resources/primary-sols/

NCETM https://www.ncetm.org.uk/media/k20boquz/ncetm-calculation-guidance-october-2015.pdf

Herts For Learning EYFS https://www.hertsforlearning.co.uk/news/essentialmaths

Herts for Learning PA Plushttps://www.hertsforlearning.co.uk/pa-plus-primary-planning-and-assessment

The Stour Academy Trust https://thestouracademytrust.org.uk/wp-content/uploads/2020/11/Written-CPA-Calculation-policy-for-Maths-2020.pdf

Wixams Academy https://www.wixamsacademy.co.uk/learning/mathematics-calculation-policy-june-2019/

Calculation Policy

Heath Mount School

Updated National Curriculum: 21 January 2021: Added information about guidance and resources from the National Centre for Excellence in the Teaching of Mathematics.