Arden Primary School Calculation Policy

Maths Mastery at Arden

At Arden, we recognise that Maths is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. In providing a high-quality maths education, we allow our children to understand the world, reason mathematically, appreciate the beauty and power of mathematics and develop a sense of curiosity and enjoyment for the subject.

Mastering maths means pupils acquire a deep, long-term, secure and adaptable understanding of the subject that is solid enough to enable them to move on to more advanced material in the future. True mastery aims to develop all children's mathematical understanding at the same pace. As much as possible, children should be accessing the same learning. Differentiation should primarily be through support, scaffolding and deepening, not through task. At Arden, we teach in mixed ability classes with mixed ability talk partners. Aspire challenges are used to deepen understanding.

Stem Sentences

Stem sentences encourage and structure a child's thinking and their ability to articulate this. At Arden, we have some generic sentence stems that are used in all year group settings in order to support the explanations given by children. From Nursery to Year 6, our children are encouraged to explain, justify, argue, describe relationships, prove and enquire.

Vocabulary

The use of accurate mathematical vocabulary that is consistently understood across the primary setting is key to ensuring a solid understanding of the mathematical concepts. Children at Arden are encouraged to use accurate vocabulary from Nursery to Year 6 which is modelled by all staff.

Concrete, pictorial and abstract approach

We believe that children gain a more secure grasp of mathematical concepts through contextual exploration using concrete resources such as cubes, base ten and counters. The use of concrete resources is then supported through appropriate pictorial representations such as bar models and part, part, whole models. Once the conceptual understanding has been achieved through concrete and pictorial means, children will then move on to exploring abstract representations.

Fluency, reasoning and problem solving

We place a high emphasis on the learning of times tables facts and other number facts through varied and frequent practice, in order that children can recall and apply knowledge rapidly and accurately. Children are encouraged to reason using appropriate mathematical vocabulary and apply their mathematical knowledge to solving problems.

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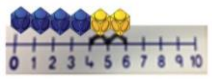
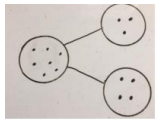
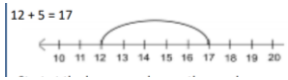
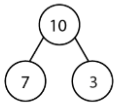
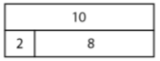
Addition					
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**	**Sentence Stems for all year groups**	**Vocabulary for all year groups**
EYFS and Year 1 Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes.	Use cubes and other objects to add numbers together as a group or in a bar.  Start at the bigger number and count on. Represent the number lines using bead strings or cubes.   	Represent the cubes using dots or crosses. Use a part whole model with dots progressing to numerals.  Start at the larger number on the number line and count on in ones or one big jump to find the total.  Draw the ten frame	 3 is a part, 7 is a part and the whole is 10. 7 + 3 = 10 10 = 7 + 3  Place the larger number in your head and count on the smaller number to find your answer. Explore equality in different ways. 6 + __ = 11 6 + 5 = 5 + __ 6 + 5 = __ + 4	_____ is more than/bigger than/taller than/heavier than _____ _____ is the **same as** _____ There are more _____ than _____ **I know** _____ **because** _____ There are _____and _____. We can write this as _____ plus _____. _____ is equal to _____ plus _____. _____ and _____ are the **addends.**	subitising - instantly recognising an amount. unitising -treating groups that contain or represent the same number of things as ones. sum total parts and wholes plus altogether add more is equal to

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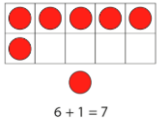
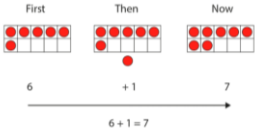
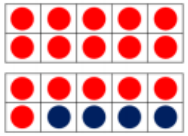
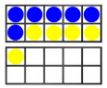
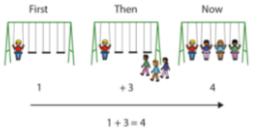
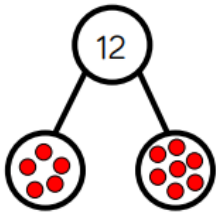
Regrouping to make 10 using ten frame. Represent and use number bonds and related subtraction facts within 20.	Start with the bigger number then use the smaller number to make ten using a ten frame.   Represent number bonds using ten frames and bead strings. 	and counters/cubes.   Show number bonds using the part, part, whole model and counters.  	Record number bonds systematically and look for patterns: 12 = 0 + 12 12 = 1 + 11 12 = 2 + 10...	**I know** that _____ plus _____ is equal to _____ **so** _____ plus _____ is equal to _____. There are _____, _____ and _____, **altogether** there are _____. **If** _____ plus _____ equals _____ **then** _____ plus _____ equals _____. **First**...**then**...**now**… The sum has increased by _____; one addend has stayed the same, so the other addend must increase by _____.	is the same as addends addend + addend = sum exchanging commutative law - a sum or product can be calculated in any order (e.g. ab = ba). associative law - we can group numbers in any order when adding or multiplying (e.g. (a + b) + c = (b + c) + a)

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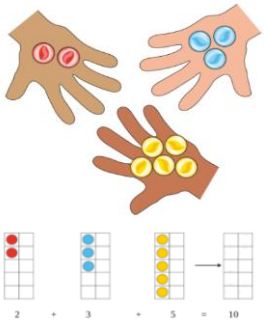
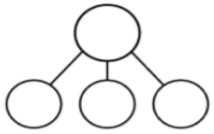
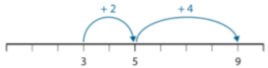
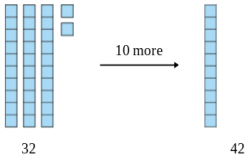
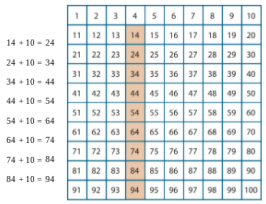
Year 2 Adding three single digits.	Use counters and cubes to combine three amounts. Show using the ten frame.  	Represent using counters on a part, part, part, whole model.  10 = 2 + 3 + 5	Show using a number line before representing as a number sentence. Bridge to ten first as appropriate.  	Do I need to make an **exchange**? What has stayed the **same**? What has **changed**?	distributive law - a x (b + c) = (a x b) + (a x c) inverse
Adding multiples of ten.	Model using base ten.  	Recognise patterns in a 100 square and on the Gattegno Chart.  	Represent the calculation on a number line and using the column method (with base ten) where appropriate.   		

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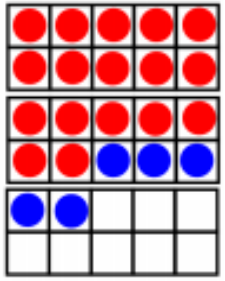
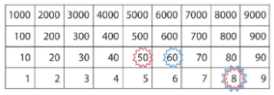
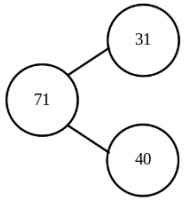
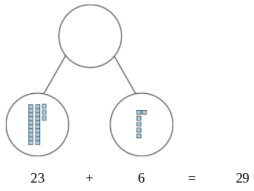
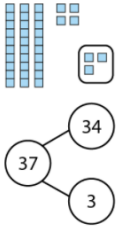
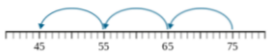
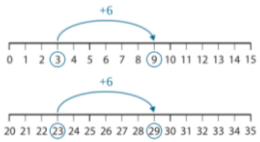
Add TO + O.	Use ten frame to bridge to ten.  17 + 5 = 22 Use base ten to represent the calculation.	 Represent using a part, part, whole model.  Represent as a part, part, whole model.   	 Show on a number line and use the column method in its expanded or shortened form as appropriate. Make connections with related facts.  		

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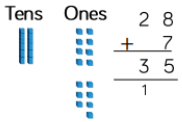
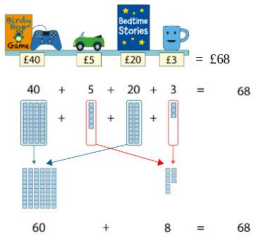
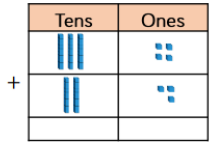
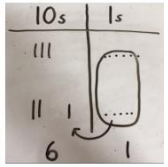
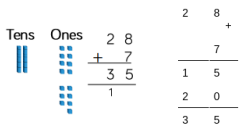
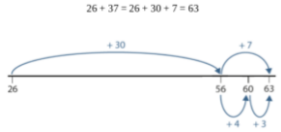
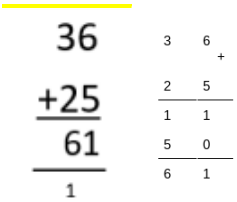
Add TO + TO.	 Use base ten to partition two 2-digit numbers and regroup to make ten.  Find the sum of 34 and23 	Use bar models to support. Represent the base ten using symbols.  	 Show calculations on a number line, bridging the ten where necessary. Show a formal column method in its expanded and/or shortened form where appropriate. Use concrete resources alongside this.   		

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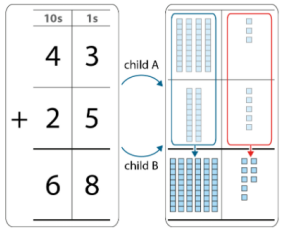
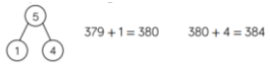
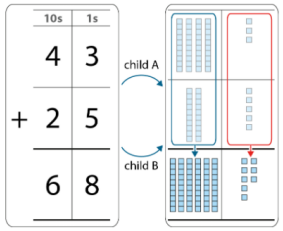
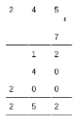
Year 3 Column method - 3 digit and 1 digit numbers.	Use base ten and/or place value counters to recap methods from Year 2 with 2 digit numbers before moving to 3 digits. Begin with no regrouping, then move to regrouping. Add ones first, then tens, then hundreds.   245 + 7	Represent using counters in a place value chart, circling when an exchange has been made. Use counters in a column to prepare for the abstract. Represent the calculation using bar models and part, part, whole models. 	Use the formal column method in its expanded and/or shortened form as appropriate. Show alongside base ten.   		

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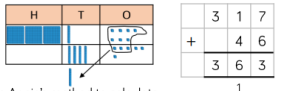
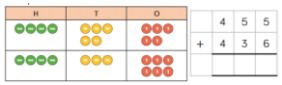
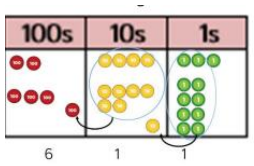
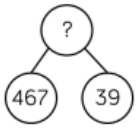
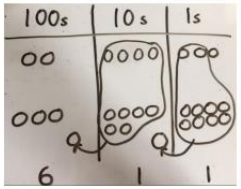
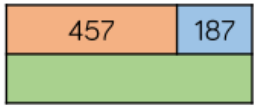
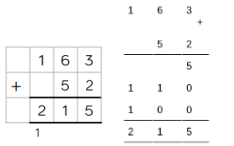
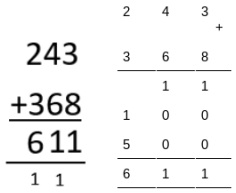
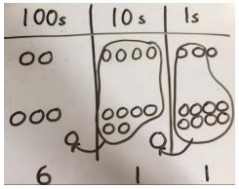
Column method - 3 digit and 2 digit numbers. Column method - 3 digit and 3 digit numbers.	   243 + 368	  	 		
Year 4 Column method - regrouping (up to 4 digits)	Use base ten and place value counters within place value grids. Exchange ten ones for one ten etc. Begin with three digits, moving to four.	Represent the counters in a place value chart, circling when an exchange has been made.  Use part, part	Use the formal method when needed - making the appropriate decision as to when this is necessary, including with money and measure. Show alongside base ten. 		

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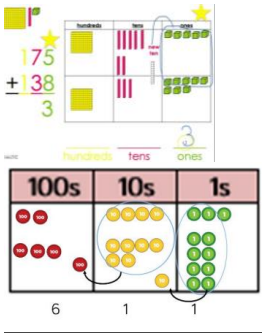
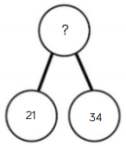
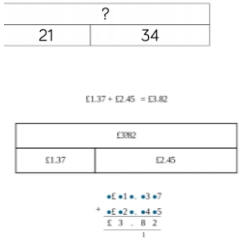
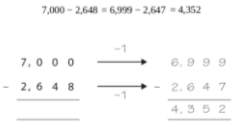
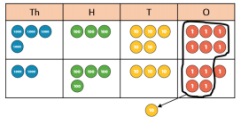
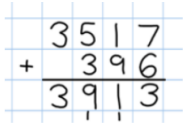
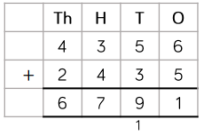
		whole models and bar models to support mental calculations.  	 Solve missing digit problems and word problems. 		
Year 5 Column method - regrouping (more than 4 digits).	As Year 4.	Show exchanges using place value counters. 	Use the formal column method for decimals and numbers with more than 4 digits.  		

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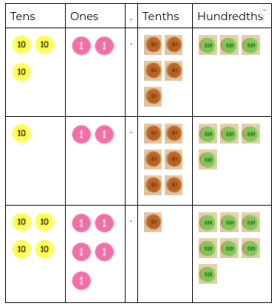
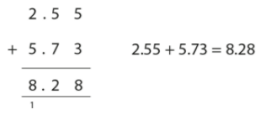
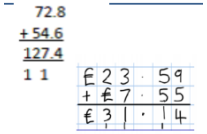
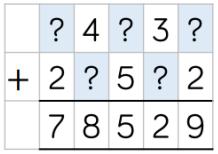
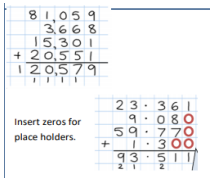
Use of place value counters for adding decimals.	Introduce decimal place value counters and model exchange. 	Represent decimal calculations using bar models. 	  Solve missing number problems. 		
Year 6 Column method - regrouping (several numbers). Abstract methods. Place value counters to be used for adding decimal numbers.	As Year 5	As Year 5	Use the formal column method for decimal numbers and several numbers.  Solve missing number problems. 		

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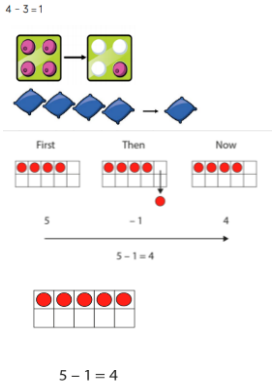
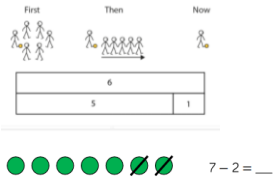
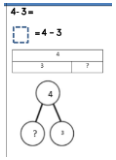
Subtraction					
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**	**Sentence Stems for all year groups**	**Vocabulary for all year groups**
EYFS and Year 1 Taking away ones.	Physically take away and remove objects from a whole. Use a variety of objects including ten frames and Numicon.  	Draw the concrete resources they are using and cross out the correct amount. Show using the bar model.  	Represent the calculation in the abstract using numerals, part, part, whole models and bar models.  	_____ is less than/smaller than/shorter than/lighter than **I know** _____ **because** _____ There are less _____ than _____ The **difference between** _____ and _____ is _____ **I know** that _____ minus _____ is equal to _____ **so** _____ minus _____ is equal to _____ **If** _____ minus _____ equals _____ **then** _____minus _____ equals _____.	take away less than the difference subtract minus fewer decrease minuend subtrahend minuend - subtrahend = difference regrouping exchanging inverse
Counting back.	Move beads along a bead string as you count back in ones.	Represent what they see in pictorial form.	Use number lines or number tracks to count back in ones. Begin to use empty number lines.		

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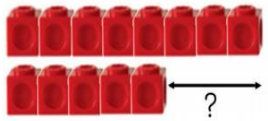
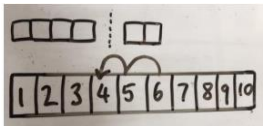
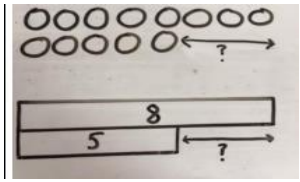
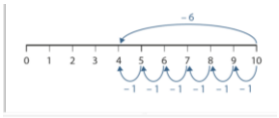
Find the difference. Represent and use number bonds and related subtraction facts within 20.	 Move objects away from the group as you count backwards.  Use cubes, Numicon, Cuisenaire Rods or other objects to calculate the difference.  Represent number bonds using ten frames and bead strings. Explore the	 Draw the cubes or other concrete resources they have used and begin to represent as a bar model.  Show number bonds using the part, part, whole model and	 "Put 8 in your head and count back 3…" Find the difference in the context of a problem, e.g. James has 12 cars and his brother has 7, how many more cars does James have than his brother? Record number bonds systematically and look for patterns in the inverse:	**First…then…now…** I've added _____ to the minuend and kept the subtrahend the same, so I must add _____ to the difference. Do I need to make an **exchange**? What has stayed the **same**? What has **changed**?	subitising - instantly recognising an amount. unitising -treating groups that contain or represent the same number of things as ones.

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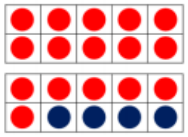
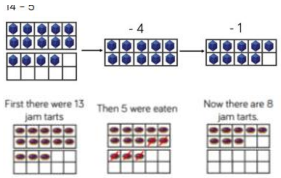
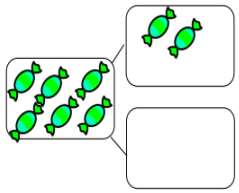
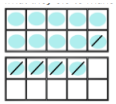
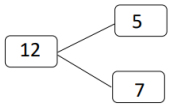
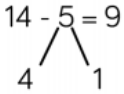
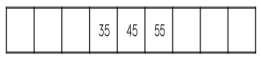
Make 10 using the ten frame.	subtraction facts.  14 - 5 on a ten frame = 14 - 4 - 1. 	counters. Use subtraction to find the missing number.  Present the ten frame pictorially, crossing out the numbers they have subtracted. Discuss what they did to first make ten. 	12 = 0 + 12, 12 - 0 = 12 12 = 1 + 11, 12 - 1 = 11 12 = 2 + 10, 12 - 2 = 10... Use the part, part, whole model to find the inverse calculation.  Show how to make ten by partitioning the subtrahend.  14 - 4 = 10 10 - 1 = 9		
Year 2 Subtract tens	Use base ten to explore patterns in adding and subtracting tens.	Look for patterns in the 100 square.	56 - 20 = 36 69 - 40 = 29 		

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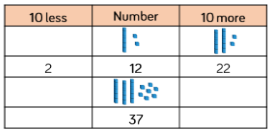
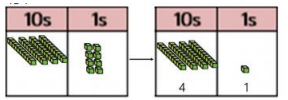
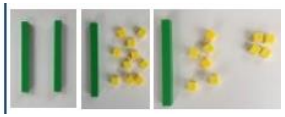
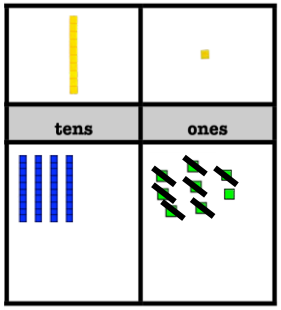
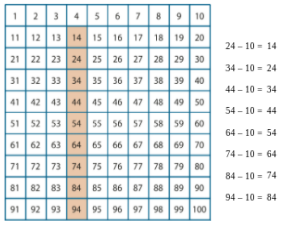
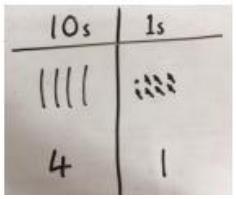
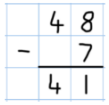
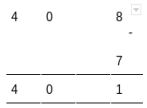
Subtract one digit from two digits	 Use base ten and place value grids to represent the subtraction, exchanging ten for ones where necessary (begin with no exchange).   	 Represent the base ten pictorially. 	Represent the calculation on a number line, using partitioning and bridging to ten.  Show a formal column method in its expanded and/or shortened form where appropriate. Use alongside base ten.   48 - 7 = 41		

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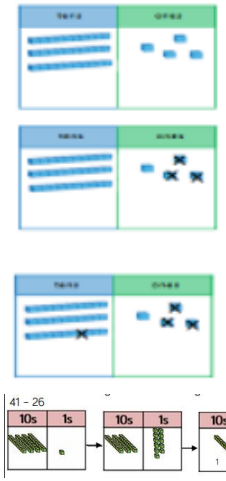
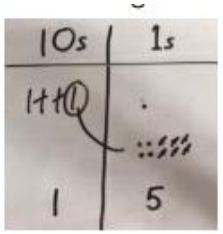
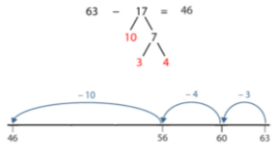
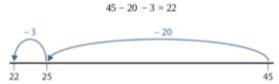
Subtract with two digits	Use base ten and place value grids to represent the subtraction. Exchanging tens for ones where necessary (begin with no exchange). 34 - 13  	Represent the base ten pictorially, remembering to show the exchange. 	Represent the calculation on a number line, using partitioning and bridging to ten.  Jump back on a number line in tens and ones.  Show a formal column method alongside base ten in its expanded and/or shortened form where appropriate. 		

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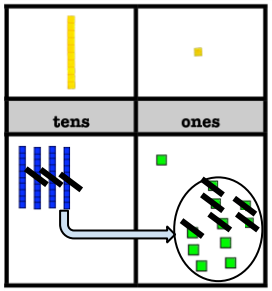
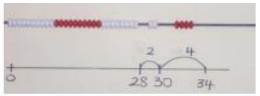
	 Use a bead bar or bead strings to model counting to the next ten.  34—28		3 0 1 1 ~~4~~ ~~0~~ ~~1~~ 2 0 6 1 0 5 41 - 26 = 15		

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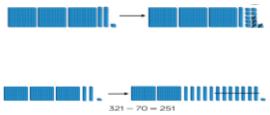
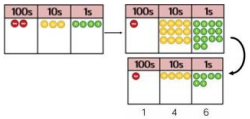
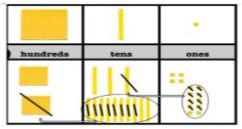
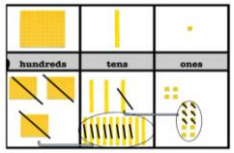
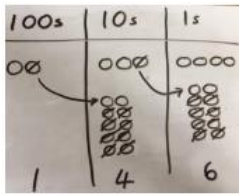
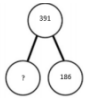
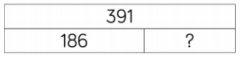
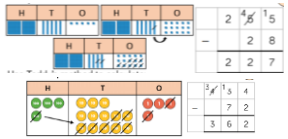
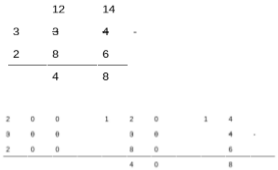
Year 3 Column method three digits subtract one digit with and without regrouping. Column method three digits subtract two digits with and without regrouping. Column method three digits subtract three digits with and without regrouping.	Represent the calculation using base ten or place value counters and place value grids. Begin with TO -TO from year two then build up to three digit numbers. First examples involve no regrouping, later begin regrouping using apparatus.    234 - 88 	Represent the place value counters and base ten pictorially remembering to show what has been exchanged. Represent calculations as bar models and part, part, whole models.   	Show a formal column method alongside base ten in its expanded and/or shortened form where appropriate.    		

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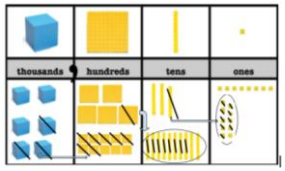
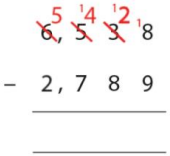
Year 4 Column method with regrouping. (up to 4 digits)	Represent the calculation using base ten or place value counters and place value grids. Begin with HTO - HTO from year three then build up to four digit numbers. First examples involve no regrouping, later begin regrouping using apparatus.  	Represent the place value counters and base ten pictorially remembering to show what has been exchanged. Represent calculations as bar models and part, part, whole models.  	Show a formal column method alongside base ten in its expanded form if necessary, with all children using the shortened form where appropriate. Introduce decimal subtraction through the context of money.  6,538 − 2,789 = 3,749 		

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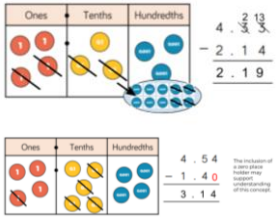
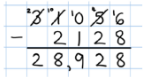
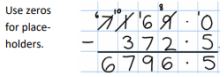
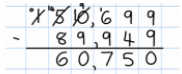
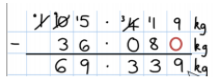
Year 5 Column method with regrouping. Abstract for whole numbers. Start with place value counters for decimals- with the same amount of decimal places.	As Year 4 - at least 4 digits.  	As Year 4 - at least 4 digits.	Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal point.   		
Year 6 Column method with regrouping. Abstract methods. Place value counters for decimals- with different amounts of decimal places.	As Year 5.	As Year 5.	Subtract with increasingly large and more complex numbers and decimal values. Make an appropriate choice as to method depending on the complexity/size of the numbers.   		

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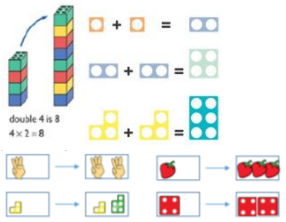
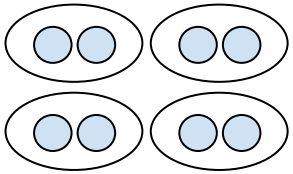
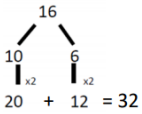
Multiplication					
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**	**Sentence Stems for all year groups**	**Vocabulary for all year groups**
EYFS and Year 1 Recognising and making equal groups. Doubling.	Use cubes and other objects in the classroom to make and recognise equal groups.  Use manipulatives including cubes and Numicon to demonstrate doubling.  Count the groups of objects in 10s, 2s,	Draw objects to represent the equal groups found.  Double 4 is 8.  Represent the	Represent the equal groups as 4 groups of 2 or 4 x 2 = 8. Partition a number then double each part before recombining it back together.  Count in multiples of	There are _____ _____ in _____ _____. The groups are equal **because** there are the same number of _____ in each group. There are _____ **equal groups** of _____. There are _____ in each group. There are _____ groups of _____. The product of _____ and _____ is _____. A times b can represent a groups of b. It can also represent b groups of a.	double times multiplied by the product of groups of lots of equal groups factor inverse factor x factor = product commutative law - a sum or product can be calculated in any order (e.g. ab = ba).

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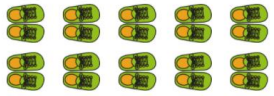
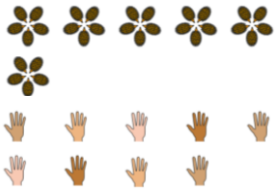
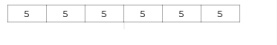
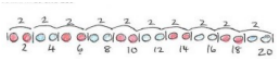
Counting in multiples.	5s becoming more efficient - begin to use arrays. Count pairs of shoes.  Count the petals in fives and 'high fives'.  Use ten frames and hands to count in tens.  Recognise the equal groups and describe how many are in each group -	counting with diagrams using efficient organisation - begin to use arrays.  Look for patterns on the Gattegno Chart.  Use a bar model to represent the calculation. 6 x 5 = 30  Represent the practical resources	10, 2 and 5 out loud. Write the sequences of numbers. 10, 20, 30, 40, 50... 2, 4, 6, 8, 10... 5, 10, 15, 20, 25...  Write the number sentence to describe the resources used:	_____ is a factor **so** we can use the _____ times tables. **I know** that double ____ is ____, **so** half of _____ is _____. Products in the _____ times tables are also in the _____ times tables. **If** _____ is a factor of _____ **then** it is also a factor of _____. Both factors are the same, **so** we can also write this as _____ squared is equal to _____. The _____ is _____ times the length/ weight/height of the _____. **If** I multiply one	associative law - we can group numbers in any order when adding or multiplying (e.g. (a + b) + c = (b + c) + a) distributive law - a x (b + c) = (a x b) + (a x c) multiple prime number square number cube number composite number highest common factor subitising - instantly recognising an amount.

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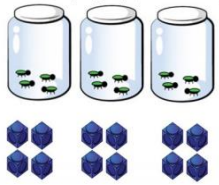
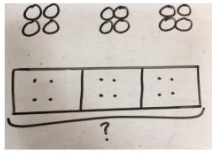
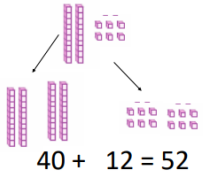
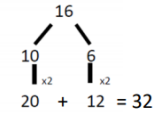
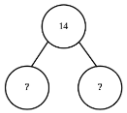
Repeated addition.	'there are three equal groups, with four in each group.' 	in a picture and use a bar model. 	4 + 4 + 4 = 12 3 x 4 = 12	factor by _____, **then** I must divide the other factor by _____ **for** the product to stay the same. _____ is a factor of _____ **because** _____ x _____ = _____. _____ is a multiple of _____ **because** _____ x _____ = _____. Do I need to make an **exchange**? What has stayed the **same**? What has **changed**?	unitising -treating groups that contain or represent the same number of things as ones.
Year 2 Doubling 10, 2, 5 times tables.	Use base ten to show the partitioned approach to doubling.  Count familiar objects in 10s, 2s and 5s. Use Numicon and ten	Draw pictures, representations and the part, part, whole model to show the partitioned approach to doubling.   Use number lines, counting sticks and bar models to show representations of counting in	Partition and recombine, using models to support. 16 x 2 = 10 x 2 + 6 x 2 Count in multiples of a number out loud and write the sequence of numbers. Write the number sentence for	

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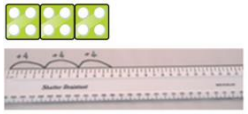
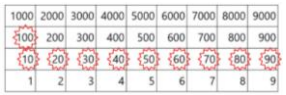
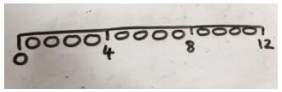
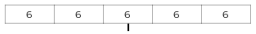
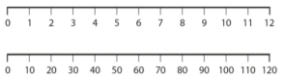
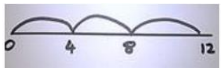
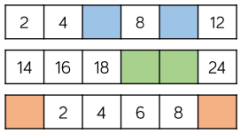
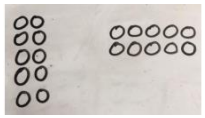
	frames to represent the numbers and see the sequence.   	multiples. Recognise the pattern in a Gattegno Chart.    6 x 5 = 30 Or  5 x 6 = 30	the times tables facts. Number lines can support thinking. 0, 5, 10, 15, 20… 3 x 5 = 15   		
Arrays- showing commutative multiplication and inverse	Create arrays using counters, cubes and Numicon, recognising that the array represents different equations and that	Represent arrays pictorially. 	Explore patterns in the times tables facts and use these to decide if a number is a multiple of 2, 5, 10. Use the array to write a range of		

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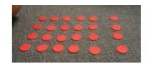
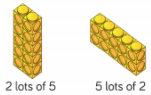
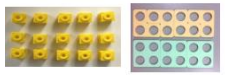
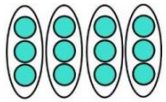
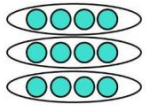
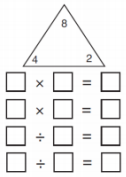
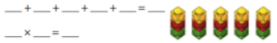
	multiplication is commutative.   	  Represent the inverse as 'fact families.'  	calculations including repeated addition and inverse calculations. Inverse to be taught alongside division . 10 = 2 x 5 5 x 2 = 10 2 + 2 + 2 + 2 + 2 = 10 5 + 5 = 10 10 ÷ 5 = 2 5 = 10 ÷ 2		
Year 3 3, 4 and 8 times tables.	Represent the 3, 4 and 8 times tables using objects, cubes and counters. Record the multiplication statements alongside this.  Show the multiplication facts as arrays and find the four facts (x	Count in multiples of 3, 4 8 on a drawn number line and recognise patterns on a 100 square.  Represent the calculations in a bar model.	Record multiplication facts as repeated addition and in their inverse form. Use arrays. Explore patterns in the times tables facts and use these to decide if a number is a multiple of 3, 4, 8. Recognise the relationship between 2, 4, 8 times tables.		

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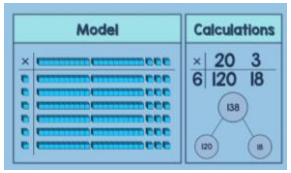
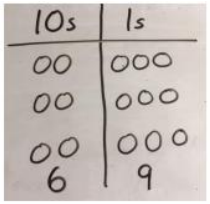
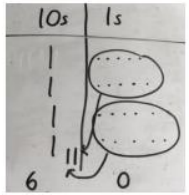
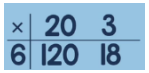
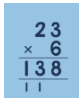
Multiply TO by O using the grid and short methods.	and ÷) that go with it..  Use place value counters and/or base ten apparatus to represent the multiplication calculation.  21 x 3 Show alongside a grid to explore the use of the grid method.  	 5 x 3 = 15 Represent the counters and/or base ten pictorially.  23 x 3  15 x 4 Represent the grid method pictorially.	Count in 3, 4, 8 using counting sticks and other resources. Record informally using mental methods and partitioning (grid method), leading to expanded column method and finally the column method as appropriate.    		

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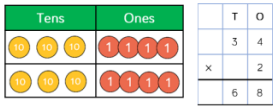
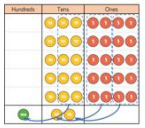
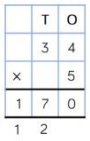
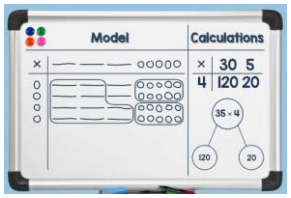
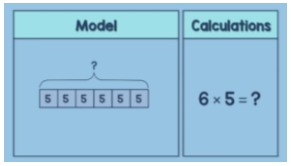
	When the children are unitising confidently, move to the use of place value counters and the short method.    	 Represent word problems using a bar model.  Muffins come in boxes of 5, Peter buys 6 boxes of muffins. How many muffins does Peter buy altogether?			

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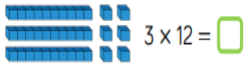
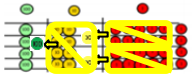
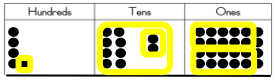
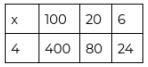
Year 4 6, 7, 9, 11 and 12 times tables. Multiply TO and HTO by O using column multiplication.	Represent the 6, 7, 9, 11, 12 times tables using objects, cubes and counters. Record the multiplication statements alongside this. Show the 11 and 12 times tables using base ten.  Recap the grid method from year 3 using place value counters.  Base ten and place value counters can be used alongside the short and expanded column methods.	Count in multiples of 6, 7, 9, 11, 12 on a drawn number line and recognise patterns on a 100 square.  Represent the place value counters pictorially. Draw the counters using circles or colours to represent the different values.  	Explore patterns in the times tables facts and use these to decide if a number is a multiple of 6, 7, 9, 11, 12. Recognise the relationship between 3, 6, 9 times tables. Count in 6, 7, 9, 11, 12 using counting sticks and other resources. Represent as a grid method with formal column addition to find the final answer.  400 80 + 24 504 Use the expanded and short column method with TO x O then HTO by O alongside place value counters.		

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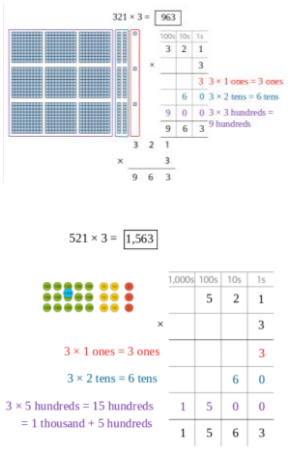
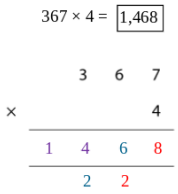
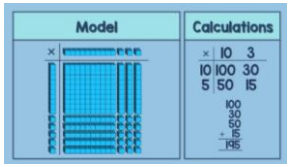
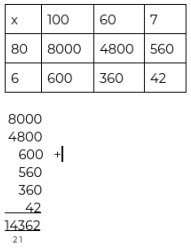
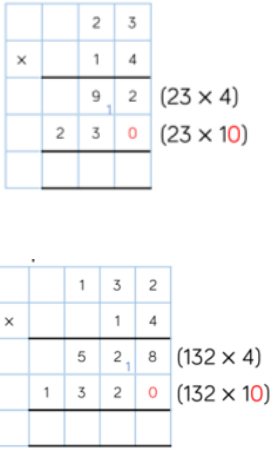
					
Year 5 Column multiplication up to 4 digit numbers multiplied by 1 or 2 digits.	Recap learning from Year 4 using place value counters and base ten. Move towards TO x TO, ThHTO x O, ThHTO x TO, HTO x TO. 	Use the grid method where necessary to support the understanding of the column multiplication method. 	Multiply using the column method for 4 digit numbers x 1 or 2 digits. 		

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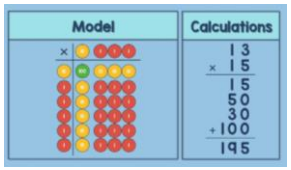
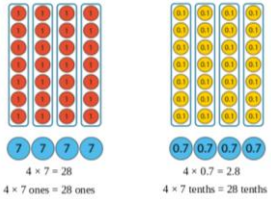
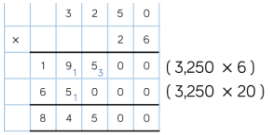
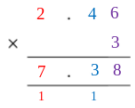
	  Support the understanding of decimal multiplication using place value counters before moving into a formal method. 		 Show decimal multiplication alongside it's non-decimal counterpart so that children can see the relationship. Ensure sufficient coverage of ÷10/100/1000 first.    		

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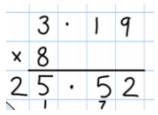
Year 6 Column multiplication with multi-digit up to 4 digits by a 2 digit number.	As Year 5	As Year 5	As Year 5 plus multiplying decimals up to 2dp by a single digit. 		

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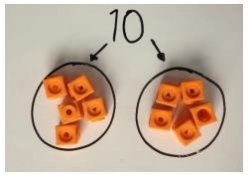
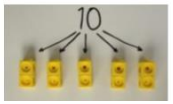
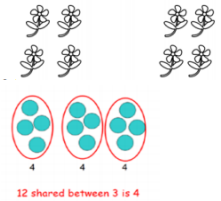
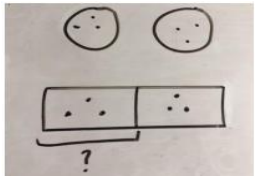
Division					
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**	**Sentence Stems for all year groups**	**Vocabulary for all year groups**
EYFS and Year 1 Sharing objects into groups. Division as grouping	Share objects into equal groups using a range of materials.    Use cubes, counters and other objects to make groups of… e.g. Put 10 cubes into groups of 2.  	Use pictures or shapes to share quantities.   Draw the cubes, counters and other objects to represent the calculation. 	6 shared between 2 equals 3 10 shared between 5 equals 2 10 put into groups of 2 equals 5	_____ **divided into** _____ **groups of** _____ _____ **divided between** _____ _____ **divided by** _____. There are _____ groups and a remainder of _____. _____ is a multiple of _____, **so** when it is divided into groups of _____, there is no remainder. **If** I multiply the dividend by _____, **I must** multiply the divisor by _____ for the quotient to stay the same.	share group divide divided by half dividend divisor quotient dividend ÷ divisor = quotient subitising - instantly recognising an amount. unitising -treating groups that contain or represent the

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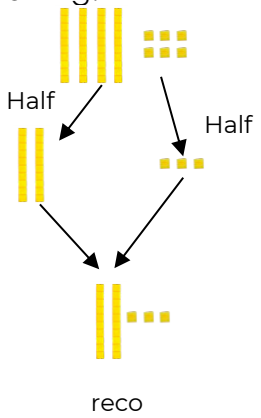
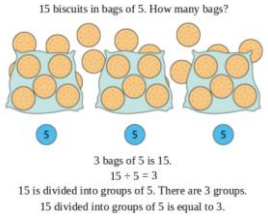
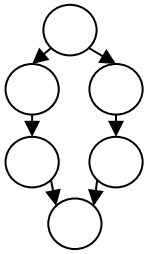
Year 2 Halving Division as grouping within the 2, 5 and 10 times tables. .	Use base ten to show the partitioned approach to halving.  Use cubes, counters and other objects to make equal groups of… e.g. Put 10 cubes into groups of 2.  	Draw pictures, representations and the part, part, whole model to show the partitioned approach to halving.  Represent the division on a number line or bar model, including the use of repeated subtraction.	Partition and recombine, using models to support. 46 ÷ 2 = 40 ÷ 2 + 6 ÷ 2 = 20 + 3 = 23 15 ÷ 3 = 5 15 - 3 - 3 - 3 - 3 - 3 Divide 15 into 3 groups, how many in each group?	_____ is a factor of _____ **because** _____ ÷ _____ = _____. _____ is a multiple of _____ **because** _____ ÷ _____ = _____. Do I need to make an **exchange**? What has stayed the **same**? What has **changed**?	same number of things as ones.

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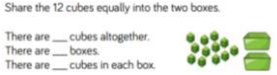
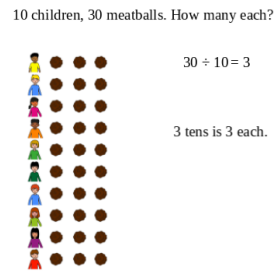
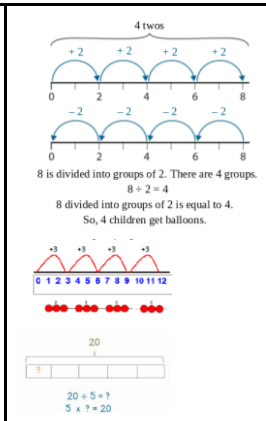
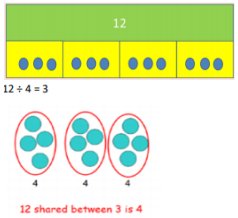
Division as sharing within the 2, 5 and 10 times tables.	Share objects into equal groups using a range of materials.  Represent the division as an array and notice the connection between multiplication and division.  	 Use pictures or shapes to share quantities. Use bar modelling to show and support understanding.  	15 ÷ 5 = 3		
Year 3 Division of TO by O including examples with a remainder.	Continue the work begun in Year 2 with arrays, sharing and grouping	Continue the work begun in Year 2 with arrays, sharing and grouping	Continue the work begun in Year 2 with arrays, sharing and		

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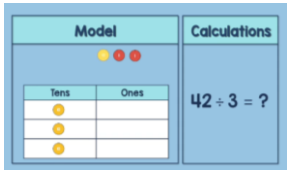
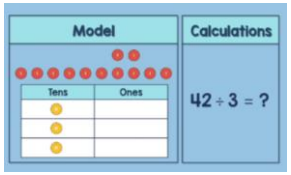
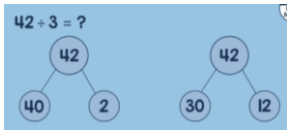
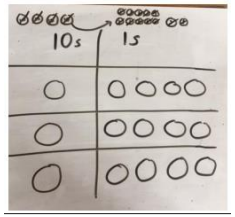
	within the 3, 4 and 8 times tables. Use place value counters to show the division. Begin with the dividend, which is then split into the appropriate number of groups according to the divisor.  Make an exchange where this is necessary.  Continue sharing according to the divisor and	within the 3, 4 and 8 times tables. Show how the number has been partitioned in order to carry out the division. Use a part, part, whole model.  Represent the place value counters pictorially.  Use number lines to support understanding and show where there	grouping within the 3, 4 and 8 times tables. Understand the calculations that have been carried out with the place value counters and represent as number sentences. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14 Complete written divisions, showing the remainder using r. 28 ÷ 5 = 5 r 3		

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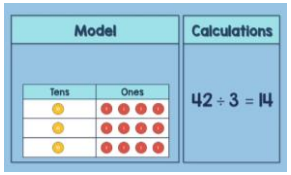
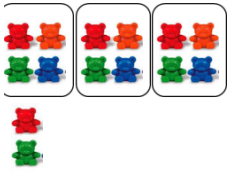
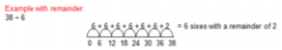
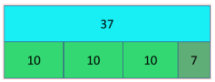
	represent the calculation as a number sentence.  Divide objects between groups and see how many are left over to illustrate the concept of 'remainders'.  14 ÷ 3 = 4 r 2	might be a remainder.  Draw dots and group them to clearly show where there might be a remainder. Represent on a bar model.   			
Year 4 Short division of HTO by O including remainders..	Use place value counters to divide TO and HTO by O, including where there is a remainder. Show alongside the short	Represent the place value counters pictorially.	Use known multiplication facts to recognise when a division calculation will have a remainder and make a prediction.		

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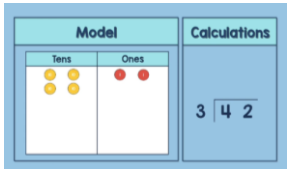
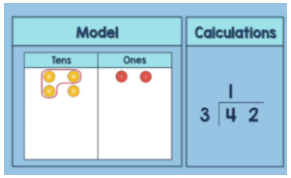
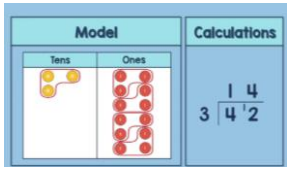
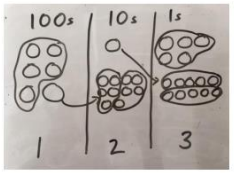
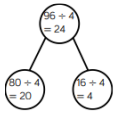
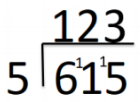
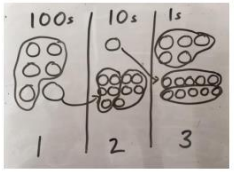
	division method.  Recognise where counters may need to be exchanged.   	 Show the calculation as a part, part, whole model.  	Use the short division strategy, showing clearly any remainders.  		
Year 5 Short division up to ThHTO by O including remainders.	Use place value counters to divide TO, HTO, ThHTO and decimals by O, including where there is a remainder. Show alongside the short division method.	Represent the place value counters pictorially.  	Use the short division strategy for whole numbers and decimals, showing clearly any remainders.		

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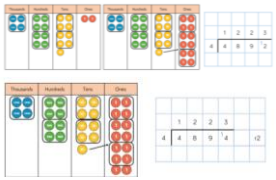
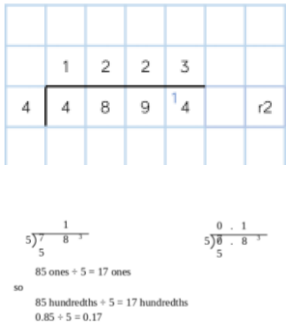
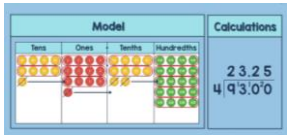
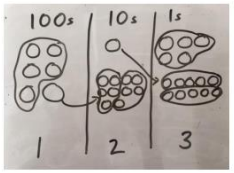
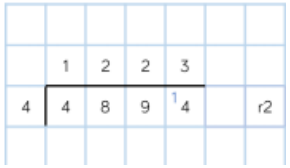
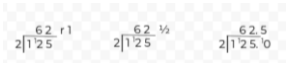
					
Year 6 Short division. Long division up to 4 digits by a 2 digit number (including decimals).	Short division as Year 5 plus use place value counters to write the remainder as a decimal or fraction.  Long division, e.g. 2544 ÷ 12.  We can't group 2 thousands into groups of 12 so we	Represent the place value counters pictorially. 	Use the short division strategy for whole numbers and decimals, showing clearly any remainders, writing them in their decimal or fractional form.  Show remainders in three forms: 		

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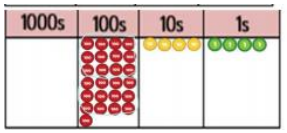
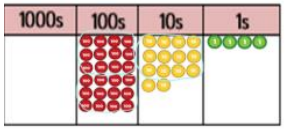
	will exchange them.  $\begin{array}{r} 02 \\ 12\overline{)2544} \\ 24 \\ \hline 1 \end{array}$ We can group 25 hundreds into groups of 12, leaving one hundred remaining.  $\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$ After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12		Long division for 4 digits divided by 2 digits. $\begin{array}{r} 0212 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$ Use knowledge of factors to simplify long division calculations into two short division calculations. E.g. 2364 ÷ 27 = (2364 ÷ 9) ÷ 3 = 87 r 5. Use knowledge of multiples to support 4 digit by 2 digit division.		

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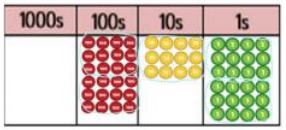
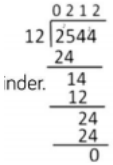
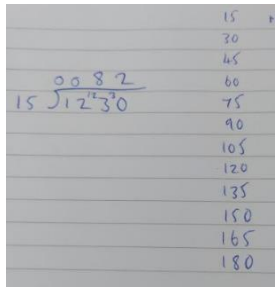
	which leaves 2 tens.   After exchanging the two tens, we have 24 ones. We can group 24 ones into 2 groups of 12 which leaves no remainder.		 		

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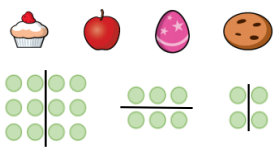
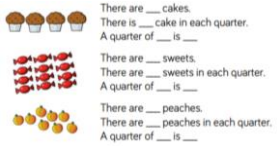
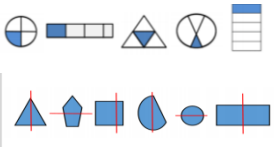
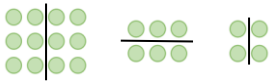
Arden Primary School Calculation Policy

Fractions (calculation only)					
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**	**Sentence Stems for all year groups**	**Vocabulary for all year groups**
EYFS and Year 1 Find half of an object, shape or quantity, recognising that half is one of two equal parts. Find a quarter of an object, shape or quantity, recognising that a quarter is one of four equal parts.	Use familiar objects and counters.  Use familiar objects and counters. 	Recognise halves and quarters in drawn shapes.  Draw the counters they have split into half. 	None at this stage. Children will just use the words half and quarter not the notation ½ or ¼.	This is a whole ____ **because** I have all of it. There are _____ in the whole group. There are _____ in this part of the group. _____ is a whole, _____ is a part and _____is a part. The whole is	numerator denominator tenth hundredth proper fraction improper fraction equivalent fraction mixed number

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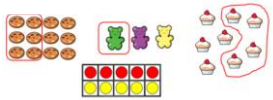
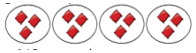
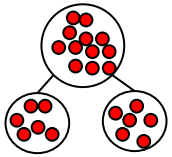
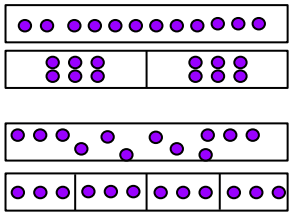
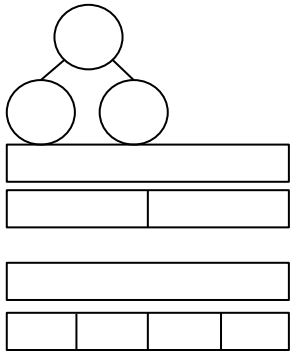
Year 2 Find ½, ⅓, ¼, $\frac{2}{4}$, ¾ of a length, shape, set or quantity, recognising that the parts have to be equal. Find the non-unit fraction three quarters.	Use familiar objects and counters to show the fractions.  Share counters into four equal parts and count three parts. 	Begin to represent the fractions in bar models and part, part, whole models.   Find three quarters using bar models.	Use the notation for fractions, e.g. ½ of 12 is 6 and ⅓ of 15 is 5. Represent the bar model and part, part, whole model with numerals. 	divided into _____ equal parts. _____ of the parts has been shaded. _____ can be written as _____. **I say** __ . __ **but I think** ___ wholes and ___ tenths. _____ **is between** _____ and _____. _____ is the previous whole number/tenth/hundredth and _____ is the next whole number/tenth/hundredth. _____ is 10/100/1000 times	common denominator vinculum (fraction bar) integer common denominator

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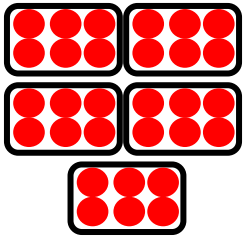
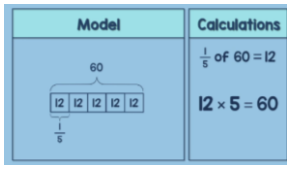
Year 3 Find unit and non-unit fractions of amounts.	Separate counters into equal groups, relating to division. 30 ÷ 5 = 6 therefore ⅕ of 30 = 6. ⅗ of 30 = 18.  Begin to show the counters within the bar model diagram. Counting more sections when calculating a non-unit fraction.  When working with larger numbers, use place value counters to calculate.	Show the bar model using counters or figures, alongside the abstract calculation, varying the question type to enable deeper understanding. E.g. ⅕ of a number is 12, what is the number?  Recognise that to find a non-unit fraction of an amount, the same bar model can be used - with more sections being counted. Show alongside the abstract calculation. E.g. Peter has 30	⅕ of 60 = 12 60 ÷ 5 = 12 30 ÷ 5 = 6 6 x 3 = 18 ⅗ of 30 = 18 Once the bar model has been explored, understand the abstract concept as "divide by the denominator and multiply by the numerator."	bigger than _____. **If** _____ is the whole, **then** ____ is part of the whole. The denominator is _____ **because** the whole is divided into _____ equal parts. The numerator is _____ **because** _____ parts are shaded. The whole has been divided into _____ equal parts. _____ of the parts have been shaded; that is _____ of the whole. There are _____ parts between zero and one, that means we are counting in units of _____.	

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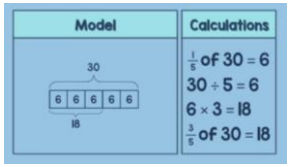
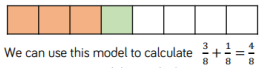
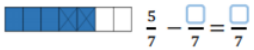
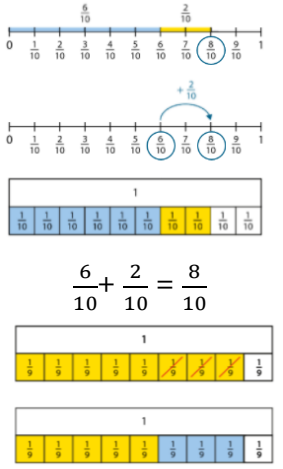
Add and subtract fractions with the same denominator.	E.g. find ¼ of 84 = 21, ¾ of 84 = 63.  Use paper strips and circles to explore adding and subtracting fractions and show as number sentences. 	sweets. He eats ⅗ of the sweets. How many sweets does he eat?  Use bar models to represent the paper strips and perform the calculations.  Cross out the sections of the bar that are being subtracted.   Use knowledge of addition and subtraction of	Move from the bar model to the number line and then the abstract, continuing to show the pictorial to support.  	_____ is equivalent to _____. _____and _____ are related fractions **because** the denominator, "_____", is a multiple of the other denominator "_____". What has stayed the **same**? What has **changed**?	

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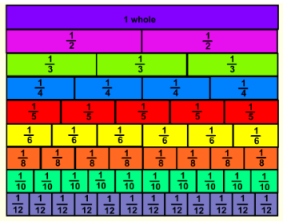
		fractions to find different ways to partition - use the part, part, whole model. .  Explore addition and subtraction through the use of the fraction wall. 	$\frac{8}{9} - \frac{3}{9} = \frac{5}{9}$		

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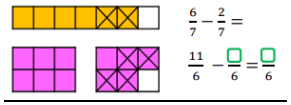
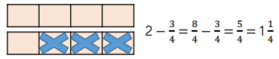
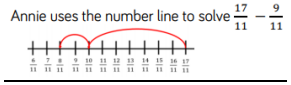
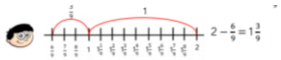
Year 4 Add two or more fractions with the same denominator. Subtract two fractions with the same denominator. Subtract from whole amounts.	As Year 3, including examples where the fraction is improper and where more than two fractions are used in the calculation. Understand that whole numbers have equivalent numerators and denominators. Explore this using paper strips. 	As Year 3, including examples where the fraction is improper and where more than two fractions are used in the calculation.   Use bar models to illustrate the subtraction calculation, showing larger whole numbers as more than one strip.  	As Year 3, including examples where the fraction is improper and where more than two fractions are used in the calculation.  Show number lines alongside the bar model to illustrate the subtraction calculation and move to the abstract.  $2 - \frac{6}{9} = \frac{18}{9} - \frac{6}{9} = \frac{12}{9} = 1\frac{3}{9}$		

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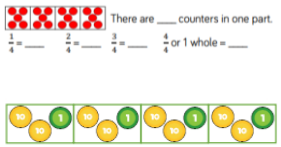
Calculate fractions of a quantity.	As Year 3 plus... Use counters and place value counters to find unit and non unit fractions of amounts. Understand the 'divide by the denominator, multiply by the numerator' rule and apply when using counters. 	As Year 3 plus... Represent the calculation using a bar model.  5/9 of 369 = 205	Moving to... $2 - \frac{6}{9} = 1\frac{3}{9}$ As Year 3 plus… Show all steps in the calculation using the 'divide by the denominator, multiply by the numerator' rule with increasing complexity. Use all multiplication facts from Year 4 and relate to division. Find $\frac{5}{9}$ of 369. 369 ÷ 9 = 41 41 x 5 = 205		

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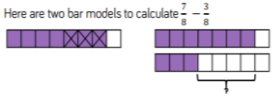
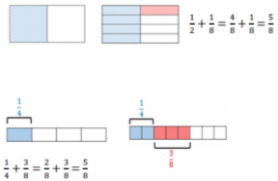
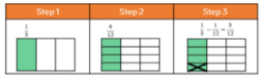
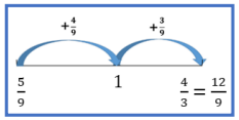
Year 5 Add and subtract fractions with the same denominator and denominators that are multiples of the same number. Add and subtract fractions within one. Add three or more fractions.	As Year 4 for fractions with the same denominator. Use paper strips and circles to identify equivalent fractions when working with fractions whose denominators are multiples of the same number. 	As Year 4 for fractions with the same denominator.  Represent the paper strips using bar models that show the equivalent fractions.  Add three or more fractions including greater complexity using bar models alongside calculations.  Show subtraction using crosses on a bar model. 	As Year 4 for fractions with the same denominator. Represent the calculation in it's abstract form alongside the bar model, beginning to recognise the arithmetical connections between numerators and denominators. $\frac{2}{6}+\frac{3}{12}+\frac{1}{3}=\frac{4}{12}+\frac{3}{12}+\frac{4}{12}=\frac{11}{12}$ Find the difference using a number line.  		

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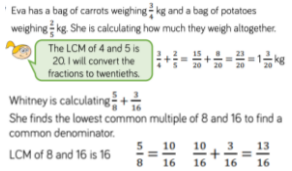
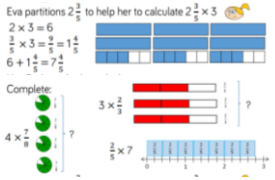
Year 6 Add and subtract fractions and mixed numbers.	As Year 5 plus: children will be encouraged to find the lowest common multiple in order to find the lowest common denominator.	As Year 5 plus: children will be encouraged to find the lowest common multiple in order to find the lowest common denominator.	As Year 5 plus: children will be encouraged to find the lowest common multiple in order to find the lowest common denominator.  		
Multiply fractions by integers.	As Year 5.	As Year 5.  	As Year 5.		
Multiply fractions by fractions.	Illustrate the equivalence of ½ x ⅓ and ½ of ⅓ through fraction strips.	Show the equivalence of ½ x ⅓ and ½ of ⅓ through the use of bar models.	Recognise the formula for multiplying fractions as multiplying the numerators and denominators.		

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Divide fractions by integers. Find fractions of an amount.	Dexter is calculating $\frac{1}{3} \times \frac{1}{2}$ by folding paper. He folds a piece of paper in half. He then folds the half into thirds. He shades the fraction of paper he has created. When he opens it up he finds he has shaded $\frac{1}{6}$ of the whole piece of paper. $\frac{1}{3} \times \frac{1}{2}$ means $\frac{1}{3}$ of a half. Folding half the paper into three equal parts showed me that $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ Represent the division of fractions by integers using paper strips. As Year 5.	$\frac{4}{5} \times \frac{3}{4}$ 1 unit 1 unit Notice that across the top, we have shaded in 4 out of 5 across the top to represent the four - fifths. Then we shaded 3 out of 4 vertically to show three - fourths. Now we can use the diagram to get the product. The total number of spaces is the denominator and the shaded number of spaces is the numerator. This diagram shows the fraction $\frac{12}{20}$. Show how to divide fractions by integers using bar models. $\frac{1}{3} \div 2 = \frac{1}{6}$ As Year 5.	$\frac{2}{3} \times \frac{5}{7} = \frac{10}{21}$ Understand that to divide fractions by integers, you need only divide the numerator. $\frac{4}{9} \div 2 = \frac{4 \div 2}{9}$ As Year 5.		

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