Progression in Calculations

EYFS – Year 6

September 2023

Introduction

This policy supports the use of the White Rose Maths scheme, Maths Mastery, Sarah Martin and Tara Loughran resources. Progression within each area of calculation is in line with the mathematics guidance: key stages 1 and 2, non-statutory guidance for the national curriculum in England June 2020. This calculation policy is used to support children to develop a deep understanding of number and calculation. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations.

• Concrete representation— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.

• Pictorial representation – a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations, such as a diagram or picture of the problem.

• Abstract representation—a pupil is now capable of representing problems by using mathematical notation, for example 12 x 2 = 24.

It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations

The Mastery of Maths

At the centre of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that are taught and used in EYFS to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

Our Calculation Policy – The Research

- Teachers should have a clear understanding of how children learn maths. Staff need to know the individual children well and develop a culture that supports children's curiosity/thinking and problem solving. (EEF)
- Manipulatives need to be used purposefully and appropriately to have an impact on learning. (EEF)
- All adults in class should have a clear, strong understanding of why a particular CPA model is being taught. (EEF)
- Representations across year groups should be consistent to connect prior learning to new learning. (DFE Maths Recover

The rights of the mathematician

1. The right to enjoy mathematics
2. The right to have interests and preferences
3. The right to make jottings, drawings and working out
4. The right to use our own methods and approaches
5. The right to use manipulatives and resources
6. The right to reason, to talk about maths and be listened to
7. The right to make mistakes
8. The right to estimate, to guess and to conjecture
9. The right to ponder and take time
10. The right to be playful

Catherine Gripton

https://blogs.nottingham.ac.uk/primaryeducationnetwork/2020/02/14/the-rights-of-the-mathematician/

Some of the strategies in the document below may be used in more than one of the CPA representations dependent upon the context in which they are taught.

Addition

Addition – EYFS

ELG Number: Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

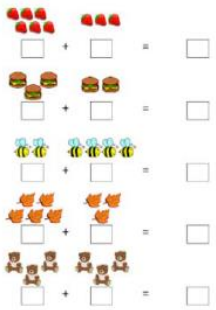
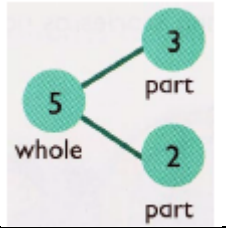
EYFS Vocabulary.

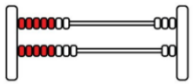
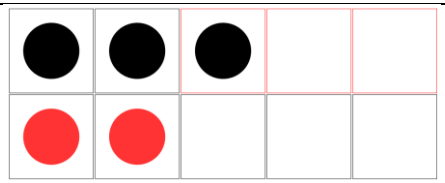
Number

Zero, number, one, two, three … to twenty and beyond, teens numbers, eleven, twelve … twenty, none, how many …? count, count (up) to, count on (from, to), count back (from, to), count in ones, twos, fives, tens, is the same as, more, less, odd, even, few, pattern, pair

Addition

Key language which should be used: total, parts and wholes, plus, add, altogether, more than, equals, 'is equal to' 'is the same as' column, place value, counting forward, more, and, make, total, double, most, count on, number line, part, part, whole

Objectives	Concrete	Pictorial	Abstract
• Find the total number of items in two groups by counting all of them. (including doubling.)	Use toys and general classroom resources for children to physically manipulate,  group/regroup. Use specific math's resources such as counters, cubes, rekenrek etc.	 Two groups of pictures so children can count the total. 	A focus on symbols and numbers to form a calculation. 5+2=7 

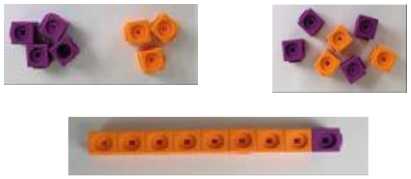
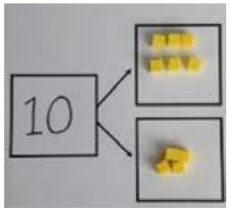
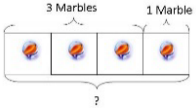
	 Use visual supports such as ten frames, part-part-whole and addition mats, with the physical objects and resources that can be manipulated.    Use of giant tens frame. On your fingers - show me. Children will physically make the symbols using their body. The children will make the symbol with their	 Use visual supports such as ten frames, part-part-whole and addition mats with pictures/icons.	

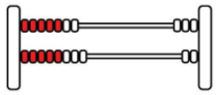
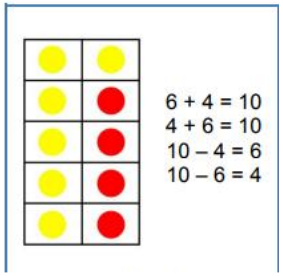
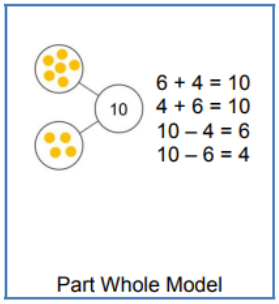
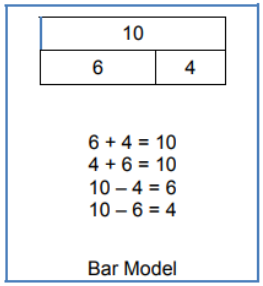
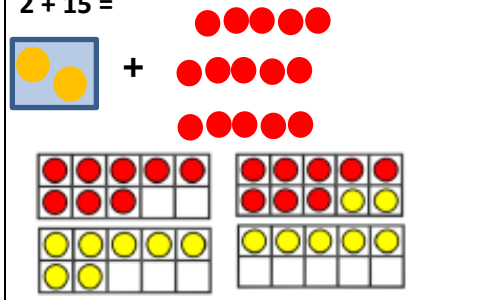
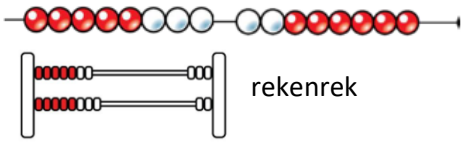
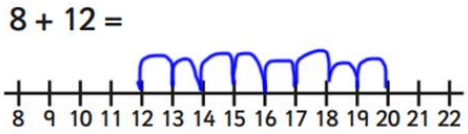
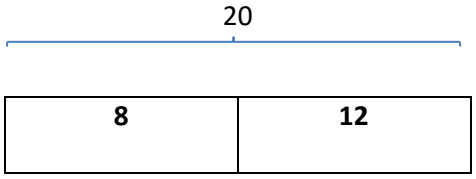
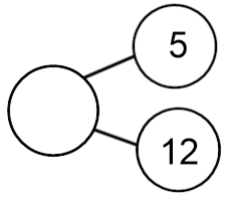
	arms for example 5 (show 5 fingers) + (make a + with arms) 2 (show 2 fingers) = (make that with arms so both arms straight across our bodies) 7 (show 7 fingers)		

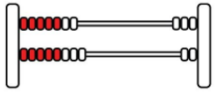
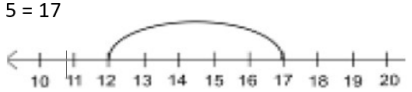
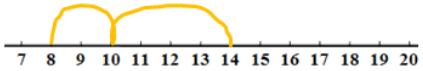
Addition Year 1

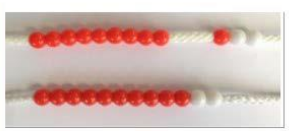
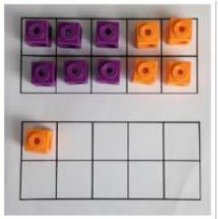
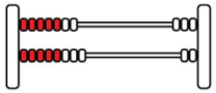
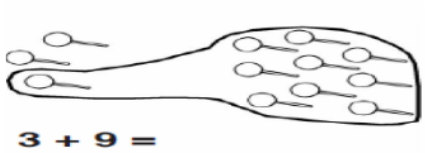
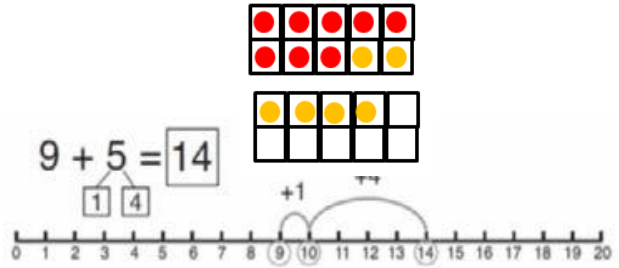
Year 1 Vocabulary

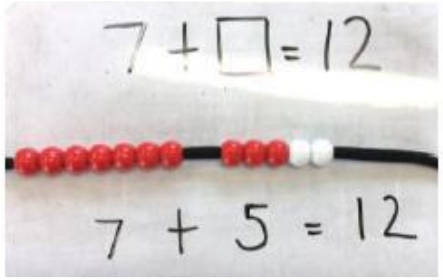
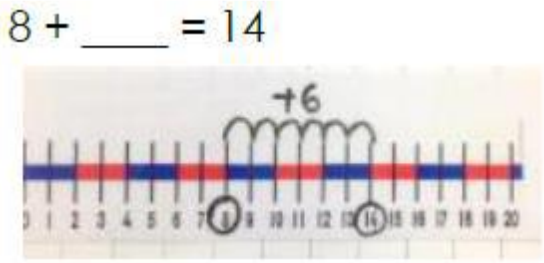
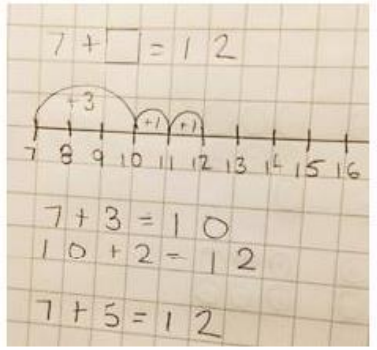
add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, balancing, part, part, whole, parts and wholes, plus, add, altogether, more than, 'is equal to' 'is the same as' column, place value, counting forwards

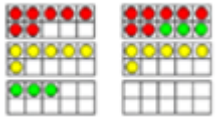
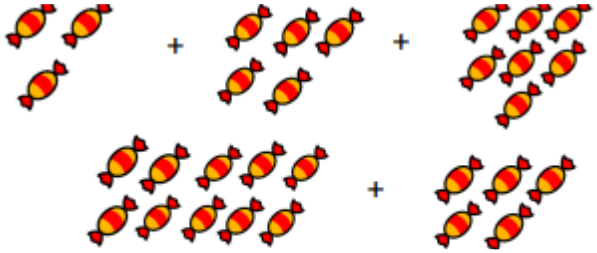
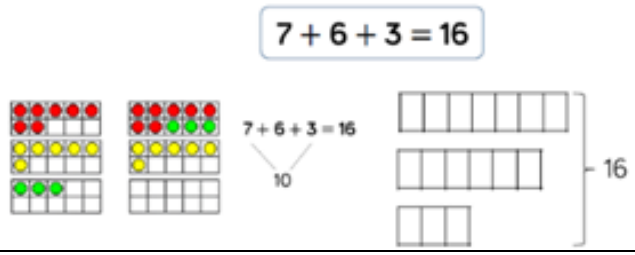
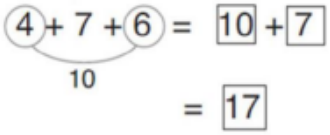
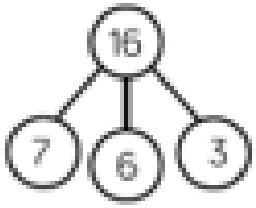
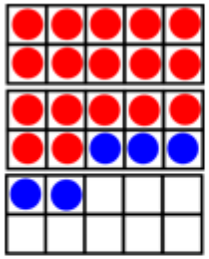
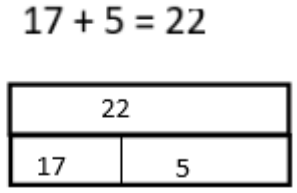
Objectives	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model	Use cubes to add two numbers together as a group or in a bar. (Some children may still need to use real objects)  Use part-part-whole model. 	 Use pictures to add two numbers together as a group or in a bar.  The Bar Model will be continued from EYFS as a method to support problem solving involving addition, continuing with the concrete representations and moving onto using pictorial representations of objects. Some children will also move onto the abstract. 	  Use the part-part whole diagram as shown above to move into the abstract. **4 + 3 = 7** **10= 6 + 4**

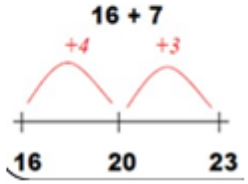
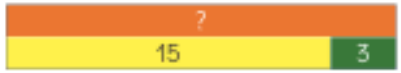
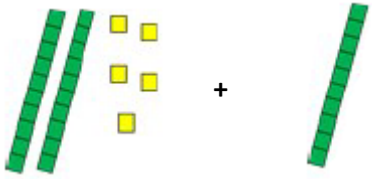
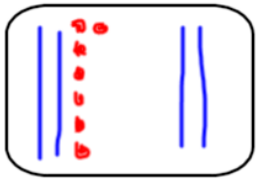
Represent and use number bonds and related subtraction facts within 20	Children may need to initially use real objects then move onto the  representation. 		
Addition one-digit and two-digit numbers to 20 including 0.	Count out each set then find the total **2 + 15 =**   rekenrek	Recognise the biggest number in the calculation and count on from it mentally or using number line.  	5 + 12 = 17 17= 1 2 + 5 

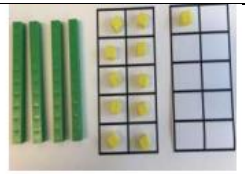
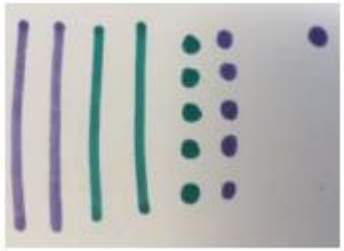
Start at the bigger number and counting on	Count on from first number (Cover first number or display as numeral). **2 + 5**  Recognise the biggest number in the calculation and count on from it (using objects for smaller number if necessary) Start with the larger number on the bead string and then count of to the smaller number 1 by 1 to find the answer.   rekenrek 	Partitioning the smaller number and use the tens number to bridge calculation. 12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer. 	**6 + 8** becomes **8 + 2 + 4** **5 + 17** becomes **17 + 3 + 2** Place the larger number in your head and count on the smaller number to find your answer.

Regrouping to make 10 (The 'make 10' strategy)	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10. Use ten frames. rekenrek 	Use pictures or a number line.  3 + 9 = Regroup or partition the smaller number using the part-part-whole model to make 10.  9 + 5 = 14 1 4 +1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	7 + 4= 11 If I am at seven, how many more do I need to make 10? How many more do I add on now?

Missing Number Problems.	Children begin by using concrete objects to support counting on to find the missing number. 	Children can then use the support of a number line to count on to find the missing numbers. 	Children should use knowledge of number bonds to partition when counting on to find the missing number. 

Addition Year 2			
Vocabulary add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens			
Objectives	Concrete	Pictorial	Abstract
Adding 3 1-digit numbers	**4 + 7 + 6= 17** Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, making 10 with 2 of the digits (if possible) then add on the third digit. When adding 3 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. 	 Add together three groups of objects. Draw a picture to recombine the groups to make 10. 	 Combine the two numbers that make 10 and then add on the remainder. 
Adding a 2-digit number and ones	 17+5=22 Use ten-frame to make magic ten.	Use the part-part-whole and number line to model.	17+5=22 

	16 + 3=  Children explore the pattern 17+5=22 27+5=32	   24 + 4 = 28 Bar model.  	
Adding a 2-digit number and multiples of 10	 25 + 10 = 35 Explore that the ones digit does not change	Dienes may be used above the number line initially. The calculation will be shown alongside the number line to see the connection.  **27 + 20= 47**	27 + 10 = 37 27 + 20 = 47 27 + ___ = 57
Adding two 2-digit numbers within 100	25 + 26 = 51	25 + 26 = 51	25 + 26 = 51 20 + 20 = 40 5 + 6 = 11 40 + 11 = 51 Leading on to adjusting to make a

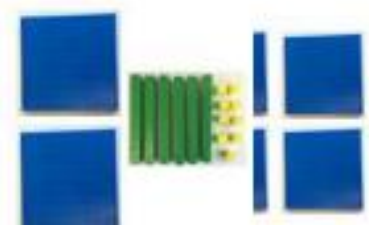
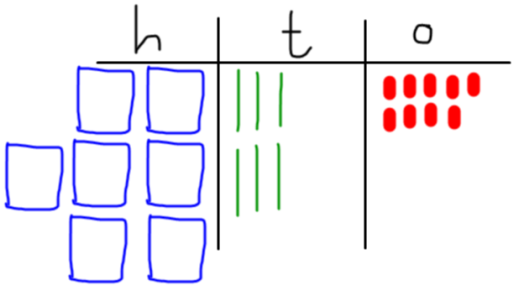
	 		multiple of 10. 25 + 26 = 51 30 + 21 = 51

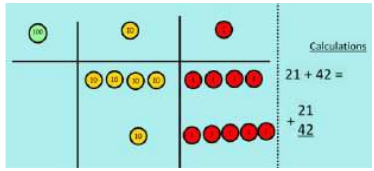
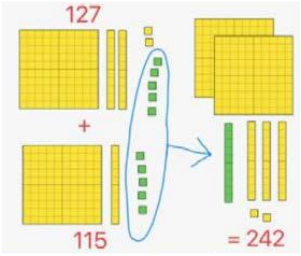
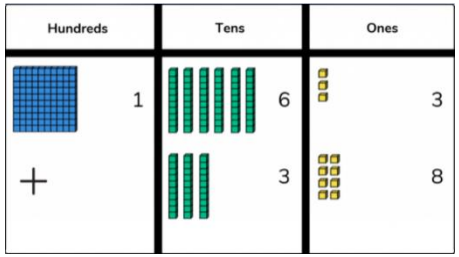
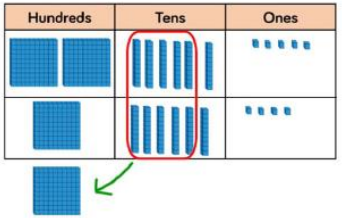
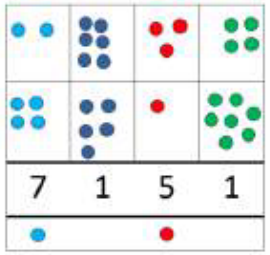
Addition Year 3

- This work revises and reinforces ideas from Key Stage 1, including the focus on place value

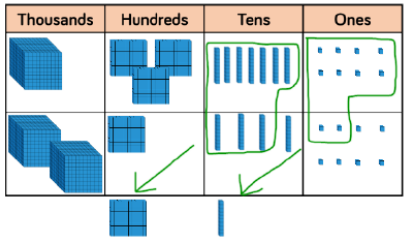
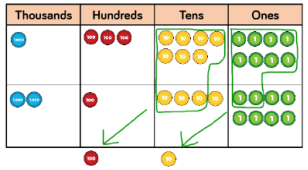
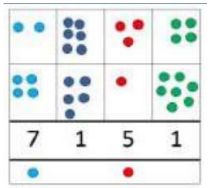
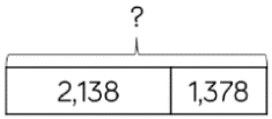
Vocabulary

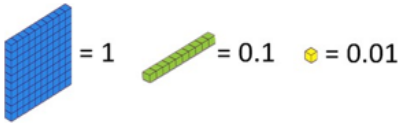
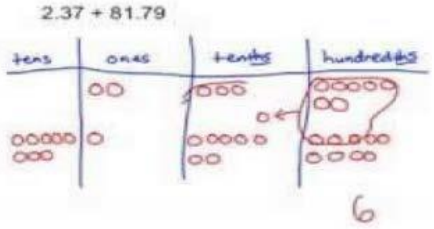
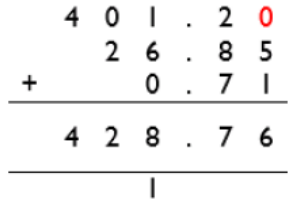
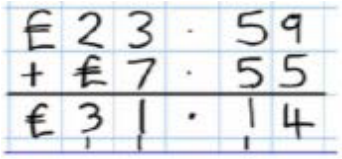
addition add, more, and make, sum, total, altogether, double, near double, half, halve, tens, hundreds, decimal, decimal point, plus, one more, two more... ten more... one hundred more, how many more to make…? How many more is… than…? How much more is…?

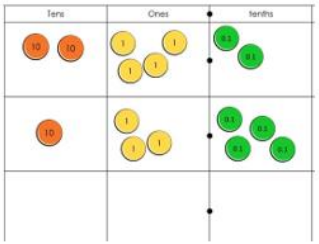
Objectives	Concrete	Pictorial	Abstract
Add numbers with up to 3-digits, using formal written methods of columnar addition Column addition (no regrouping)	269 + 500 = 769  Using manipulatives (dienes, counters) children to line up hundreds, tens and ones. Move to using place value counters	Children move to drawing dienes.  269 + 500 = 769	Add the ones first, then the tens, then the hundreds. 2 2 3 + 1 1 4 3 3 7

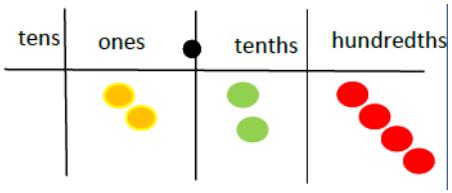
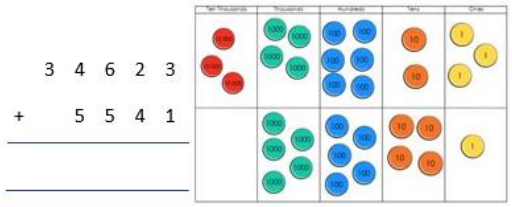
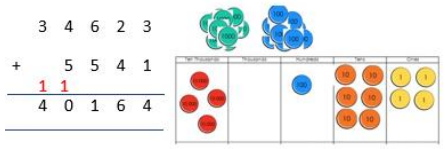
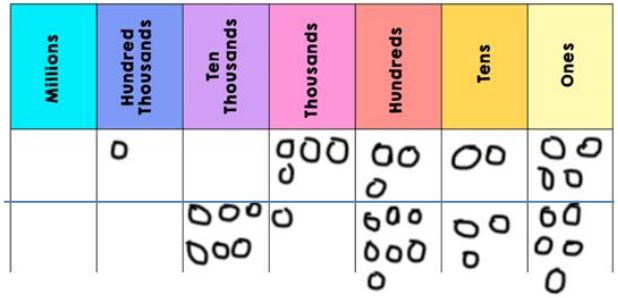
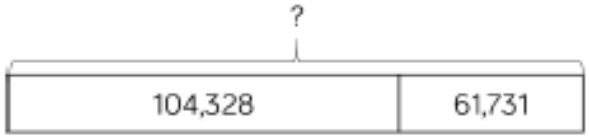
			
Column Addition with regrouping.	Exchange ten ones for a ten. Model using dienes and place value counters.   	 Children can draw a representation of the grid to further support their understanding, carrying the ten underneath the line.	$\begin{array}{rcl} 20 & + & 5 \\ \underline{40} & + & \underline{8} \\ 60 & + & 13 \end{array} = 73$ Children are to begin with the abstract: expanded form. For those children, that are confident, the below method should be used. Start by partitioning the numbers before formal column to show the exchange. $265 + 164 = 429$

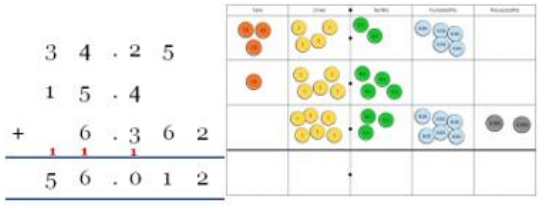
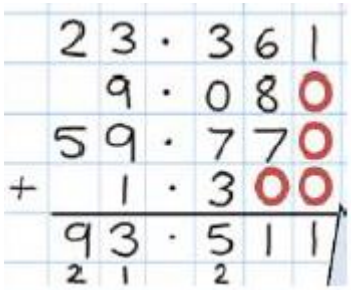
			$\begin{array}{r} 536 \\ +\ 85 \\ \hline 621 \\ \hline 1\ 1 \end{array}$

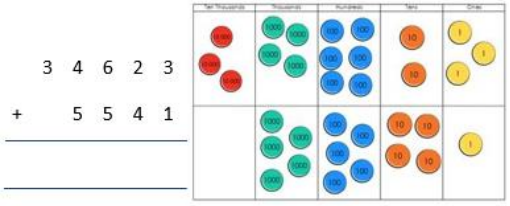
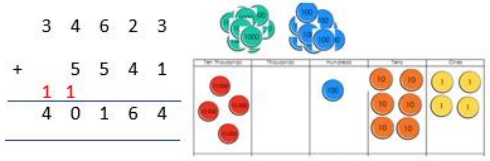
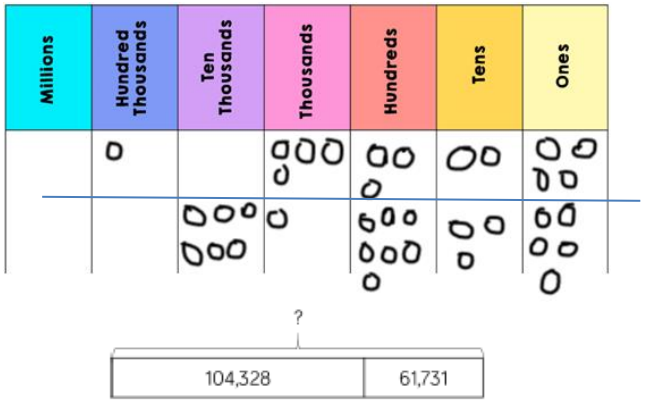
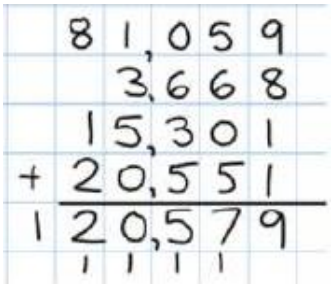
Addition Year 4			
Vocabulary add, addition, more, plus, increase, sum, total, altogether, double, near double, near double, half, halve, tens, hundreds, decimal, decimal point, how many more to make…?			
Objectives	Concrete	Pictorial	Abstract
Add numbers with up to 4 digits Using formal written methods of columnar addition where appropriate add numbers with up to 4 digits (with exchange)	Children continue to use dienes or place value counters to add, exchanging ten ones for a ten and ten tens for a hundred and ten hundreds for a thousand.   	Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.   If the children are completing a word problem, draw a bar model to represent what it's asking them to do. The calculation will be shown alongside the manipulative used to see the connection.	**1,378 + 2,148 = 3,526** Continue from previous work to carry hundreds as well as tens. $\begin{array}{r} 1378 \\ +\ 2148 \\ \hline 3526 \\ \hline 1\ 1 \end{array}$

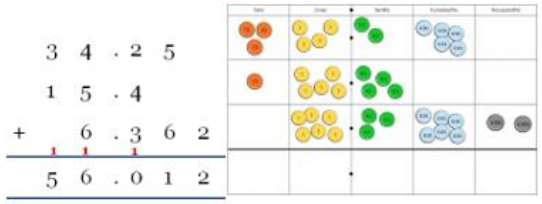
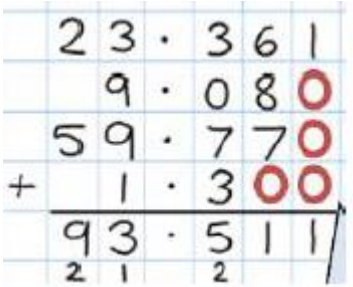
			
Add decimals with 2 decimal places, including money. When adding decimals with different numbers of decimal places, children should be taught and encouraged to make them the same through identification that 2 tenths is the same as 20 hundredths, therefore, 0.2 is the same value as 0.20	Calculating with decimal numbers Assign different values to dienes equipment. If a Dienes 100 block has the value of 1, then a tens rod has a value of 0.1 and a ones cube has a value of 0.01. These can then be used to build a conceptual understanding of the relationship between these.  Place value counters are another useful manipulative for representing decimal numbers. **24.2 + 13.4 =**	Draw representations using place value grid. 	As the children move on, introduce decimals with the same number of decimal places and different. **401.2 +26.85 + 0.71=**  Money can be used here. 

	 All of the calculation strategies for integers (whole numbers) can be used to calculate with decimal numbers. Introduce decimal place value counters and model exchange for addition.  **11.29 + 19.56 =**		

Addition Year 5			
Vocabulary add, addition, more, plus, increase, sum, total, altogether, score double, near double, how many more to make…? Equals, sign, is the same as, tens, hundreds, thousands, millions, ones, tenths, inverse			
Objectives	Concrete	Pictorial	Abstract
Y5—add numbers with more than 4 digits. Add decimals with 2 decimal places, including money. In Year 5, pupils are expected to be able to use formal written methods to add whole numbers with more than four digits as well as working with numbers with up to three decimal places. Pupils should think about whether this is the most efficient method, considering if mental methods would be more effective.	As year 4. Introduce/recap decimal place value counters and model exchange for addition.  For this method start with the digit of least value because if regrouping happens it will affect the digits of greater value.   Combine the counters in each column and	  Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.	104,328 + 61,731 = 166,059 81,059 3,668 15,301 + 20,551 120,579

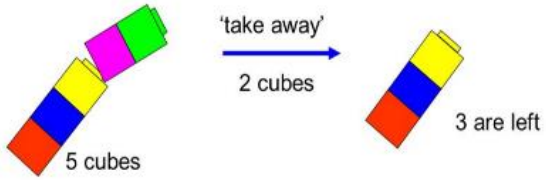
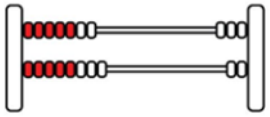
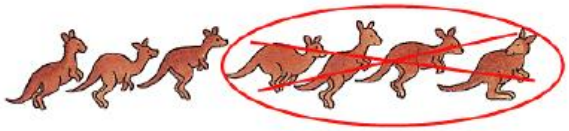
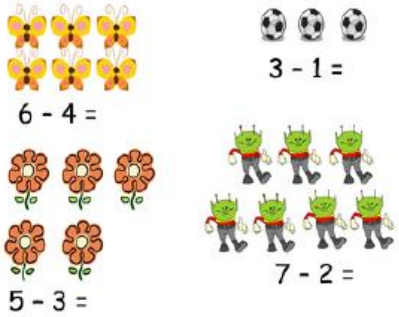
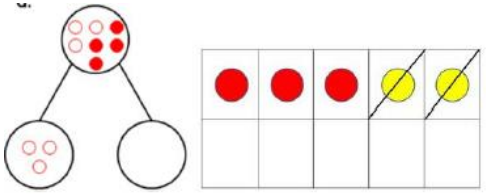
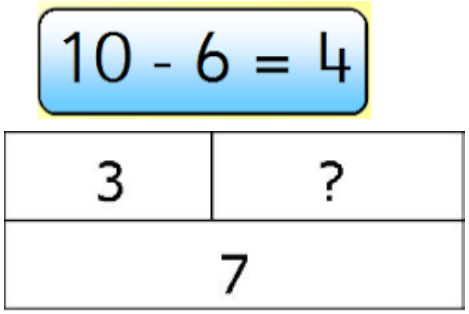
	regroup as needed: Decimal numbers:  		Children should have abstract supported by a pictorial or concrete if still needed. Insert zeros for place holders when  using decimals.

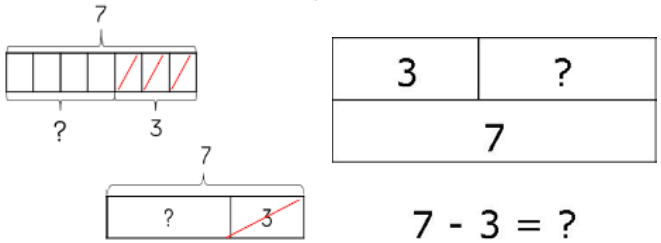
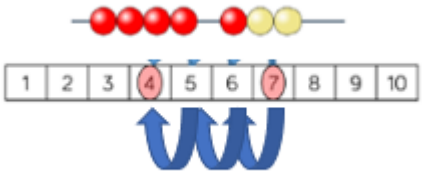
Addition Year 6			
Vocabulary add, addition, more, plus, increase, sum, total, altogether, score double, near double, how many more to make…? Equals sign =, is the same as, tens, hundreds, ones, tenths, hundredth, thousandths, inverse			
Objectives	Concrete	Pictorial	Abstract
Y6—add several numbers of increasing complexity Including adding money, measure and decimals with different numbers of decimal points.	As Year 5: Revisit and consolidate understanding. Start with the digit of least value because if regrouping happens it will affect the digits of greater value. Combine the counters in each column and   regroup as needed:	As Year 5: Revisit and consolidate understanding.  	As Year 5: Revisit and consolidate understanding. 104,328 + 61,731 = 166,059  Children should have abstract supported by a pictorial or concrete if still needed. Insert zeros for place holders when using decimals.

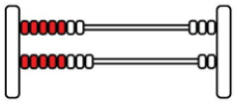
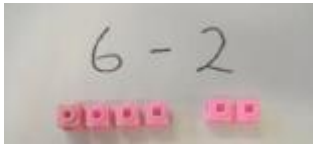
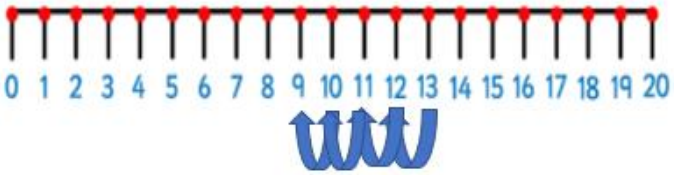
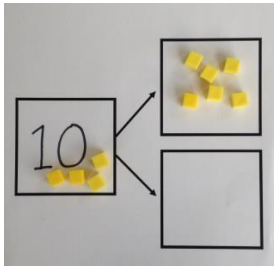
	Decimal numbers:  		

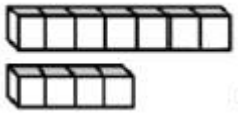
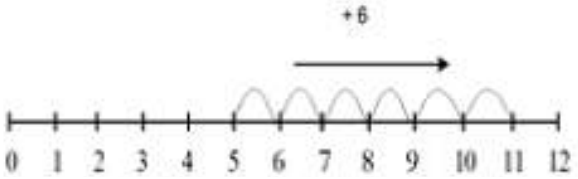
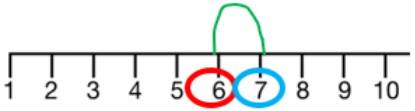
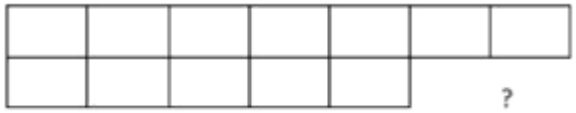
Subtraction

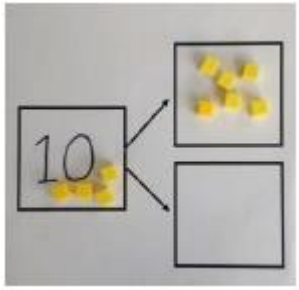
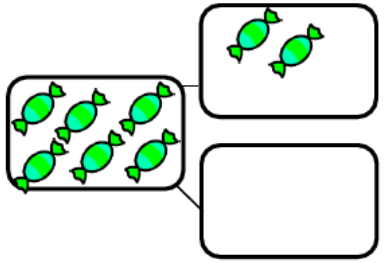
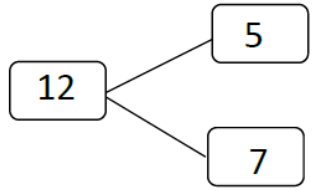
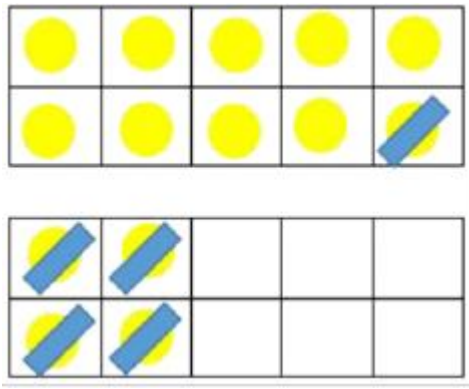
Subtraction – EYFS			
ELG Number: Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.			
EYFS Vocabulary. **Subtraction** take away, less than, the difference, fewer, counting backwards			
Objectives	Concrete	Pictorial	Abstract

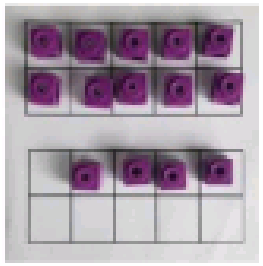
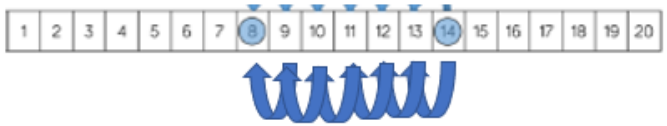
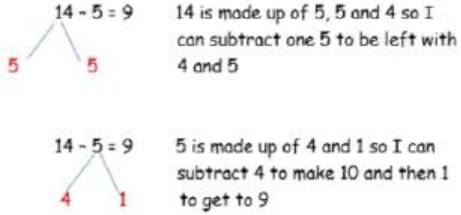
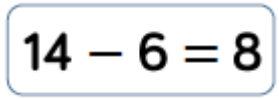
Find one less from a group of five objects, then ten objects. Knows that a group of things change in quantity when something is taken away - In practical activities and discussion, beginning to use the vocabulary involved in subtracting. - Using quantities and objects, they subtract two single digit numbers and count back to find the answer.	Physically taking away and removing objects from a whole.  Use toys and general classroom resources for children to physically manipulate, group/regroup. Use specific maths resources such as bead  strings, rekenrek etc.  Children will physically make the symbols using their body.  The children will make the symbol with their arms for example 5 (show 5 fingers) - (make a - with arms) 3	  A group of pictures for children to cross out or cover quantities to support subtraction.  Use visual supports such as ten frames, part-part whole and bar model with pictures/icons. Children begin to draw the concrete resources they are using and cross out.	A focus on symbols and numbers to form a calculation. 

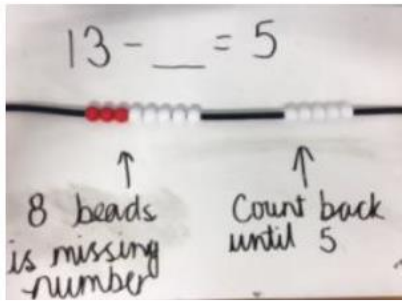
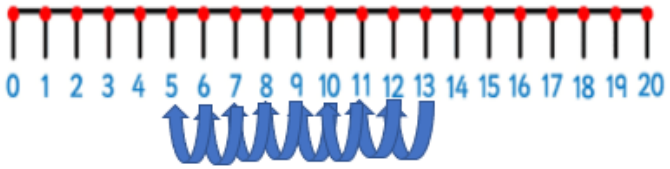
	(show 3 fingers) = (make that with arms so both arms straight across our bodies) 2 (show 2 fingers)		
Subtraction Year 1			
Vocabulary Subtraction- Take-away, less than, the difference, subtract, minus, fewer, decrease, counting backwards, equal to, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is… **When children give an answer, encourage them to give the answer in a full sentence. E.g., '7 take away 3, the difference is four' '17 take away 8 is equal to 9.'**			
Objectives	Concrete	Pictorial	Abstract
Subtract from one-digit and two-digit numbers to 20, including 0. Taking away ones	Use physical objects, counters, cubes etc. to show how objects can be taken away.  6—4 = 2  4—2 = 2	Cross out drawn objects to show what has been taken away. 18-4=    	7—4 = 3 16—9 = 7

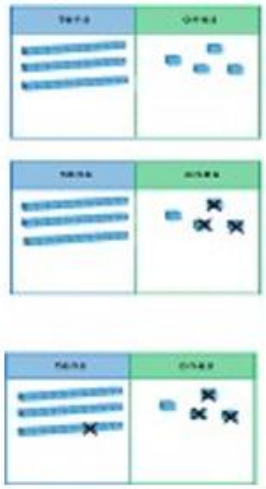
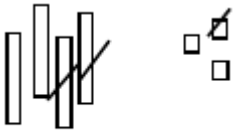
Counting back Subtracting by counting back Pupils should be encouraged to rely on **number bonds** knowledge as time goes on, rather than using counting back as their main strategy.	Make the larger number in the subtraction. Move the beads along the bead string as they count on in ones. **13 – 4**   Use counters and move them away from the group as they take them away, counting back as they go.  	Count back on a number line. Start at the bigger number and count back the smaller number showing the jumps on the number line.  Counting back using number lines   10 − 6 = 4	**13 – 4 =** Put 13 in your head, count back 4. What number are you at? (Use your fingers to help you) 10 − 6 = 4

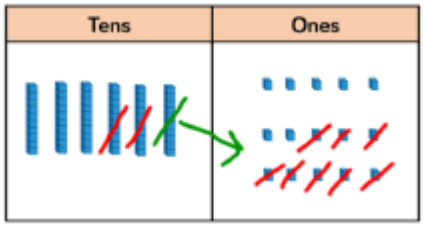
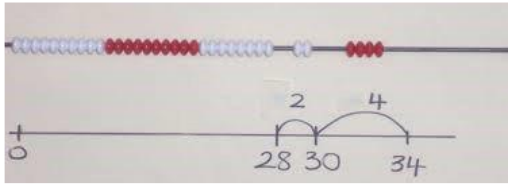
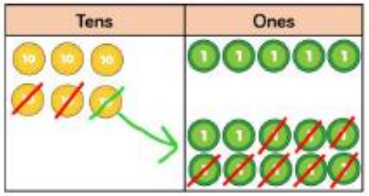
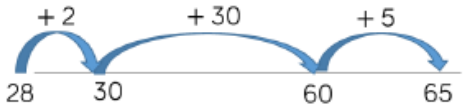
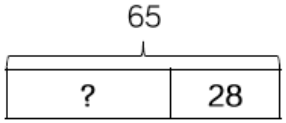
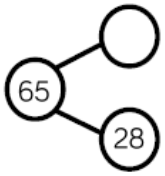
Find the difference	Finding the difference (using cubes, rekenrek or dienes rods) Compare objects and amounts.    '7 is 3 more than 4.'	7 – 6 or find the difference between 7 and 6 Count on using a number line to find the difference.    Use of the bar model.  	Find the difference between 8 and 6. 8 – 6, the difference is? Children to also explore 9 - 7 = 8 – 6 Hannah has 12 sweets and her sister has 5. How many more does Hannah have than her sister?

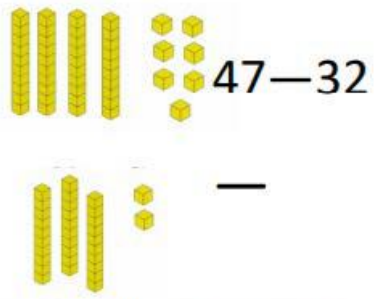
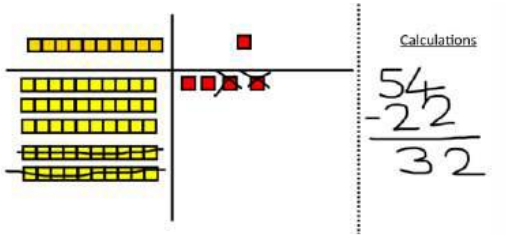
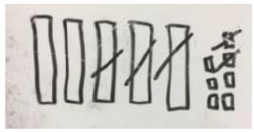
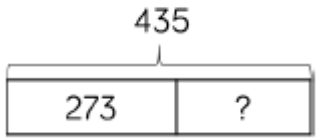
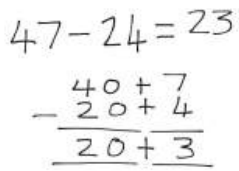
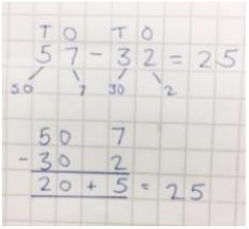
Represent and use number bonds and related subtraction facts within 20 Part-part whole model	Link to addition. Use part-part whole model to model the inverse. 	Use a pictorial representation of objects to show the part-part whole model. 	Move to using numbers within the part-part whole model.  
Subtracting to make 10	Using a 10 frame to subtract - The children may subitise how many to subtract to get to the next 10	Children to represent the ten frame pictorially.  Count back using a number line.	**14 – 4=** How many do we take off to reach the next 10? How many do we have left to take off? **14 – 5 = 9** You also want children to see related facts e.g. **15 – 9 = 4**

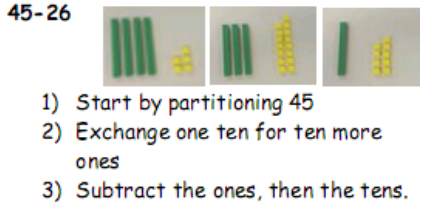
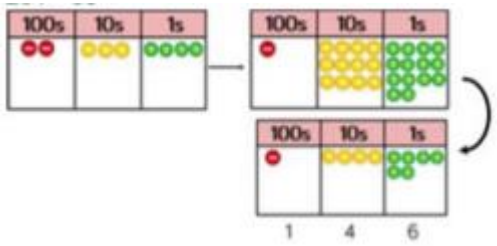
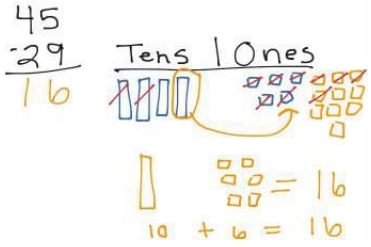
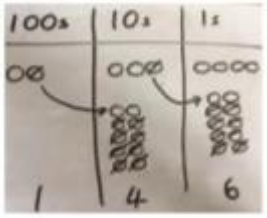
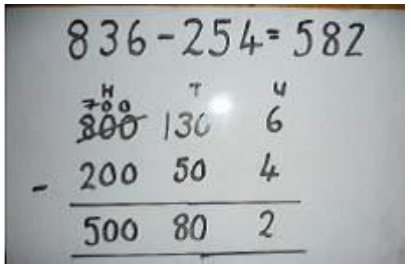
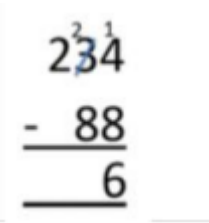
	 Children could do this by subtracting a 4	 	Children to represent how they have solved it e.g.  
Missing number problems.	Children begin by using concrete objects to support counting back to find the missing number.	Children can then use the support of a number line to support counting back to find the missing number.  	Children who have grasped the use of the number line concept will be taught to mentally 13 – 3 - 5 = 5  Children can then move on mentally counting back to find the missing

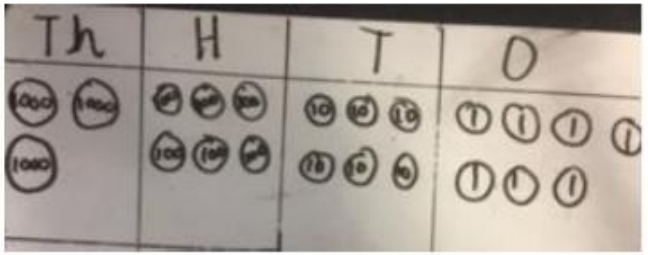
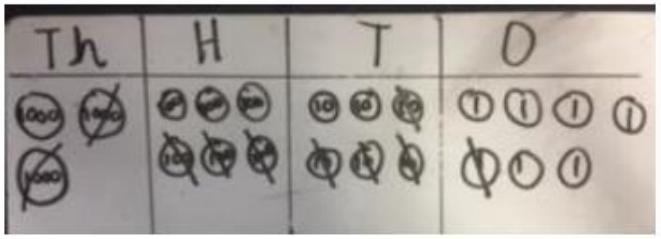
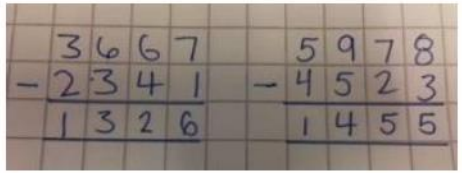
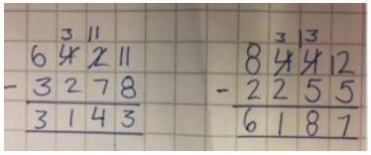
	13 - ____ = 5  	 	number. Children will need to count back to the 'answer' while keeping tally of 'how many' they have counting back. 13…12, 11, 10, 9, 8, 7, 6, **5** 'I counted back till I landed on 5. I counted back 8 jumps in total so the missing number is 8

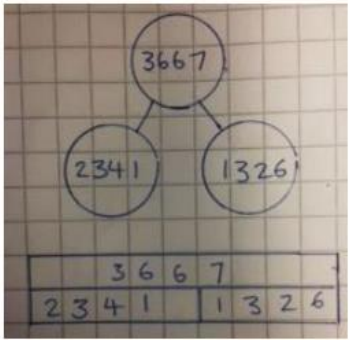
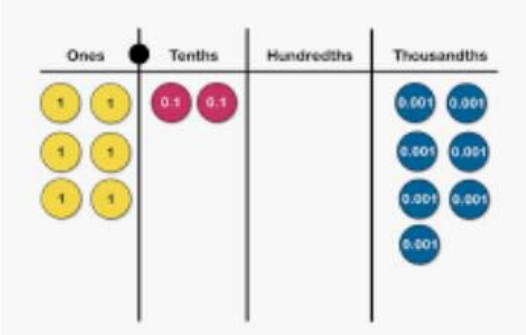
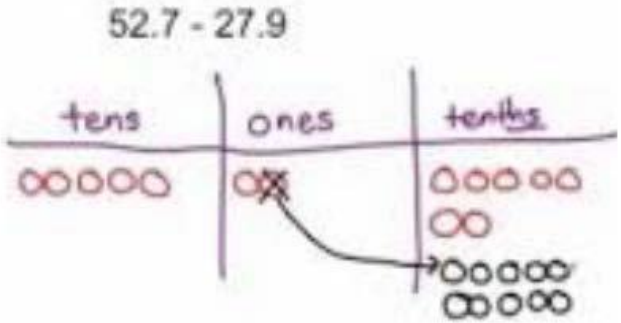
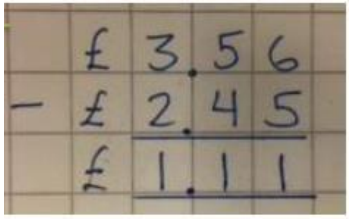
Subtraction Year 2			
Vocabulary Subtraction- equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is…difference, count on, strategy, partition, tens units			
Objectives	Concrete	Pictorial	Abstract
Subtract a two-digit number and ones, a two-digit number and tens, two two-digit numbers Partitioning to subtract without re-Grouping: 'Friendly numbers'	Use dienes to show how to partition the number when subtracting without regrouping. 34 – 13 = 21 	Children draw representations of dienes and cross off.  43—21 = 22	43—21 = 22 Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers. Toward the end of the year, children move to more formal recording using partitioning method: e.g., 43-21=22 40 and 3 -20 and 1 20 and 2
Make ten strategy. Progression should be crossing one ten,	65 – 28 = 37	65 – 28 = 37	65 – 28 = 37

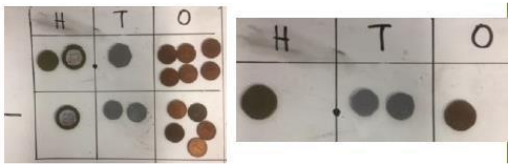
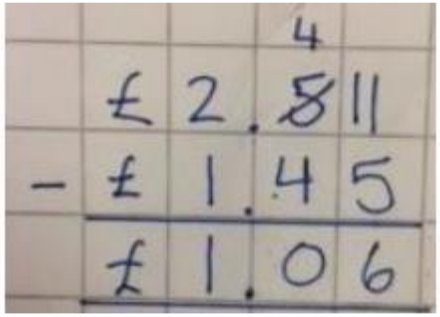
crossing more than one ten	 Use a bead bar or bead strings to model counting to next ten and the rest. 	  	

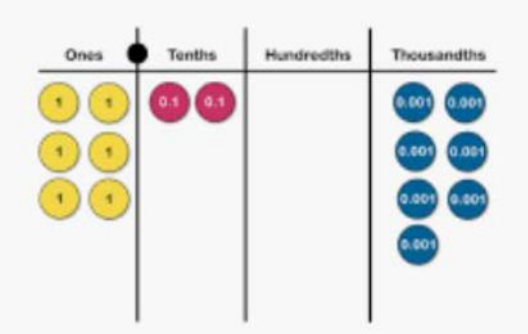
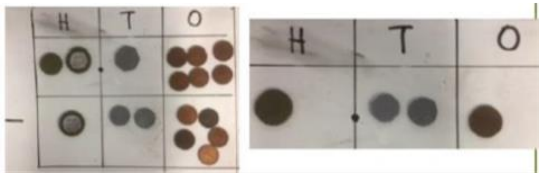
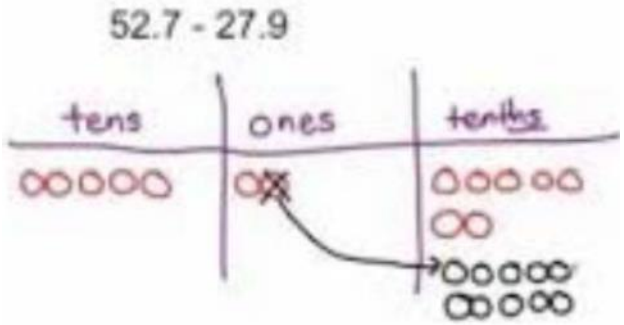
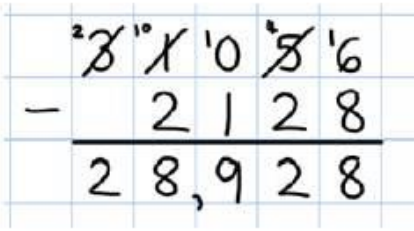
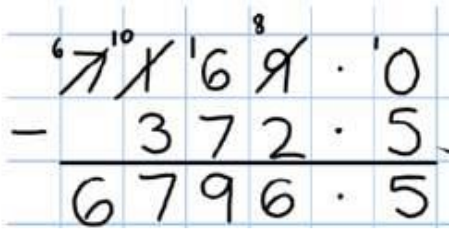
Subtraction Year 3 - This work revises and reinforces ideas from Key Stage 1, including the focus on place value			
Vocabulary Subtraction- equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left? how much less is…difference, count on, strategy, partition, tens units			
Objectives	Concrete	Pictorial	Abstract
To subtract numbers with up to three-digits, using formal written methods of columnar subtraction. Column subtraction (without exchanging)	Use dienes to model.  	Draw representations to support understanding.  57 – 32 = 25   	Children should begin with the expanded form. Intermediate step may be needed to lead to clear subtraction understanding.  Moving onto a more formal way as below.  • Arrange in a column • Subtract the ones • Subtract the tens combine 435 -223

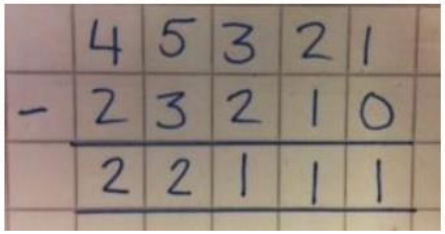
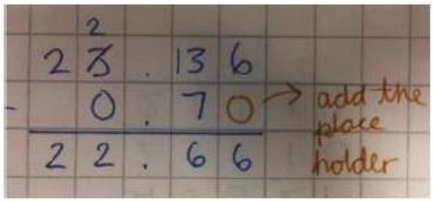
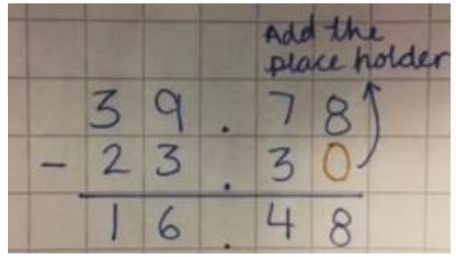
Column Subtraction (with exchanging)	Begin with dienes Move to place value counters, modelling the exchange of a ten into ten ones. Column method using dienes.  Column method using place value counters. 234-88  	Children may draw dienes or place value counters and cross off.  Represent the place value counters pictorially' remembering to show what has been exchanged. 234-88  	Children should begin with the expanded form by partitioning into place value columns  Then move to formal method. Children must understand what has happened when they have crossed out the digits. 

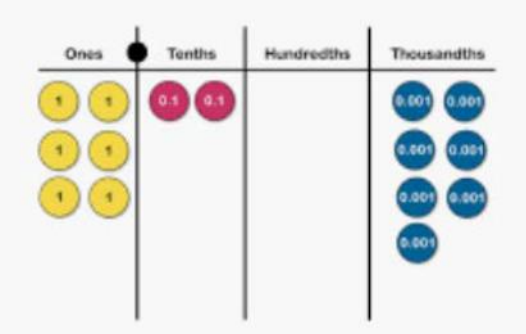
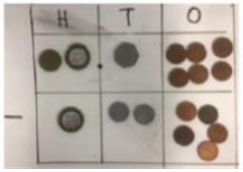
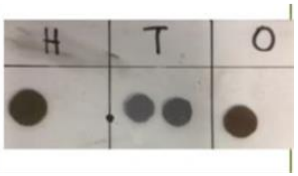
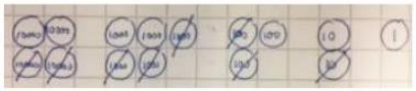
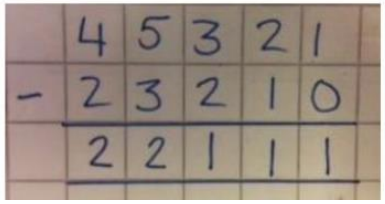
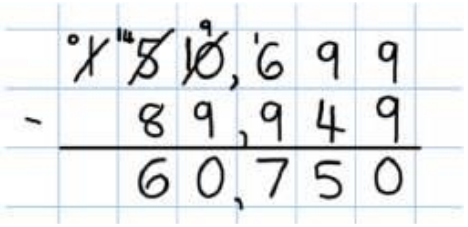
Subtraction Year 4			
Vocabulary Subtraction – Subtract, subtraction, take (away), minus, decrease, leave, how many are left/left over? Difference between, half, halve, how many more/fewer is… than…? How much more/less is…? Equals, sign, is the same as, tens boundary, hundreds boundary inverse			
Objectives	Concrete	Pictorial	Abstract
Subtraction with up to 4 digits. Subtract numbers with up to 4 digits using the formal written methods appropriate of columnar subtraction where appropriate	Children can use concrete representation of the columns and place value counters.   	Children can use concrete or draw a pictorial representation of the columns and place value counters. Can physically cross out in books to solve.   3667 – 2341 = 1326	Formal column method involving no exchanges 3667 – 2341 = 5978 – 4523 =  Formal column method involving exchanges above 6421 – 3278 = 8442 – 2255 = Reminding children of place value when exchanging –is this a ten or a one I'm exchanging?  Children should be able to represent their understanding of addition and subtraction within a bar model and a

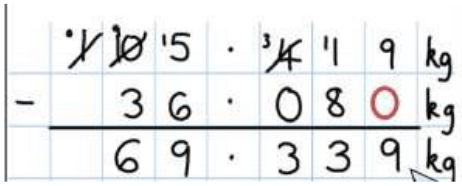
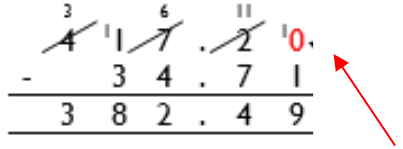
			part-part whole model. Children should be able to explain that they are finding a part when they subtract, and they are finding a whole or a total when adding. 
Introduce decimal subtraction through context of money	Children to be encouraged to use counters to represent numbers and take counters away to subtract.  Children use coins to subtract two decimal		Formal column method with decimals in different contexts including money £ 3.56 - £ 2.45 = £1.11  The decimal point needs to be lined up like all the other place value columns It is important that children recognise that they are subtracting tenths and

	amounts to find change. £3.56 - £2.45 =£1.11 		hundredths and that they understand they are subtracting part of a number not a whole number. £2.51 - £ 1.45 = £1.06 

Subtraction Year 5			
Vocabulary Subtraction - Subtract, subtraction, take (away), minus, decrease leave, how many are left/left over? Difference between, half, halve, how many more/fewer is… than…? How much more/less is…? Equals, sign, is the same as, tens boundary, hundreds boundary, thousands, millions boundary, ones boundary, tenths boundary, inverse			
Objectives	Concrete	Pictorial	Abstract
Subtract with at least 4 digits, including money and measures. Subtract with increasingly large and more complex numbers and decimal values (up to 3 decimal place).	As with previous years, children should use place value counters to support subtraction.   	 	Children should continue to use the decomposition method to solve calculations.  Use zeros for placeholders. Zero is added to show there is no value to subtract.  It is important that children recognise that they are subtracting tenths and

		Children should use the column method when subtracting tens of thousands and hundreds of thousands. As with previous years, children should use place value counters images and drawings to support subtraction.   45321 -23210 22111	hundredths and that they understand they are subtracting part of a number, not a whole number.  23.136 -0.70 → add the place holder 22.66  add the place holder 39.78 -23.30 16.48

Subtraction Year 6			
Vocabulary Subtraction – Subtract, subtraction, take (away), minus, decrease leave, how many are left/left over? Difference between, half, halve, how many more/fewer is… than…? How much more/less is…? Equals sign =, is the same as, tens boundary, hundreds boundary ones boundary, tenths boundary hundredth boundary, thousandths boundary, inverse			
Objectives	Concrete	Pictorial	Abstract
Year 6—Subtract with increasingly large and more complex numbers and decimal values.	As with previous years, children should use place value counters to support subtraction.    	Children should use the column method when subtracting tens of thousands and hundreds of thousands. As with previous years, children should use place value counters images and drawings to support subtraction.   	Formal column method is used to solve problems in the context of measure, for examples, weight and money. The decimal point needs to be lined up like all of the other place value columns. Children should extend the decomposition method and use it to subtract whole numbers and decimals with any number of digits. 

			  When subtracting decimals with different numbers of decimal places, children should be encouraged to make them the same through identification that 2 tenths is the same as 20 hundredths, therefore 0.2 is the same value as 0.20

Multiplication

Multiplication – EYFS

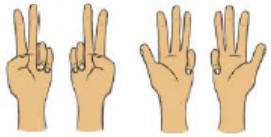
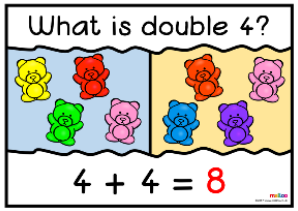
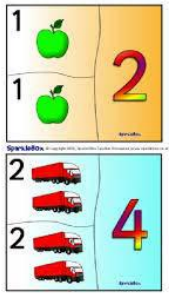
ELG Number:

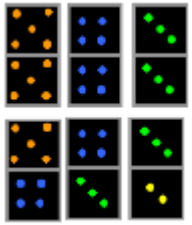
EYFS Vocabulary.

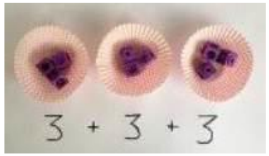
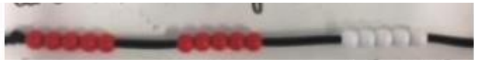
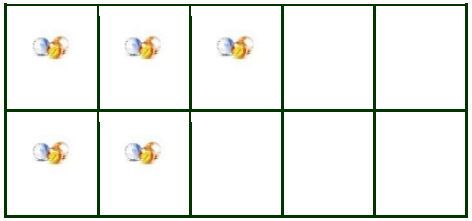
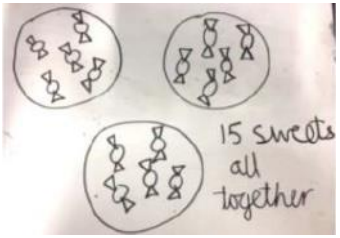
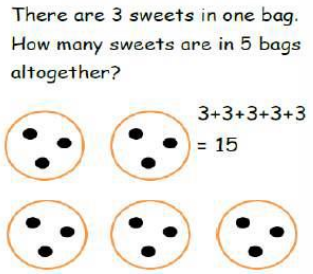
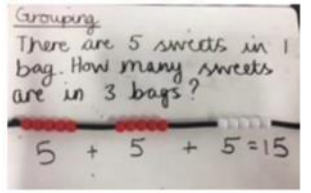
Multiplication Vocabulary

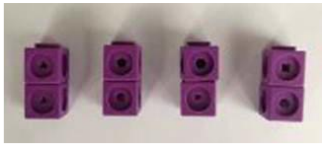
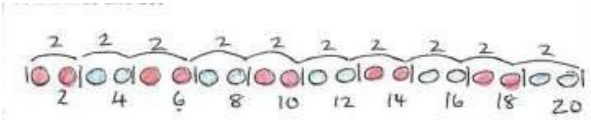
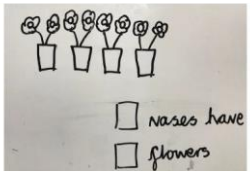
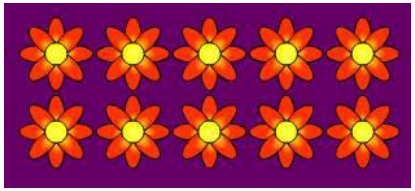
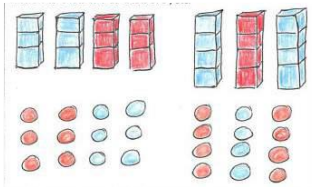
group, lots of, double, odd, even, equal, same

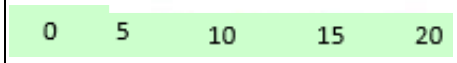
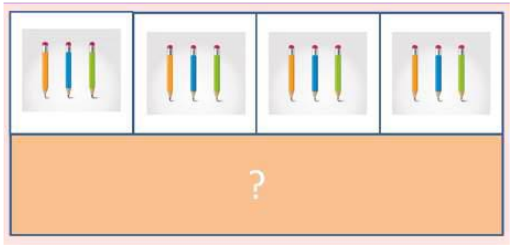
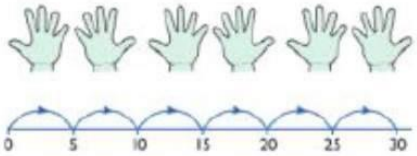
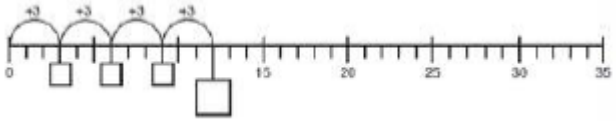
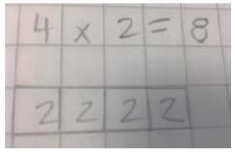
Multiplication-There should be an emphasis on number exploration within EYFS.

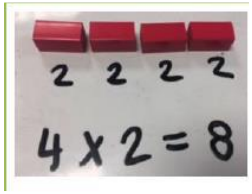
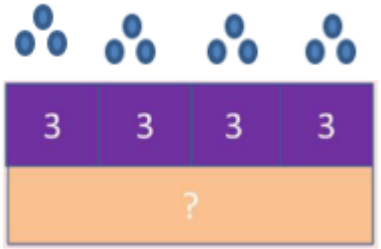
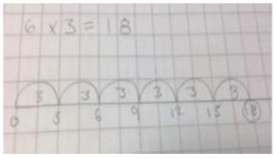
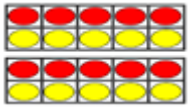
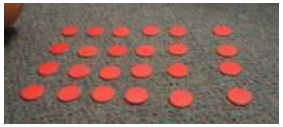
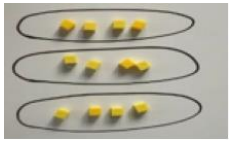
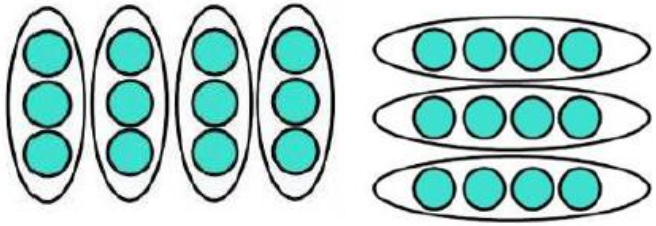
Objectives	Concrete	Pictorial	Abstract
Can solve problems involving doubling	 Counting and other maths resources for children to make 2 equal groups. Physical and real-life examples that encourage children to see concept of doubling as adding two equal groups.   	 Pictures and icons that encourage children to see concept of doubling as adding two equal groups. 	With a focus to move onto abstract stage. Most children will stay in the concrete and pictorial stage to explore doubling For those children who are ready: 1+1= 7+7= 2+2= 8+8= 3+3= 9+9= 4+4= 10+10= 5+5= 11+11= 6+6= 12+12= Addition calculations to model adding two equal groups.
Counting in ones, twos, tens, odd and even			

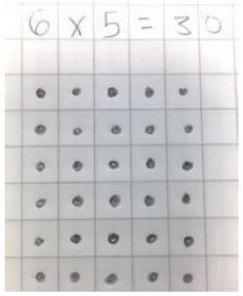
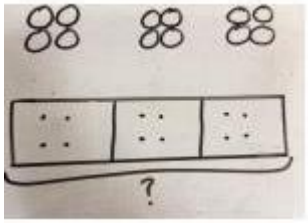
numbers Matching pairs e.g., socks, Noah's ark	Finding doubles in dominoes   Songs and rhymes Doubles in practical contexts. Groups of objects with the same number, counting how many in each group, and finding how many altogether 		

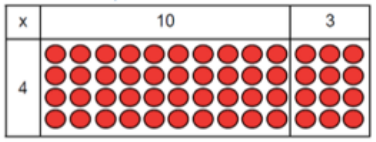
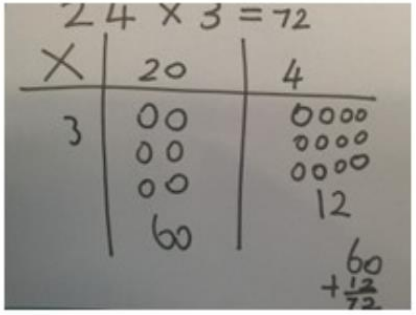
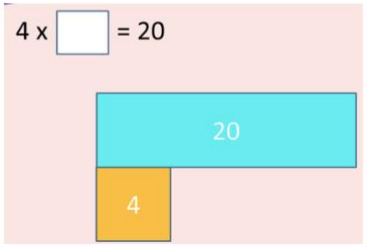
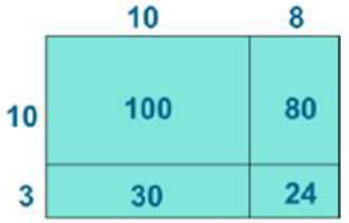
Multiplication Year 1			
Year 1 Multiplication Vocabulary odd, even, count in twos, fives, count in tens (forwards from/backwards from), how many times? lots of, groups of, once, twice, five times, ten times, multiple of, times, multiply, multiply by, array, row, column, double, equal groups			
Objectives	Concrete	Pictorial	Abstract
Use of repeated addition	Use different objects to add equal groups   Use of bead strings to understand multiplication as grouping and repeated addition.  Repeated addition of sets of objects, teacher modelling 2+2+2 = 6 Use coins for repeated addition  	Children to draw their own visuals to support multiplication as repeated addition and grouping.  Use pictorial including number lines to solve problems. model 	3 x 4 4 + 4 + 4 Write addition sentences to describe objects and pictures.  

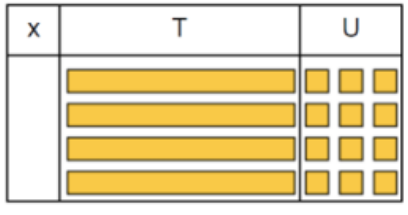
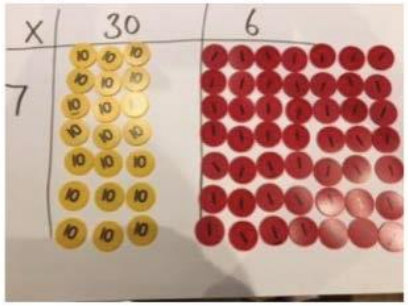
Count in multiples of twos, fives and tens,	Count the groups as children are skip counting, children may use their fingers as they are skip counting.   	Children make representations to show counting in multiples.   Use of images, given and then created by the children to support counting in 2s, 5s and 10s.  	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30 There are two apples on one plate. How many apples on 3 plates?
Understanding arrays Children will be introduced to an array to support multiplication and to support the understanding that multiplication is repeated addition	Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc. 	Draw representations of arrays to show understanding Arrays and repeated addition link to commutative law. 4 x 3 or 3 x 4 	3 x 2 = 6 2 x 5 = 10

Multiplication Year 2			
Multiplication Vocabulary odd, even, twos, fives, tens, threes, lots of, groups of, once, twice, three times, five times, ten times, multiple of, times, multiply, commutative multiply by, repeated addition, array, row, column, double.			
Objectives	Concrete	Pictorial	Abstract
Count in multiples. Recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers	  Count the groups as children are skip counting, children may use their fingers as they are skip counting. Use bar models. 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40  	Number lines, counting sticks and bar models should be used to show representation of counting in multiples.  Children make representations to show counting in  multiples. Children can move on to using a number line to solve multiplication problems. • Start at 0 • Count on in the multiple	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25, 30 $4 \times 3 = \square$ Then children move onto abstractly drawing their own bar model. 

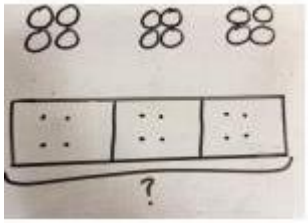
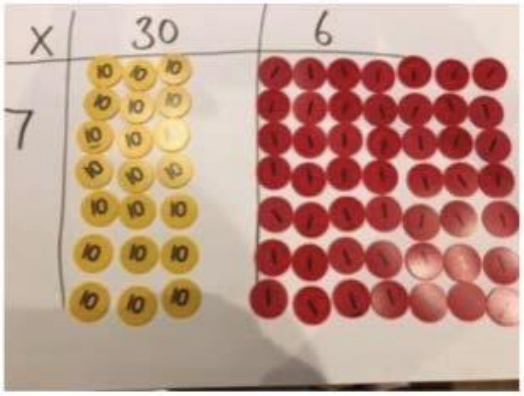
	Children can use practical resources to solve using a bar model. 	• Write the total amount.  	
Children will be able to represent a multiplication calculation using an array. Write the multiplication symbol within a number sentence. Children will also understand that multiplication can be carried out in any order (commutative)	To represent arrays using a range of concrete resources.    Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.  	Use representations of arrays to show different calculations and explore commutativity. Draw arrays in different ways to show the commutative  relationship.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15  2 × 4 = 8 4 × 2 = 8  2 × 4 = 8 4 × 2 = 8	12 = 3 × 4 12 = 4 × 3 Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 =15 5 x 3 = 15 3 x 5 = 15

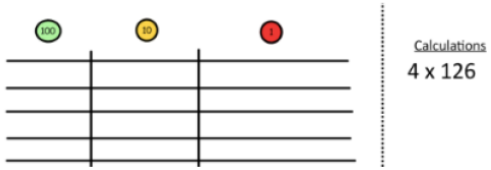
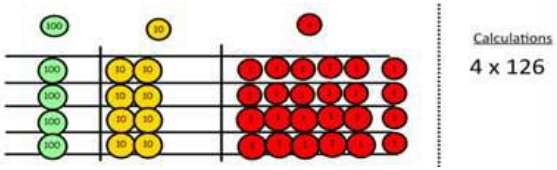
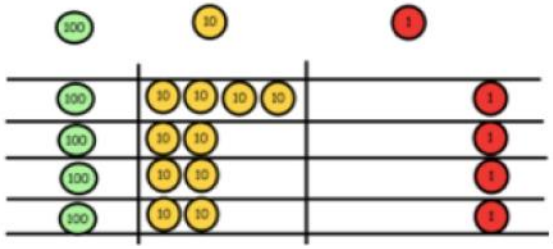
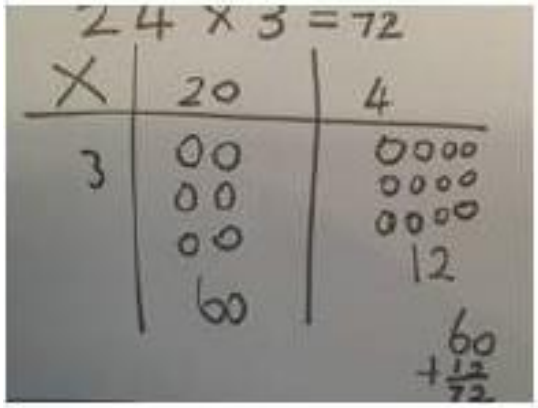
		Children can draw an array as a method to solve problems. 	
Multiplication Year 3 - This work revises and reinforces ideas from Key Stage 1. multiply, times, groups of, equal groups of, multiple of, multiplied by, estimate, inverse, grid multiplication, expanded column multiplication, partition, commutative, associative, product.			
Multiplication			
Objectives	Concrete	Pictorial	Abstract
Count in multiples of 3, 4 and 8.	Use of practical apparatus to support counting in multiples and to reinforce understanding of times tables. 3, 4 and 8  3 lots of 4	Use of pictorials to support counting on in multiples 3 x 4 =  24 8 groups of 3 is 24	3 x 4 =12 4+4+4= 12 Mentally counting on in multiples. Children should use pattern spotting to support their understanding of multiples. 0, 5, 10, 15, … ‘Multiples of 4 end in 0,2,4,6,8. They are even numbers.’ ‘53 cannot be a multiple of 8 because

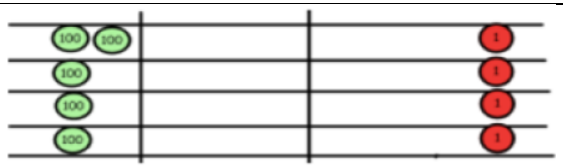
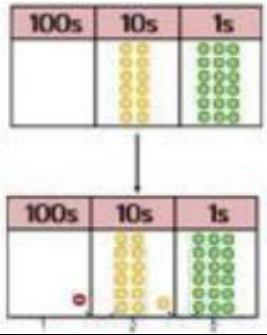
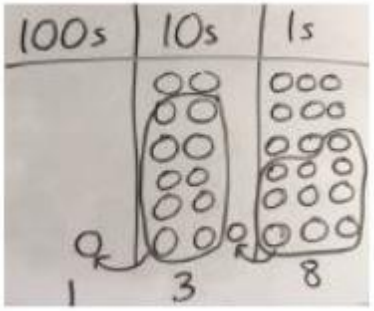
			it's not an even number'
Multiplying two-digit number by a one-digit number Grid method progressing to the formal method. Solving problems including missing number problems, integer scaling problems.	Show the link to arrays to first introduce the grid method.  Move on to using Dienes to move towards a more compact method. Move on to place value counters to show how we are finding groups of a number. Add up each column, starting with the ones making any exchanges needed.	Children can draw place value counters to support their understanding.  Bar models to explore missing numbers.  	Start with multiplying by one-digit numbers and showing the clear addition alongside the grid. **×** | **30** | **5** **7** | **210** | **35** **210 + 35 = 245** Moving forward, multiply by a 2-digit number showing the different rows within the grid method.  Children to add up each column to find the answer.

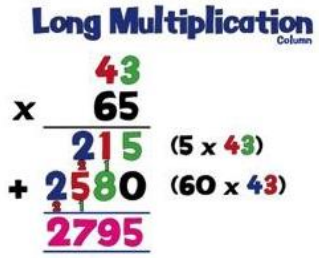
	 4 rows of 13  The calculation will be shown alongside the model chosen to see the connection		

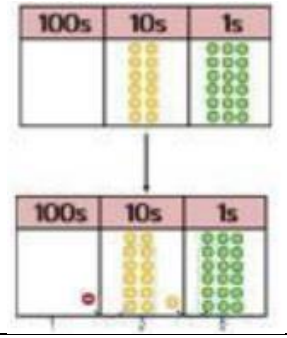
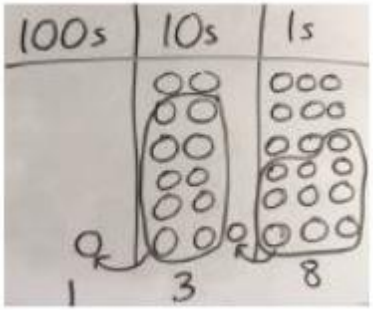
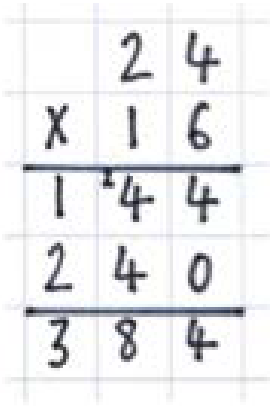
Multiplication Year 4			
Multiplication Vocabulary multiply, multiplied by, product, short multiplication, partition, distributive law, commutative, groups of, multiply, times, multiples, inverse.			
Objectives	Concrete	Pictorial	Abstract
Recall multiplication facts up to 12x12.	Use of practical apparatus to support counting in multiples and to reinforce understanding of times tables.	Use of pictorials to support counting on in multiples 3 x 4 =	3 x 4 =12 4+4+4= 12 Mentally counting on in multiples. Children should use pattern spotting to support their understanding of multiples.

	 3 lots of 4 	 24 8 groups of 3 is 24 	Children can use certain 'base facts' to help them solve the ones they are struggling with: E.G. 6 x 8 I know 5 x 8 = 40 so I need to add one more group of 8 which means 6 x 8 = 48.
Multiply two-digit and three-digit numbers by a one-digit number using formal written layout Grid method recap from year 3 for 2 digits x 1 digit Multiplying numbers by 1 digit (year 4 expectation)	 Use place value counters to show how we	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.	Start with multiplying by one-digit numbers and showing the clear addition alongside the grid. × | 30 | 5 7 | 210 | 35 210 + 35 = 245

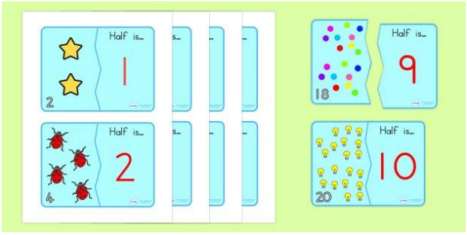
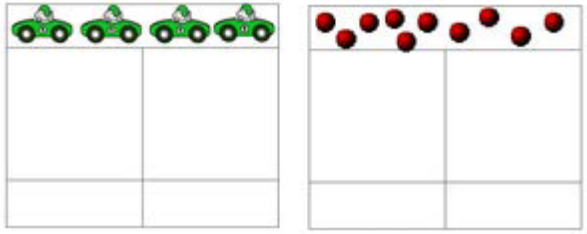
	are finding groups of a number. We are multiplying by 4 so we need 4 rows  Fill each row with 126  Add up each column, starting with the ones making any exchanges needed  Then the children will have an answer.	 	

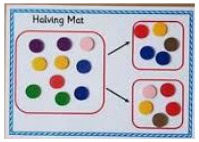
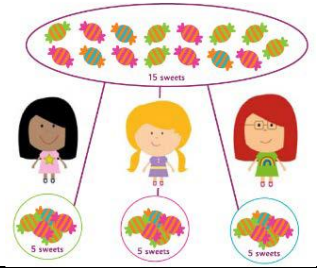
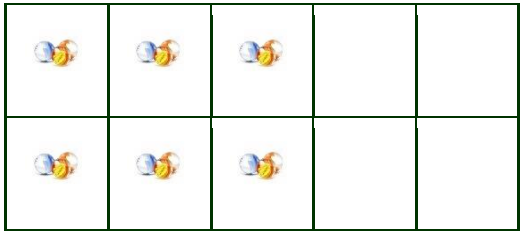
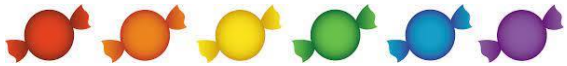
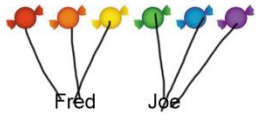
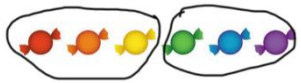
			
Multiplication Year 5			
Multiplication Vocabulary composite numbers, prime number, prime factor, cube number, square number, derive, factor pairs, formal written method, times, multiply, multiplied by, multiple of, product, short multiplication, partition, long multiplication, scaling, decimal place, units, tenths and hundreds.			
Objectives	Concrete	Pictorial	Abstract
Multiply numbers up to 4 digits by a one-digit number using a formal written layout. Column multiplication (short multiplication)	Formal column method with place value counters. 6 x23= 	23 x 6 = 	Leading to multiplication using a compact method 23 x 6 138

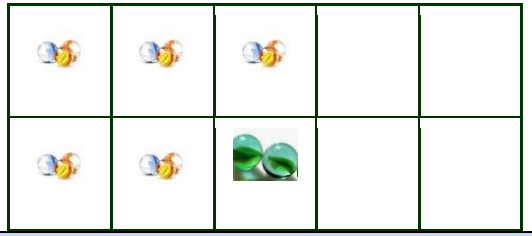
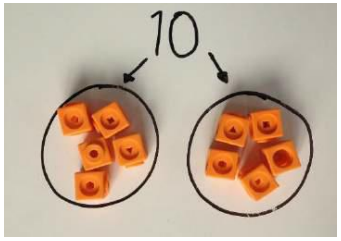
Multiply numbers up to 4 digits by two-digit numbers, including long multiplication for two-digit numbers. Column multiplication (long multiplication)			Children should only use the 'standard' column method of long multiplication if they can regularly get the correct answer using this method. 
Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000	Use of practical equipment to use to support how this increases. This can include base ten and place value counters.	The children can use place value charts to help them see that the numbers are getting bigger or smaller.	The children can use number slides or can write facts such as: 45 x 100 = 4500
Multiplication Year 6			
Multiplication Vocabulary common factors, multiples, prime, formal written method, multiply, multiplied by, multiple of, product, short and long multiplication, partition, scaling, decimal place, units, tenths and hundredths.			
Objectives	Concrete	Pictorial	Abstract
Consolidate Year 5 short multiplication. Multiply numbers up to 4 digits by a one-digit number using a formal written layout	Formal column method with place value counters. 6 x23=	23 x 6 =	Leading to multiplication using a compact method

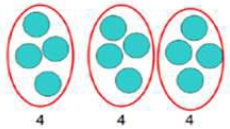
. Column multiplication (short multiplication)			
Children consolidate using long multiplication for multiplying a number up to four digits by two-digit number			 24 x 26=
Multiplying decimals up to 2 decimal places by a single digit.			

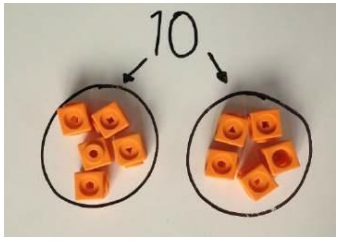
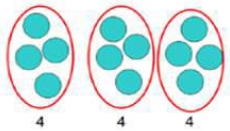
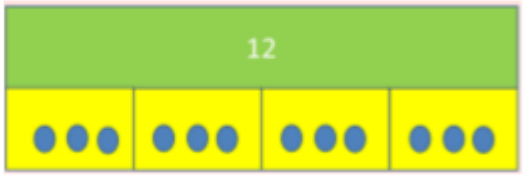
Division

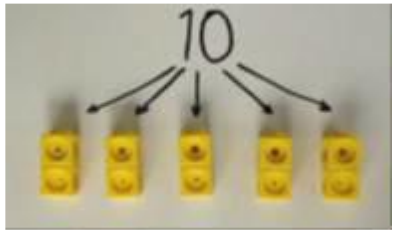
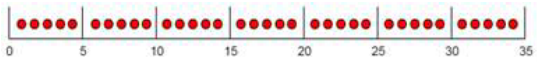
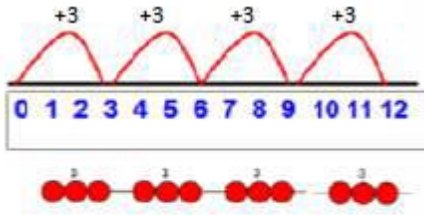
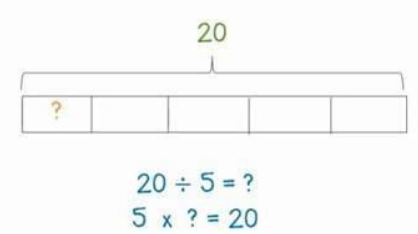
Division – EYFS			
ELG Number:			
EYFS Vocabulary. **Number Division vocabulary** halve, half, share, share equally, groups share, share equally, one each, two each, three each…group in pairs, threes… tens, equal groups of,			
Objectives	Concrete	Pictorial	Abstract
Solve problems including halving and sharing. • Halving a whole, halving a quantity of objects. • Sharing a quantity of objects.	Real life examples.   Children have the opportunity to physically cut objects, food or shapes in half. Counting and other maths resources for children to share into two equal groups. 	Pictures and icons that encourage children to see concept of halving in relation to subitising, addition and subtraction knowledge. i.e. Knowing 4 is made of 2 groups of 2, so half of 4 is 2.  	

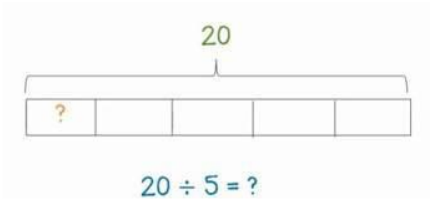
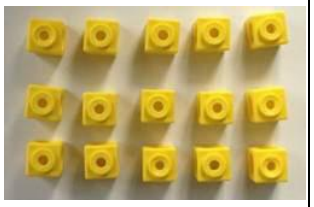
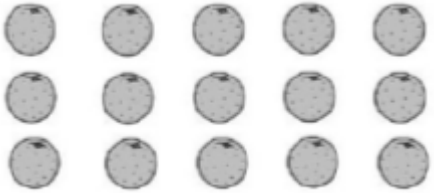
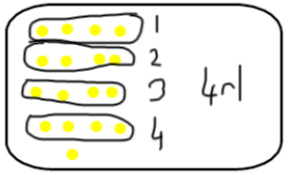
	Use visual supports such as halving mats and part-part whole, with the physical objects and resources that can be manipulated. 	Bar model with pictures or icons to support understanding of finding 2 equal parts of a number, to further understand how two halves make a whole.   Pictures for children to create and visualise 3 or more equal groups.	
Understanding the concept of a fair share	Children can experience real life problems. “We have 6 sweets. How will be share them equally so Fred and Joe have the same?”  Allowing children to explore what is	“We have 6 sweets. How will be share them equally so Fred and Joe have the same?”   	

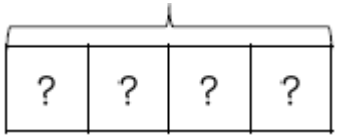
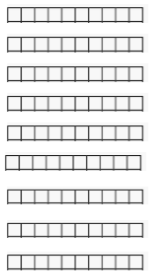
	fair sharing but also what is not. Allow children to make not equal groups. 		
Division Year 1			
Year 1 Division Vocabulary halve, share, share equally, groups, equal groups of, divide, divided by, left, left over			
Objectives	Concrete	Pictorial	Abstract
Division as sharing (sharing objects into groups)	   I have 10 cubes, can you share them equally in	Children use pictures or shapes to share quantities. 8 shared between 2 is 4  12 shared between 3 is 4	12 shared between 4 is 3 Share 9 buns between 3 people.

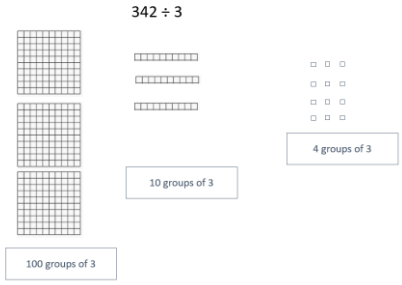
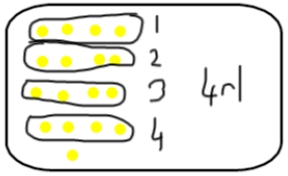
	2 groups? Equal groups of amounts shared.  Amounts shared into unequal groups. Marbles are left over. 	 Children use bar modelling to show and support understanding.  	

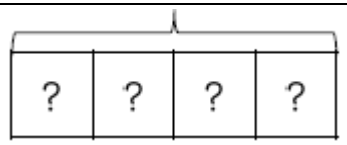
Division Year 2			
Year 2 Division Vocabulary groups of, equal groups of, halve, share, share equally, divide, divided by, divided into, repeated subtraction, inverse.			
Objectives	Concrete	Pictorial	Abstract
Solve one-step problems with division (sharing).	  I have 10 cubes, can you share them equally in 2 groups?  Equal groups of amounts shared. 	Children use pictures or shapes to share quantities. 8 shared between 2 is 4  12 shared between 3 is 4  Children use bar modelling to show and support understanding. 	12 shared between 4 is 3 12 ÷ 4 = 3 Share 9 buns between 3 people. 9 ÷ 3 = 3

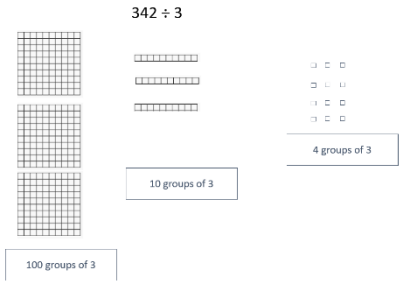
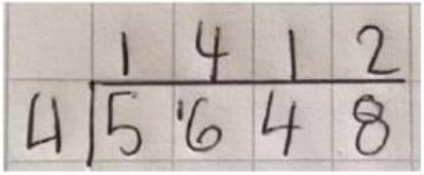
	Amounts shared into unequal groups. Marbles are left over. 	12 ÷ 4 = 3	
Solve one-step problems with division as grouping.	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	Use number lines for grouping  12 ÷ 4 = 3 Using the bar model. Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?  Children to begin to use the correct mathematical symbols to show the calculation.

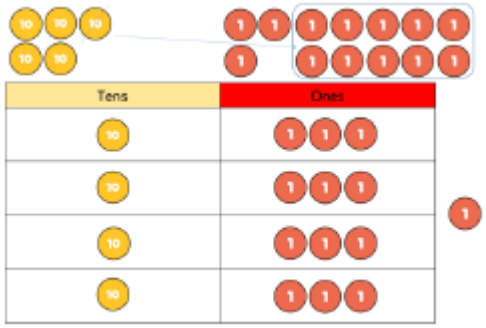
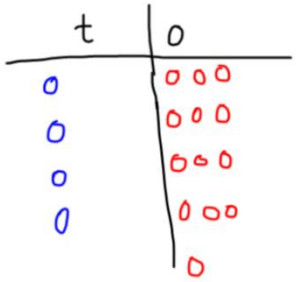
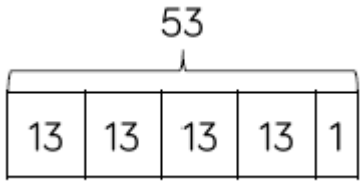
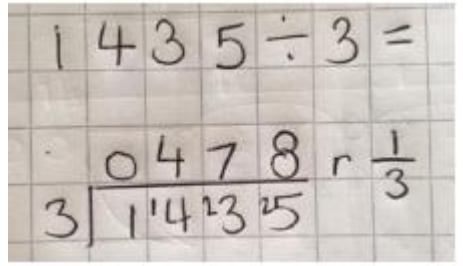
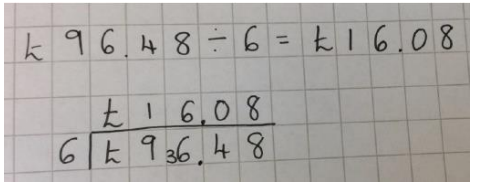
			
Division Year 3 - This work revises and reinforces ideas from Key Stage 1, including the focus on place value			
quotient divisor) dividend **Division Vocabulary** divided by, divide, divided into, grouping, divisor, short division, remainder, inverse, quotient, dividend			
Objectives	Concrete	Pictorial	Abstract
Division with arrays	Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15 	Draw an array and use lines to split the array into groups to make multiplication and division sentences. 	Find the inverse of multiplication and division sentences by creating linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4
Division with remainders.	Divide objects between groups and see how much is left over.	17 ÷ 4 =  17	17 ÷ 4 = 4r1

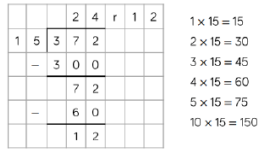
	17 ÷ 4 = 4 r 1 		
Divide 3-digit numbers by 1 digit. Short Division	96 ÷ 3  2 groups of 3 30 groups of 3	96 ÷ 3 Children to use pictorial representation to support division. They could draw base ten or use an empty number line. 	Divisions that divide equally with no remainder. 96 ÷ 3 32 3 | 96 90 6 6 0 30 groups of 3 2 groups of 3

Division Year 4			
quotient divisor) dividend **Division Vocabulary** factor, divisor, divided by, divided into, remainders, divisible by, equivalent, short division, derive, dividend, quotient, inverse, remainder, multiples, exchange			
Objectives	Concrete	Pictorial	Abstract
Divide 3-digit numbers by 1 digit.	342 ÷ 3 	342 ÷ 3 Children to use pictorial representation to support division. Draw base ten or empty number line. 	Divisions that divide equally with no remainder. 342 ÷ 3 114 3 ⟌ 342 − 300 (100 groups of 3) 42 − 30 (10 groups of 3) 12 − 12 (4 groups of 3) 0
Division with a remainder	Divide objects between groups and see how much is left over. 17 ÷ 4 = 4 r 1 	17 ÷ 4 =  17	17 ÷ 4 = 4r1

Division Year 5			
Division Vocabulary divide, divided by, divided into, divisible by, remainder, divisor, quotient, inverse, decomposing, factor, decimal place, units, tenths, scaling, short division.			
Objectives	Concrete	Pictorial	Abstract
Divide at least 4-digit numbers by 1 digit. Short division.	Recap the method from Y4 before moving onto short division. 		114 3 ⟌ 342 − 300 — 100 groups of 3 42 − 30 — 10 groups of 3 12 − 12 — 4 groups of 3 0 **5648 ÷ 4 = 1412** 

Division with a remainder	Exchanging a tens. $53 \div 4$  	 Use of pictorial representations.  	$53 \div 4 = 13\ r1$ $4\overline{)53}$ (13 r 1) Remainders as a fraction  Division using decimals. 

Division Year 6			
quotient divisor)dividend	**Division Vocabulary** divide, divided by, divided into, divisible by, remainder, factor, divisor, quotient, inverse, decimal place, units, tenths, hundredths, scaling, formal written methods.		
Objectives	Concrete	Pictorial	Abstract
Divide numbers up to 4 digits by a two-digit whole number using the formal written method of division. Long division.	Children to be secure with short division prior to progression to long division. Recapping the concrete/pictorial/abstract methods from Y3-5 will help the children to understand long division.		$372 \div 15 = 24$ r12  $1 \times 15 = 15$ $2 \times 15 = 30$ $3 \times 15 = 45$ $4 \times 15 = 60$ $5 \times 15 = 75$ $10 \times 15 = 150$

Addition and subtraction facts

The full set of addition calculations that pupils need to be able to solve with automaticity are shown in the table below. Pupils must also be able to solve the corresponding subtraction calculations with automaticity. Pupils must be fluent in these facts by the end of year 2 and should continue with regular practice through year 3 to secure and maintain fluency. It is essential that pupils have automatic recall of these facts before they learn the formal written methods of columnar addition and subtraction.

+	0	1	2	3	4	5	6	7	8	9	10
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+10
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	2+10
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7	3+8	3+9	3+10
4	4+0	4+1	4+2	4+3	4+4	4+5	4+6	4+7	4+8	4+9	4+10
5	5+0	5+1	5+2	5+3	5+4	5+5	5+6	5+7	5+8	5+9	5+10
6	6+0	6+1	6+2	6+3	6+4	6+5	6+6	6+7	6+8	6+9	6+10
7	7+0	7+1	7+2	7+3	7+4	7+5	7+6	7+7	7+8	7+9	7+10
8	8+0	8+1	8+2	8+3	8+4	8+5	8+6	8+7	8+8	8+9	8+10
9	9+0	9+1	9+2	9+3	9+4	9+5	9+6	9+7	9+8	9+9	9+10
10	10+0	10+1	10+2	10+3	10+4	10+5	10+6	10+7	10+8	10+9	10+10

Multiplication and division facts

The full set of multiplication calculations that pupils need to be able to solve by automatic recall are shown in the table below. Pupils must also have automatic recall of the corresponding division facts.

1 × 1	1 × 2	1 × 3	1 × 4	1 × 5	1 × 6	1 × 7	1 × 8	1 × 9	1 × 10	1 × 11	1 × 12
2 × 1	2 × 2	2 × 3	2 × 4	2 × 5	2 × 6	2 × 7	2 × 8	2 × 9	2 × 10	2 × 11	2 × 12
3 × 1	3 × 2	3 × 3	3 × 4	3 × 5	3 × 6	3 × 7	3 × 8	3 × 9	3 × 10	3 × 11	3 × 12
4 × 1	4 × 2	4 × 3	4 × 4	4 × 5	4 × 6	4 × 7	4 × 8	4 × 9	4 × 10	4 × 11	4 × 12
5 × 1	5 × 2	5 × 3	5 × 4	5 × 5	5 × 6	5 × 7	5 × 8	5 × 9	5 × 10	5 × 11	5 × 12
6 × 1	6 × 2	6 × 3	6 × 4	6 × 5	6 × 6	6 × 7	6 × 8	6 × 9	6 × 10	6 × 11	6 × 12
7 × 1	7 × 2	7 × 3	7 × 4	7 × 5	7 × 6	7 × 7	7 × 8	7 × 9	7 × 10	7 × 11	7 × 12
8 × 1	8 × 2	8 × 3	8 × 4	8 × 5	8 × 6	8 × 7	8 × 8	8 × 9	8 × 10	8 × 11	8 × 12
9 × 1	9 × 2	9 × 3	9 × 4	9 × 5	9 × 6	9 × 7	9 × 8	9 × 9	9 × 10	9 × 11	9 × 12
10 × 1	10 × 2	10 × 3	10 × 4	10 × 5	10 × 6	10 × 7	10 × 8	10 × 9	10 × 10	10 × 11	10 × 12
11 × 1	11 × 2	11 × 3	11 × 4	11 × 5	11 × 6	11 × 7	11 × 8	11 × 9	11 × 10	11 × 11	11 × 12
12 × 1	12 × 2	12 × 3	12 × 4	12 × 5	12 × 6	12 × 7	12 × 8	12 × 9	12 × 10	12 × 11	12 × 12

Pupils must be fluent in these facts by the end of year 4, and this is assessed in the multiplication tables check. Pupils should continue with regular practice through year 5 to secure and maintain fluency.

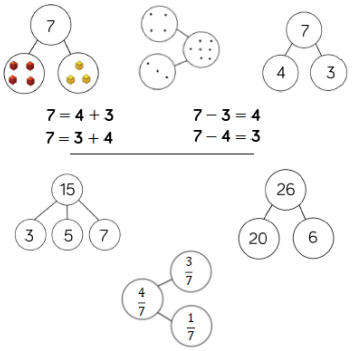
The 36 most important facts are highlighted in the table. Fluency in these facts should be prioritised because, when coupled with an understanding of commutativity and fluency in the formal written method for multiplication, they enable pupils to multiply any pair of numbers.

Fluency overview taken from:

Mathematics guidance: key stages 1 and 2 non-statutory guidance for the national curriculum in England June 2020

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1017683/Maths_guidance_KS_1_and_2.pdf

Part-Whole Model



Benefits

This part-whole model supports children in their understanding of aggregation and partitioning. Due to its shape, it can be referred to as a cherry part-whole model.

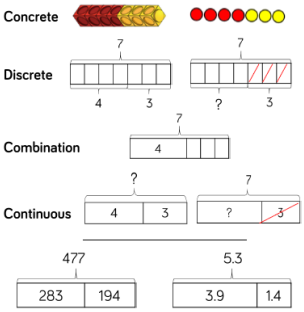
When the parts are complete and the whole is empty, children use aggregation to add the parts together to find the total.

When the whole is complete and at least one of the parts is empty, children use partitioning (a form of subtraction) to find the missing part.

Part-whole models can be used to partition a number into two or more parts, or to help children to partition a number into tens and ones or other place value columns.

In KS2, children can apply their understanding of the part-whole model to add and subtract fractions, decimals and percentages.

Bar Model (single)



Benefits

The single bar model is another type of a part-whole model that can support children in representing calculations to help them unpick the structure.

Cubes and counters can be used in a line as a concrete representation of the bar model.

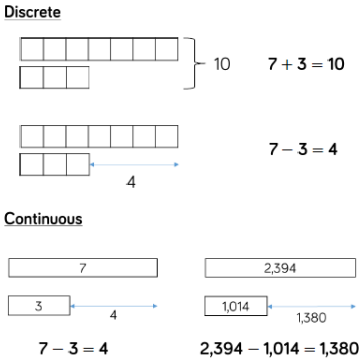
Discrete bar models are a good starting point with smaller numbers. Each box represents one whole.

The combination bar model can support children to calculate by counting on from the larger number. It is a good stepping stone towards the continuous bar model.

Continuous bar models are useful for a range of values. Each rectangle represents a number. The question mark indicates the value to be found.

In KS2, children can use bar models to represent larger numbers, decimals and fractions.

Bar Model (multiple)



Benefits

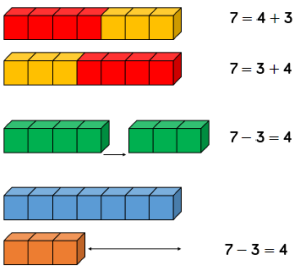
The multiple bar model is a good way to compare quantities whilst still unpicking the structure.

Two or more bars can be drawn, with a bracket labelling the whole positioned on the right hand side of the bars. Smaller numbers can be represented with a discrete bar model whilst continuous bar models are more effective for larger numbers.

Multiple bar models can also be used to represent the difference in subtraction. An arrow can be used to model the difference.

When working with smaller numbers, children can use cubes and a discrete model to find the difference. This supports children to see how counting on can help when finding the difference.

Cubes



Benefits

Cubes can be useful to support children with the addition and subtraction of one-digit numbers.

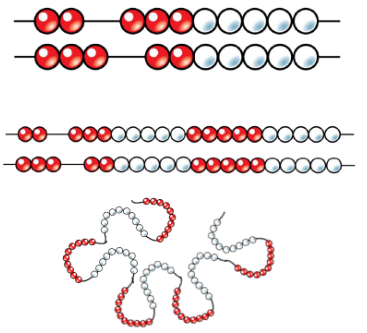
When adding numbers, children can see how the parts come together to make a whole. Children could use two different colours of cubes to represent the numbers before putting them together to create the whole.

When subtracting numbers, children can start with the whole and then remove the number of cubes that they are subtracting in order to find the answer. This model of subtraction is reduction, or take away.

Cubes can also be useful to look at subtraction as difference. Here, both numbers are made and then lined up to find the difference between the numbers.

Cubes are useful when working with smaller numbers but are less efficient with larger numbers as they are difficult to subitise and children may miscount them.

Bead Strings



Benefits

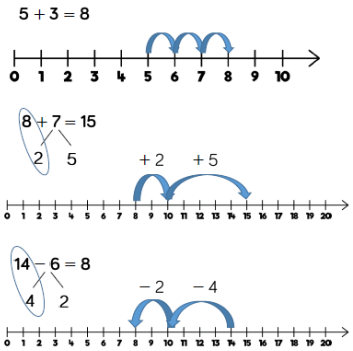
Different sizes of bead strings can support children at different stages of addition and subtraction.

Bead strings to 10 are very effective at helping children to investigate number bonds up to 10.
They can help children to systematically find all the number bonds to 10 by moving one bead at a time to see the different numbers they have partitioned the 10 beads into e.g. 2 + 8 = 10, move one bead, 3 + 7 = 10.

Bead strings to 20 work in a similar way but they also group the beads in fives. Children can apply their knowledge of number bonds to 10 and see the links to number bonds to 20.

Bead strings to 100 are grouped in tens and can support children in number bonds to 100 as well as helping when adding by making ten. Bead strings can show a link to adding to the next 10 on number lines which supports a mental method of addition.

Number Lines (labelled)



Benefits

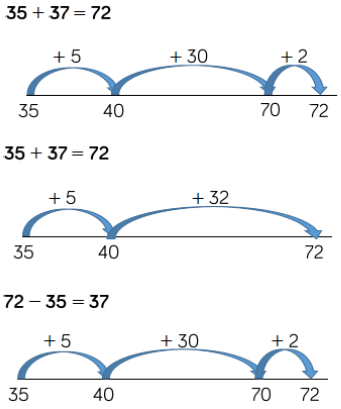
Labelled number lines support children in their understanding of addition and subtraction as augmentation and reduction.

Children can start by counting on or back in ones, up or down the number line. This skill links directly to the use of the number track.

Progressing further, children can add numbers by jumping to the nearest 10 and then jumping to the total. This links to the making 10 method which can also be supported by ten frames. The smaller number is partitioned to support children to make a number bond to 10 and to then add on the remaining part.

Children can subtract numbers by firstly jumping to the nearest 10. Again, this can be supported by ten frames so children can see how they partition the smaller number into the two separate jumps.

Number Lines (blank)



Benefits

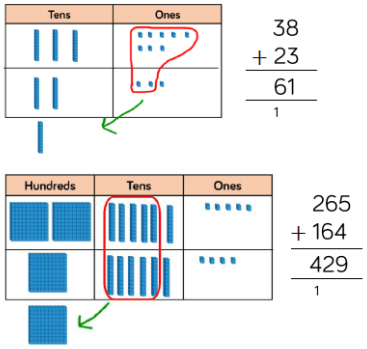
Blank number lines provide children with a structure to add and subtract numbers in smaller parts.

Developing from labelled number lines, children can add by jumping to the nearest 10 and then adding the rest of the number either as a whole or by adding the tens and ones separately.

Children may also count back on a number line to subtract, again by jumping to the nearest 10 and then subtracting the rest of the number.

Blank number lines can also be used effectively to help children subtract by finding the difference between numbers. This can be done by starting with the smaller number and then counting on to the larger number. They then add up the parts they have counted on to find the difference between the numbers.

Base 10/Dienes (addition)



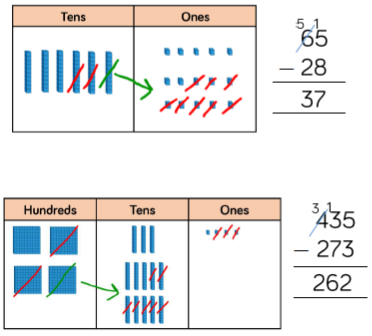
Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of column addition. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

Children should first add without an exchange before moving on to addition with exchange. The representation becomes less efficient with larger numbers due to the size of Base 10. In this case, place value counters may be the better model to use.

When adding, always start with the smallest place value column. Here are some questions to support children.
How many ones are there altogether?
Can we make an exchange? (Yes or No)
How many do we exchange? (10 ones for 1 ten, show exchanged 10 in tens column by writing 1 in column)
How many ones do we have left? (Write in ones column)
Repeat for each column.

Base 10/Dienes (subtraction)

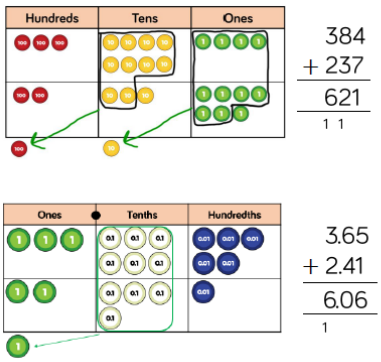


Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of column subtraction. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

Children should first subtract without an exchange before moving on to subtraction with exchange. When building the model, children should just make the minuend using Base 10, they then subtract the subtrahend. Highlight this difference to addition to avoid errors by making both numbers. Children start with the smallest place value column. When there are not enough ones/tens/hundreds to subtract in a column, children need to move to the column to the left and exchange e.g. exchange 1 ten for 10 ones. They can then subtract efficiently.
This model is efficient with up to 4-digit numbers. Place value counters are more efficient with larger numbers and decimals.

Place Value Counters (addition)



Benefits

Using place value counters is an effective way to support children's understanding of column addition. It is important that children write out their calculations alongside using or drawing counters so they can see the clear links between the written method and the model.

Children should first add without an exchange before moving on to addition with exchange. Different place value counters can be used to represent larger numbers or decimals. If you don't have place value counters, use normal counters on a place value grid to enable children to experience the exchange between columns.

When adding money, children can also use coins to support their understanding. It is important that children consider how the coins link to the written calculation especially when adding decimal amounts.

Glossary

Addend - A number to be added to another.

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

Augmentation - increasing a quantity or measure by another quantity.

Commutative – numbers can be added in any order.

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

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

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

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

Partitioning – Splitting a number into its component parts.

Reduction – Subtraction as take away.

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

Subtrahend - A number to be subtracted from another.

Sum - The result of an addition.

Total – The aggregate or the sum found by addition.