Maths Calculation Policy: Addition

The following pages show the *Power Maths White Rose Edition* progression in addition and how this works in line with the National Curriculum. The consistent use of the CPA (concrete, pictorial, abstract) approach across *Power Maths White Rose Edition* helps children develop mastery across all the operations in an efficient and reliable way. This policy shows how these methods develop children's confidence in their understanding of both written and mental methods.

RECEPTION
Children develop the core ideas that underpin all calculation. They begin by connecting calculation with counting on and counting back, but they should learn that understanding wholes and parts will enable them to calculate efficiently and accurately, and with greater flexibility. Children record their calculations in their own ways, there is no expectation of number sentences at this stage; however children may choose this way to record their thinking.
Key language: count, forwards, backwards, whole, part, recombine, break apart, ones, ten, tens, number bond, add, adding together, addition, plus, total, altogether, first, then, now,
Addition: Children start to explore addition by sorting groups. They then use sorting to develop their understanding of parts and wholes. Children combine groups to find the whole, using a part-whole model to support their thinking. They also use the part-whole model to find number bonds within and to 10. Using a five frame and ten frame, children add by counting on. They start by finding one more before adding larger numbers using counters or cubes on the frames. Children use a number track to add by counting on. Linking this learning to playing board games is an effective way to support children's addition.

KEY STAGE 1

Children develop the core ideas that underpin all calculation. They begin by connecting calculation with counting on and counting back, but they should learn that understanding wholes and parts will enable them to calculate efficiently and accurately, and with greater flexibility. They learn how to use an understanding of 10s and 1s to develop their calculation strategies, especially in addition.

Key language: whole, part, ones, ten, tens, number bond, add, addition, plus, total, altogether

Addition: Children first learn to connect addition and subtraction with counting, but they soon develop two very important skills: an understanding of parts and wholes, and an understanding of unitising 10s, to develop efficient and effective calculation strategies based on known number bonds and an increasing awareness of place value. Addition and subtraction are taught in a way that is interlinked to highlight the link between the two operations.

A key idea is that children will select methods and approaches based on their number sense. For example, in Year 1, when faced with 15 − 3 and 15 − 13, they will adapt their ways of approaching the calculation appropriately. The teaching should always emphasise the importance of mathematical thinking to ensure accuracy and flexibility of approach, and the importance of using known number facts to harness their recall of bonds within 20 to support both addition and subtraction methods.

LOWER KEY STAGE 2

Key language: partition, place value, tens, hundreds, thousands, column method, whole, part, equal groups, sharing, grouping, bar model**.**

Addition: In Year 3 especially, the column methods are built up gradually. Children will develop their understanding of how each stage of the calculation relates to place value. The example calculations chosen to introduce the stages of each method may often be more suited to a mental method. However, the examples and the progression of the steps have been chosen to help children develop their fluency in the process, alongside a deep understanding of the concepts and the numbers involved, so that they can apply these skills accurately and efficiently to later calculations. The class should be encouraged to compare mental and written methods for specific calculations, and children should be encouraged at every stage to make choices about which methods to apply.
In Year 4, the steps are shown without such fine detail, although children should continue to build their understanding with a secure basis in place value.

By the end of Year 4, children should have developed fluency in column methods alongside a deep understanding, which will allow them to progress confidently in upper Key Stage 2.

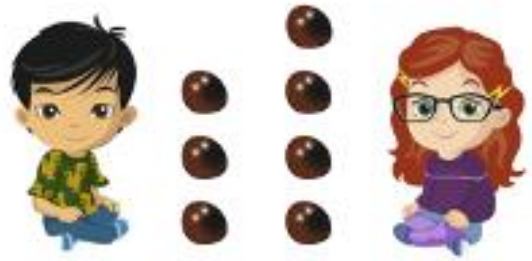
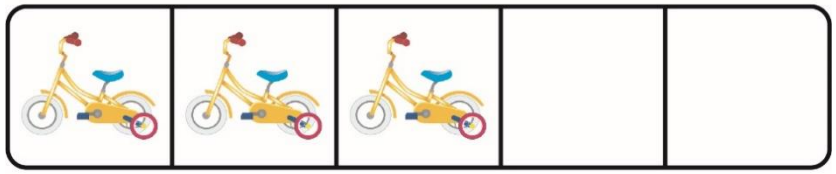
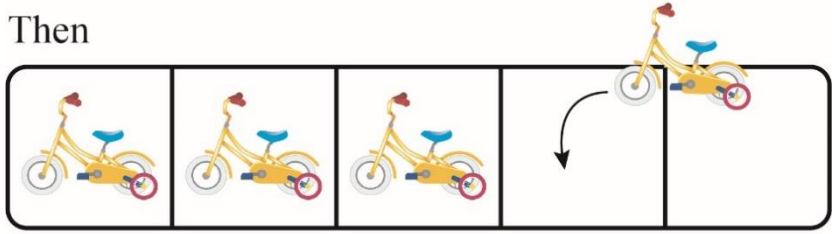
UPPER KEY STAGE 2

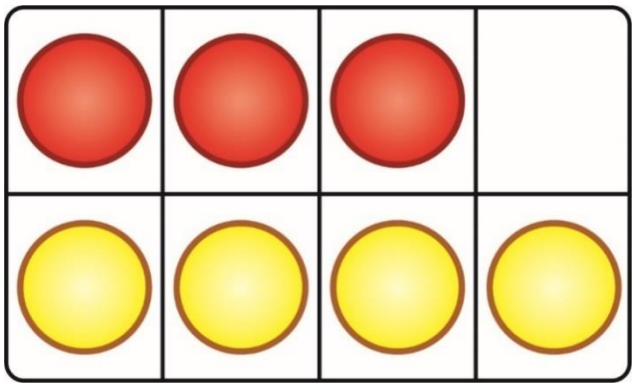
Key language: decimal, column methods, exchange, partition, mental method, ten thousand, hundred thousand, million, factor, multiple, prime number, square number, cube number

Children build on their column methods to add numbers with up to seven digits, and they adapt the methods to calculate efficiently and effectively with decimals, ensuring understanding of place value at every stage.

Children compare and contrast methods, and they select mental methods or jottings where appropriate and where these are more likely to be efficient or accurate when compared with formal column methods.

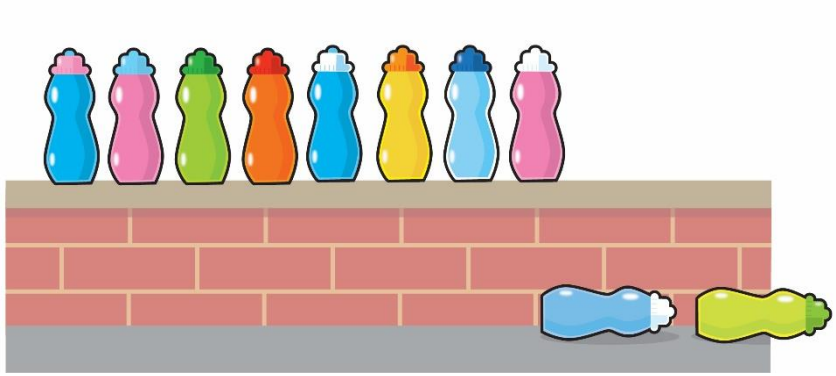
Bar models are used to represent the calculations required to solve problems and may indicate where efficient methods can be chosen.

Reception		
	Real-life representation	**Other representations**
Addition	**Counting and adding more (within 5)** Children add one more person or object to a group to find one more.  *One more than 3 is 4.*	**Counting and adding more (within 5)** Children represent first, then, now stories on a five frame. They make the first number and then add one more. First  Then  Now  *First, there are 3 bikes.* *Then, 1 more bike came.* *Now, there are 4 bikes.*

	Combining groups to find the whole Children sort people and objects into parts and combine them to find the whole.  *The parts are 3 and 4. The whole is 7.*	**Combining groups to find the whole** Children use counters or cubes in a part-whole model to find the whole.  *The parts are 3 and 4. The whole is 7.*

Finding number bonds to 10

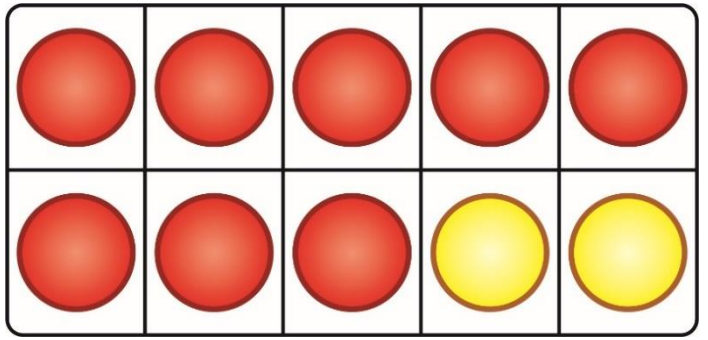
Children combine two groups to find a number bond to 10.



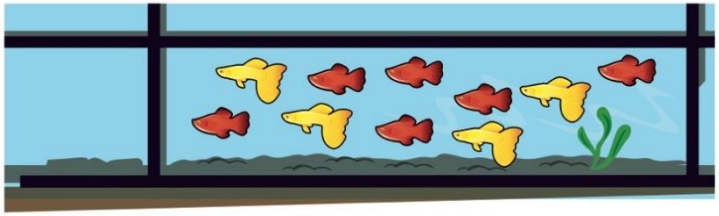
There are 8 bottles on the wall.
There are 2 bottles on the floor.
There are 10 bottles altogether.

Finding number bonds to 10

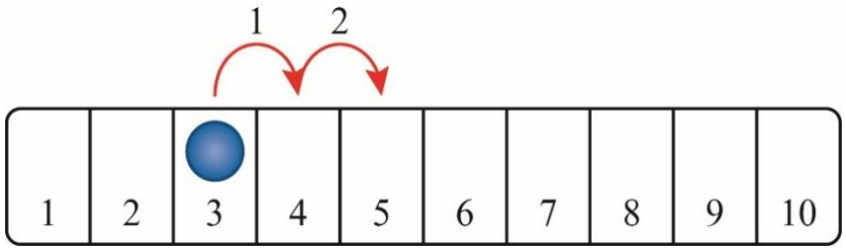
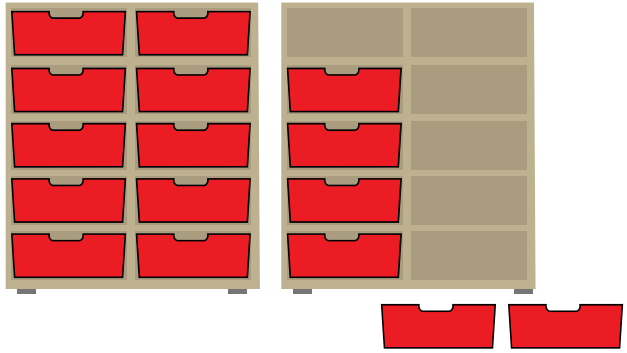
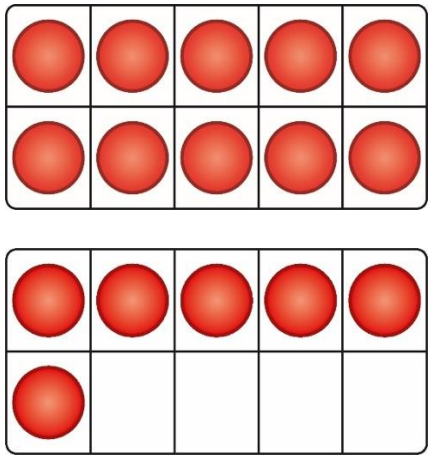
Use ten frames and part-whole models to represent key number bonds.



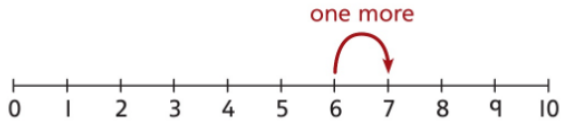
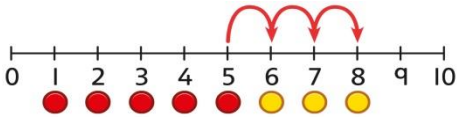
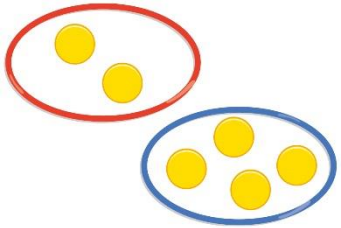
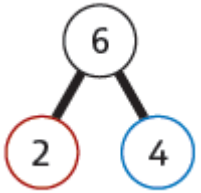
8 and 2 is 10.
There are 10 altogether.

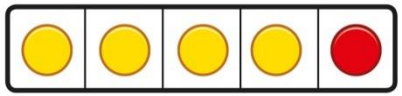
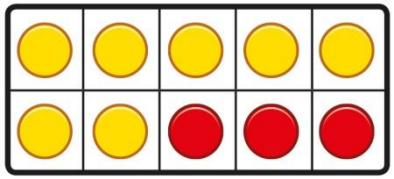
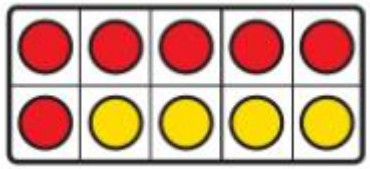
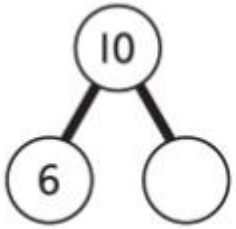
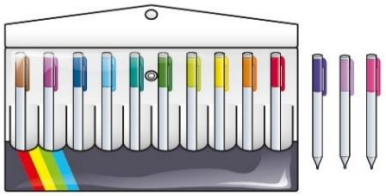
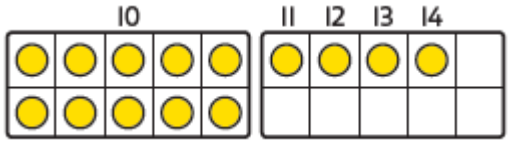
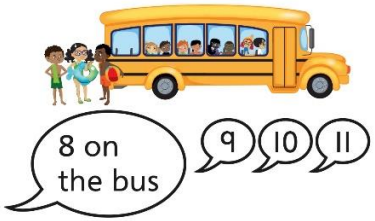
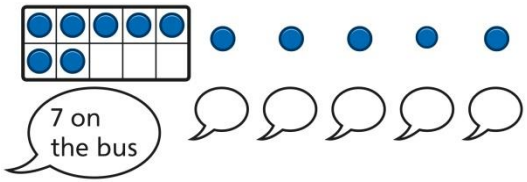
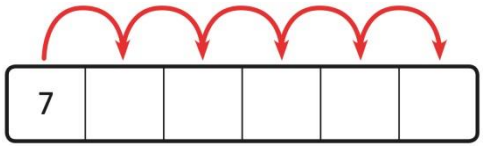


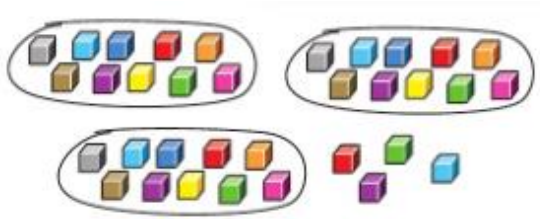
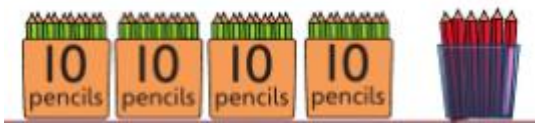
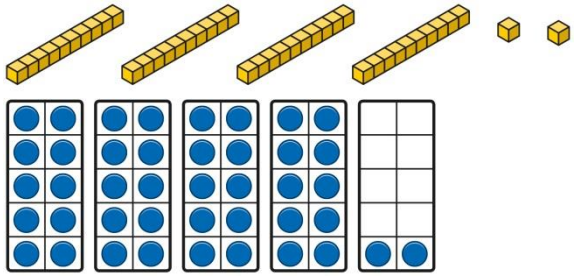
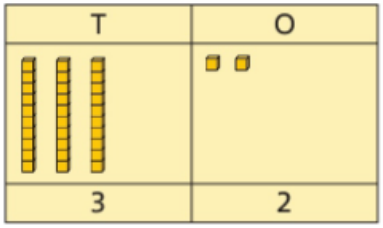
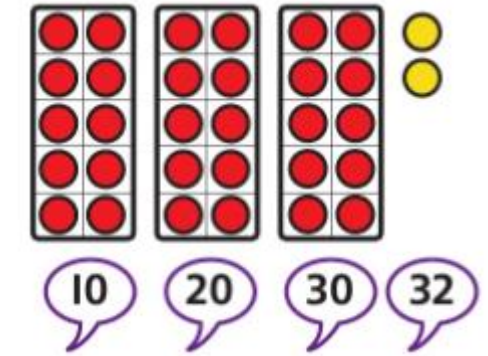
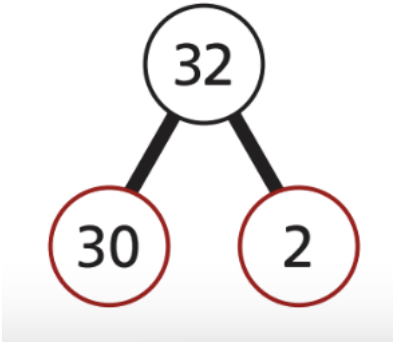
6 and 4 is 10.
There are 10 altogether.

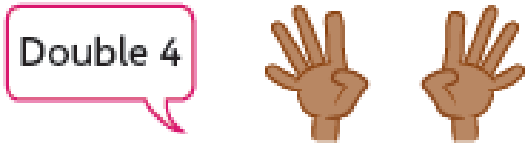
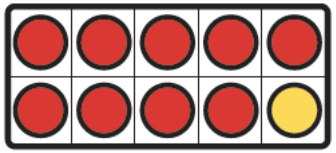
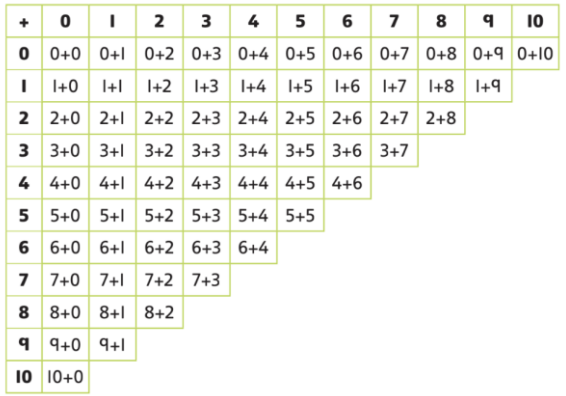
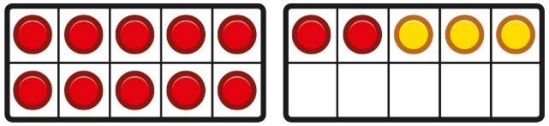
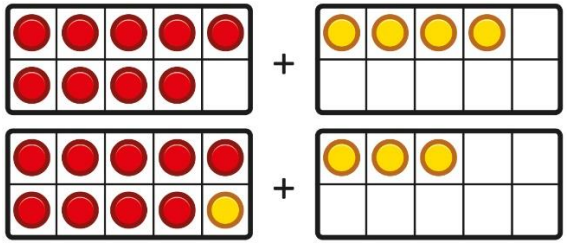
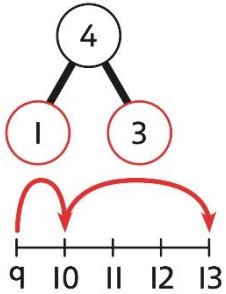
	Adding by counting on (number track) **Children jump along a physical number track. They start at the larger number and count on the smaller number to find the total.**  	Adding by counting on (number track) **Children use a number track and a counter. They start at the larger number and count on the smaller number to find the total.** 
	Adding by counting on (ten frames) Children find the total number by counting on from the larger number. 	**Adding by counting on (ten frames)** Children make the larger number on the ten frames and then make the smaller number, counting on to find the total. They can use counters, cubes or other objects on the ten frames. 

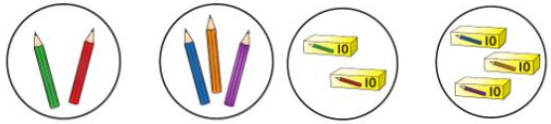
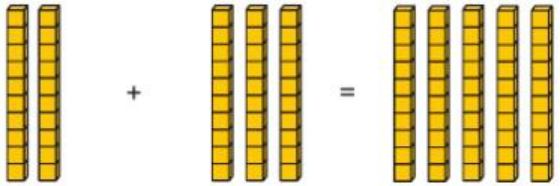
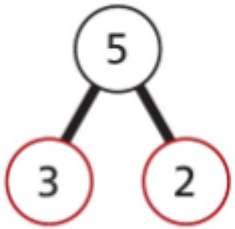
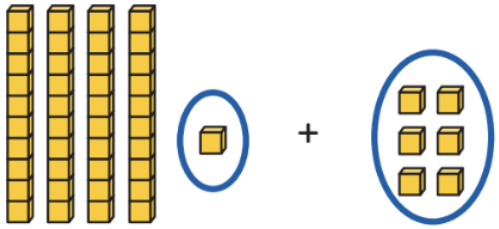
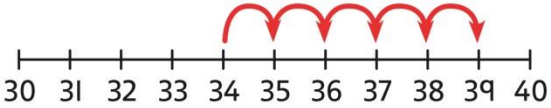
	Sorting groups (optional) Children sort everyday objects into groups. 	

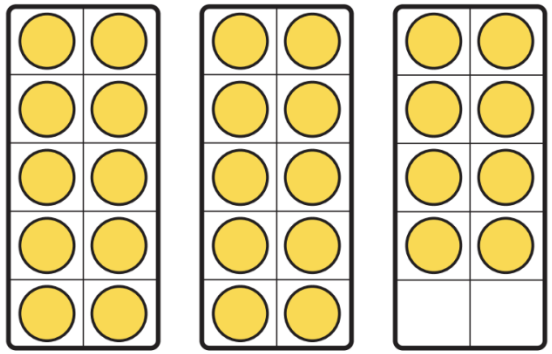
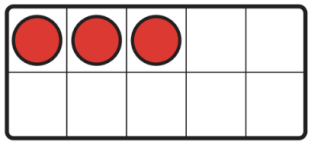
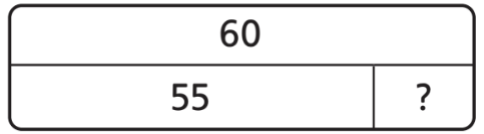
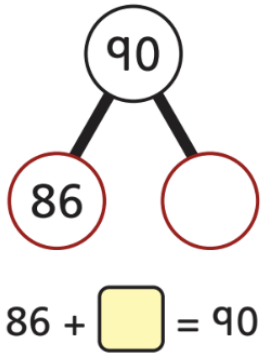
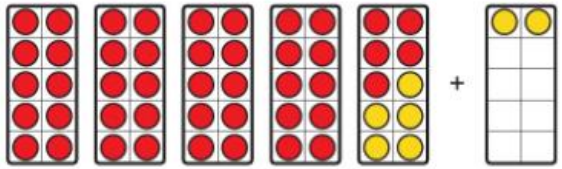
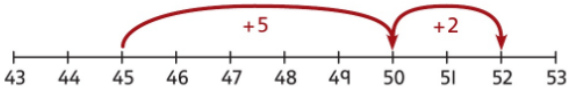
Year 1			
	Concrete	**Pictorial**	**Abstract**
Year 1 Addition			
Counting and adding more	Children add one more person or object to a group to find one more.	Children add one more cube or counter to a group to represent one more.  *One more than 4 is 5.*	Use a number line to understand how to link counting on with finding one more.  *One more than 6 is 7.* *7 is one more than 6.* Learn to link counting on with adding more than one.  *5 + 3 = 8*
Understanding part-part-whole relationship	Sort people and objects into parts and understand the relationship with the whole.  *The parts are 2 and 4. The whole is 6.*	Children draw to represent the parts and understand the relationship with the whole.  *The parts are 2 and 4. The whole is 6.*	Use a part-whole model to represent the numbers.  *2 + 4 = 6*
Knowing and finding number	Break apart a group and put back together to find and form number bonds.	Use five and ten frames to represent key number bonds.	Use a part-whole model alongside other representations to find number bonds.

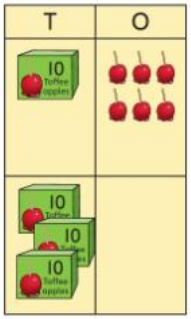
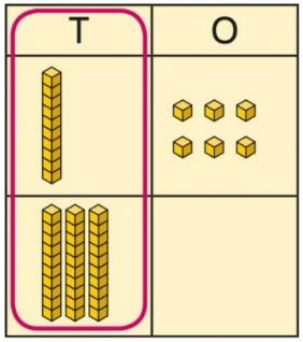
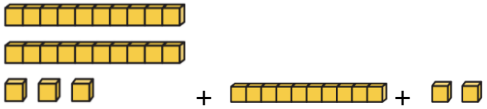
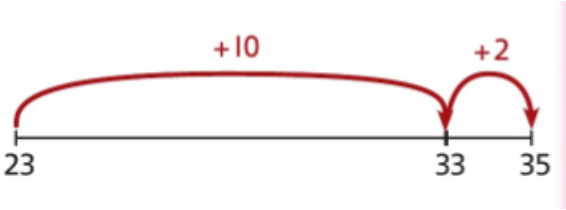
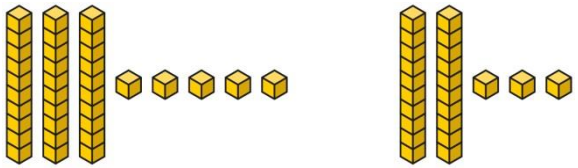
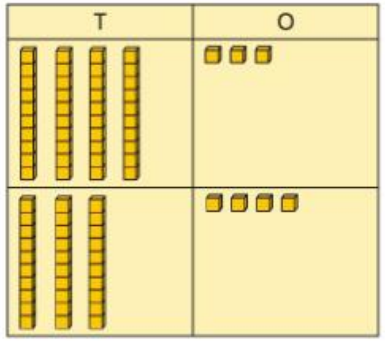
bonds within 10	 *3 + 4 = 7*  *6 = 2 + 4*	 *5 = 4 + 1*  *10 = 7 + 3*	  Make sure to include examples where one of the parts is zero.
Understanding teen numbers as a complete 10 and some more	Complete a group of 10 objects and count more.  *13 is 10 and 3 more.*	Use a ten frame to support understanding of a complete 10 for teen numbers.  *14 is 10 and 4 more.*	*1 ten and 5 ones equal 15.* *10 + 5 = 15*
Adding by counting on	Children use knowledge of counting to 20 to find a total by counting on using people or objects. 	Children use counters to support and represent their counting on strategy. 	Children use number lines or number tracks to support their counting on strategy.  7 + 5 = ☐

Year 2			
	Concrete	**Pictorial**	**Abstract**
Year 2 Addition			
Understanding 10s and 1s	Group objects into 10s and 1s.  Bundle straws, pencils or pens to understand unitising of 10s. 	Understand 10s and 1s equipment, and link with visual representations on ten frames.  Represent numbers on a place value grid, using equipment or numerals. 	Partition 2-digit numbers into 10s and 1s   *32 = 30 + 2*
Learn bonds within 10	Systematically build confidence and fluency in recall of number bonds within 10	Systematically build confidence and fluency in recall of number bonds within 10	Systematically build confidence and fluency in recall of number bonds within 10

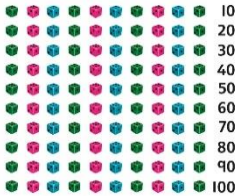
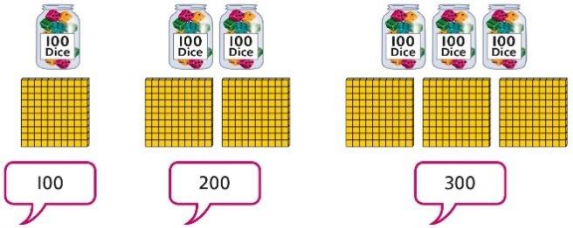
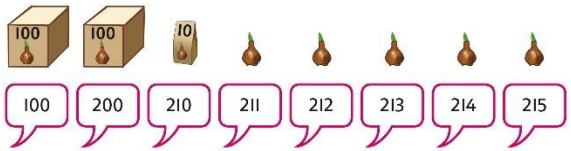
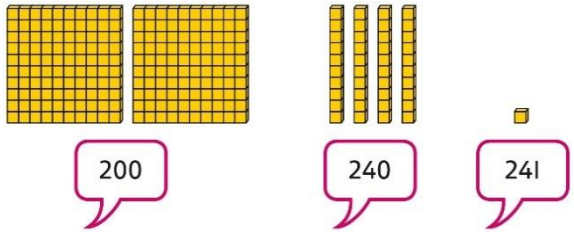
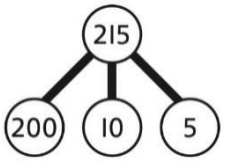
	 *4 + 4 = 8. This is a double*	 *This is a bond to 10. 9 + 1 = 10*	
Adding the 1s	Children represent 10s and 1s with everyday items. 	Children represent calculations using ten frames to add a teen and 1s.  *2 + 3 = 5* *12 + 3 = 15*	Children recognise that a teen is made from a 10 and some 1s and use their knowledge of addition within 10 to work efficiently. *3 + 5 = 8* *So, 13 + 5 = 18*
Bridging 10 using number bonds	Children use counters to complete a ten frame and understand how they can add using knowledge of number bonds to 10.  .	Use a part-whole model and a number line to support the calculation.  *9 + 4 = 13*	Children use a bead string to complete a 10 and understand how this relates to the addition.  *7 add 3 makes 10.* *So, 7 add 5 is 10 and 2 more.*
Add two multiples of 10	Use known bonds and unitising to add 10s.	Use known bonds and unitising to add 10s. 	Use known bonds and unitising to add 10s.

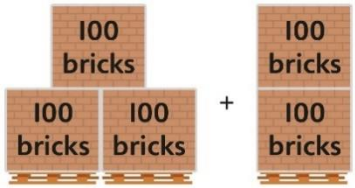
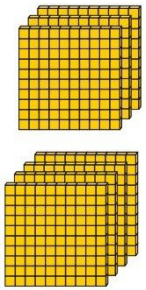
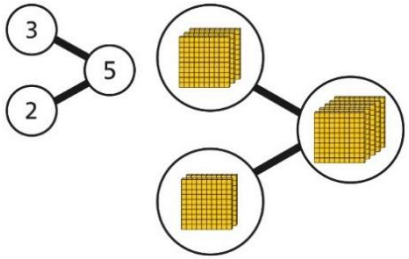
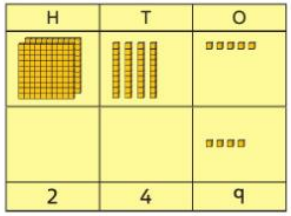
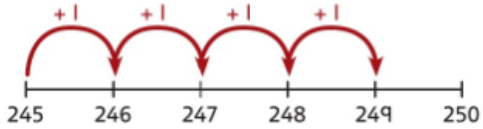
	 *I know that 2 + 3 = 5.* *So, I know that 2 tens add 3 tens is 5 tens.*	 *I know that 2 + 3 = 5* *So, I know that 2 tens add 3 tens is 5 tens.*	 *3 + 2 = 5* *3 tens + 2 tens = 5 tens* *30 + 20 = 50*
Add a 2-digit number and 1s	Add the 1s to find the total. Use known bonds within 10.  *41 is 4 tens and 1 one.* *41 add 6 ones is 4 tens and 7 ones.*	Add the ones using known bonds  *1 + 6 = 7* *So* *41 + 6 = 47*	Add the 1s. Understand the link between counting on and using known number facts. Children should be encouraged to use known number bonds to improve efficiency and accuracy.  *4 + 5 = 9* *So* *34 + 5 = 39*
Add to the next 10	Use known bonds to 10 to add to the next multiple of 10	Use known bonds to 10 to add to the next multiple of 10	Use known bonds to 10 to add to the next multiple of 10

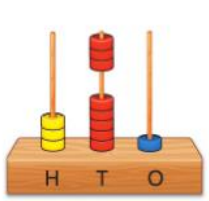
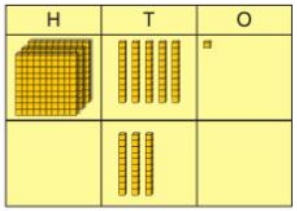
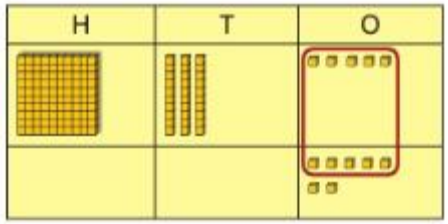
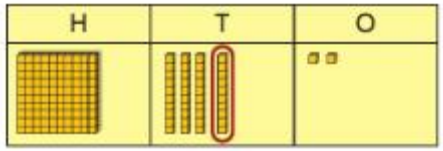
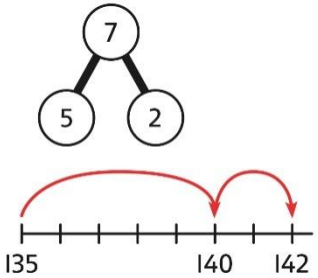
	 *8 + 2 = 10* *So* *28 + 2 = 30*	3 + ☐ = 10 33 + ☐ = 40 43 + ☐ = 50 73 + ☐ = 80 	 55 + ☐ = 60  86 + ☐ = 90
Add across a 10	Use place value equipment to support adding across any multiple of 10  *45 + 5 + 2 = 52* *45 + 7 = 52*	Add across any multiple of 10 using two jumps  *45 + 5 + 2 = 52* *45 + 7 = 52*	Add across any multiple of 10 using two steps 45 + 5 + 2 = 52 45 + 7 = 52
Add 10s to a 2-digit number	Add the 10s using a place value grid to support, using classroom items to represent the numbers.	Add the 10s using a place value grid to support.	Use known bonds and knowledge of place value to add multiples of 10 *16 + 30 = ?*

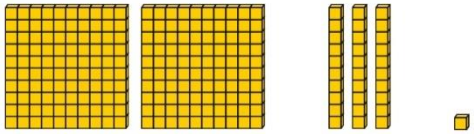
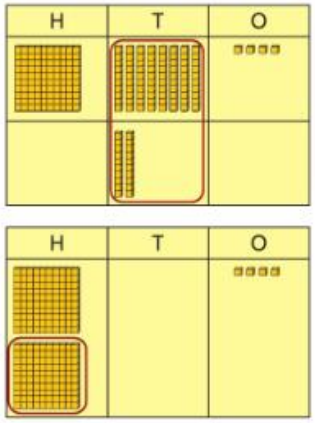
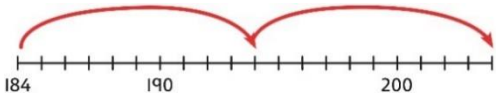
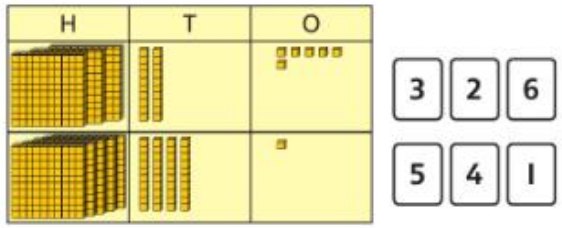
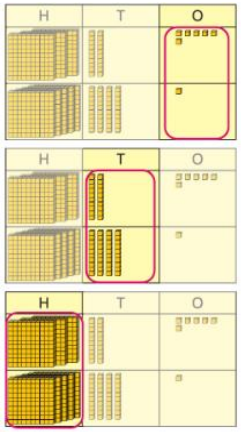
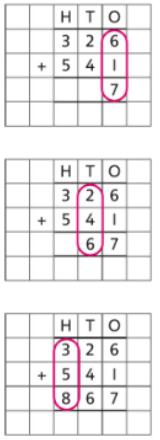
	 *16 is 1 ten and 6 ones.* *30 is 3 tens.* *There are 4 tens and 6 ones in total.*	 *16 is 1 ten and 6 ones.* *30 is 3 tens.* *There are 4 tens and 6 ones in total.*	*1 ten + 3 tens is 4 tens* *There are 4 tens and 6 ones in total.* *16 + 30 = 46* *Count on in tens from a given number* *'Start on 16', '26', '36', '46'* *16 + 30 = 46*
Add more 10s then more 1s	Add on from a 2-digit number by adding tens then ones.  *Start on "23", "33", "35"*	Add on from a 2-digit number by adding 10s then 1s.  *23 + 12 = 23 + 10 + 2*	Add on from a 2-digit number by adding tens then ones. *23 + 12 = 23 + 10 + 2*
Add the 1s and 10s separately	Add the 10s and 1s separately.  *5 + 3 = 8* *There are 8 ones in total.* *3 + 2 = 5* *There are 5 tens in total.*	Add the 1s and the 10s then recombine  3 ones and 4 ones is 7 ones	Add the 10s and 1s separately. 32 + 11 *30 + 10 = 40* *2 + 1 = 3* *32 + 11 = 43*

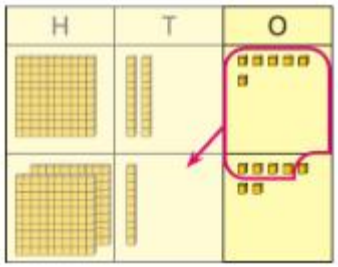
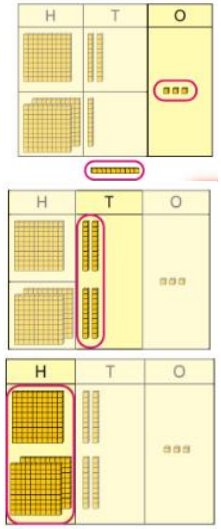
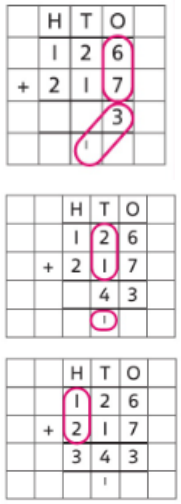
	35 + 23 = 58	4 tens and 3 tens is 7 tens 43 + 34 = 77	

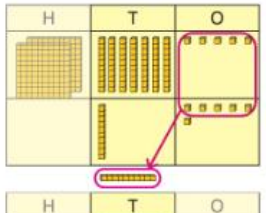
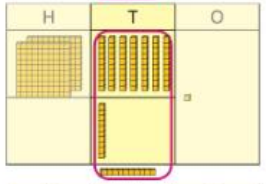
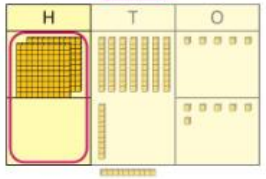
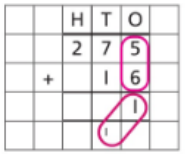
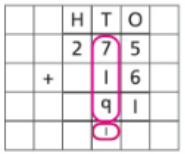
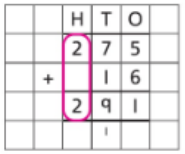
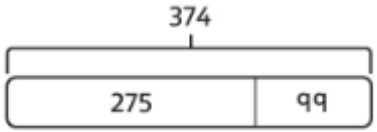
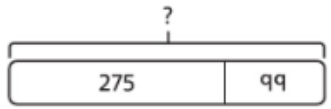
Year 3			
	Concrete	**Pictorial**	**Abstract**
Year 3 Addition			
Understanding 100s	Understand the cardinality of 100, and the link with 10 tens. Use cubes to place into groups of 10 tens. 	Unitise 100 and count in steps of 100. 	Represent steps of 100 on a number line and a number track and count up to 1,000 and back to 0. 
Understanding place value to 1,000	Unitise 100s, 10s and 1s to build 3-digit numbers. 	Use equipment to represent numbers to 1,000.  Use a place value grid to support the structure of numbers to 1,000. Place value counters are used alongside other equipment. Children should understand how each counter represents a different unitised amount.	Represent the parts of numbers to 1,000 using a part-whole model.  *215 = 200 + 10 + 5* Recognise numbers to 1,000 represented on a number line, including those between intervals.
Adding 100s	Use known facts and unitising to add multiples of 100.	Use known facts and unitising to add multiples of 100.	Use known facts and unitising to add multiples of 100.

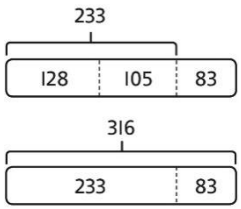
	 *3 + 2 = 5* *3 hundreds + 2 hundreds = 5 hundreds* *300 + 200 = 500*	 *3 + 4 = 7* *3 hundreds + 4 hundreds = 7 hundreds* *300 + 400 = 700*	Represent the addition on a number line. Use a part-whole model to support unitising.  *3 + 2 = 5* *300 + 200 = 500*
3-digit number + 1s, no exchange or bridging	Use number bonds to add the 1s.  *214 + 4 = ?* *Now there are 4 + 4 ones in total.* *4 + 4 = 8* *214 + 4 = 218*	Use number bonds to add the 1s.  *245 + 4* *5 + 4 = 9* *245 + 4 = 249*	Understand the link with counting on. *245 + 4*  Use number bonds to add the 1s and understand that this is more efficient and less prone to error. *245 + 4 = ?* *I will add the 1s.* *5 + 4 = 9* *So, 245 + 4 = 249*
3-digit number + 10s, no exchange	Calculate mentally by forming the number bond for the 10s.	Calculate mentally by forming the number bond for the 10s. *351 + 30 = ?*	Calculate mentally by forming the number bond for the 10s. *753 + 40*

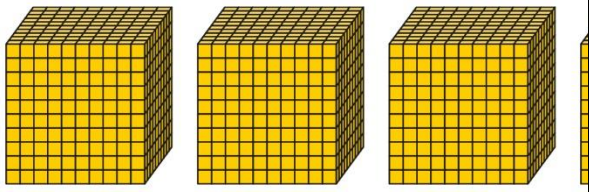
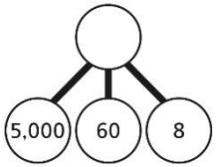
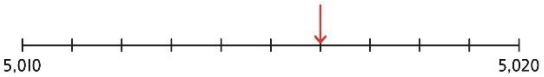
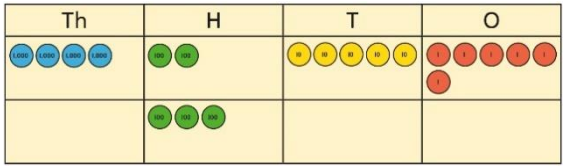
	 *234 + 50* *There are 3 tens and 5 tens altogether.* *3 + 5 = 8* *In total there are 8 tens.* 234 + 50 = 284	  *5 tens + 3 tens = 8 tens* *351 + 30 = 381*	*I know that 5 + 4 = 9* *So, 50 + 40 = 90* *753 + 40 = 793*
3-digit number + 1s with exchange	Understand that when the 1s sum to 10 or more, this requires an exchange of 10 ones for 1 ten. Children should explore this using unitised objects or physical apparatus.	Exchange 10 ones for 1 ten where needed. Use a place value grid to support the understanding.   *135 + 7 = 142*	Understand how to bridge by partitioning to the 1s to make the next 10.  *135 + 7 = ?* *135 + 5 + 2 = 142* Ensure that children understand how to add 1s bridging a 100. *198 + 5 = ?* *198 + 2 + 3 = 203*
3-digit number + 10s, with exchange	Understand the exchange of 10 tens for 1 hundred.	Add by exchanging 10 tens for 1 hundred. *184 + 20 = ?*	Understand how the addition relates to counting on in 10s across 100.

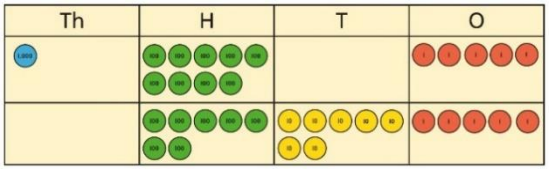
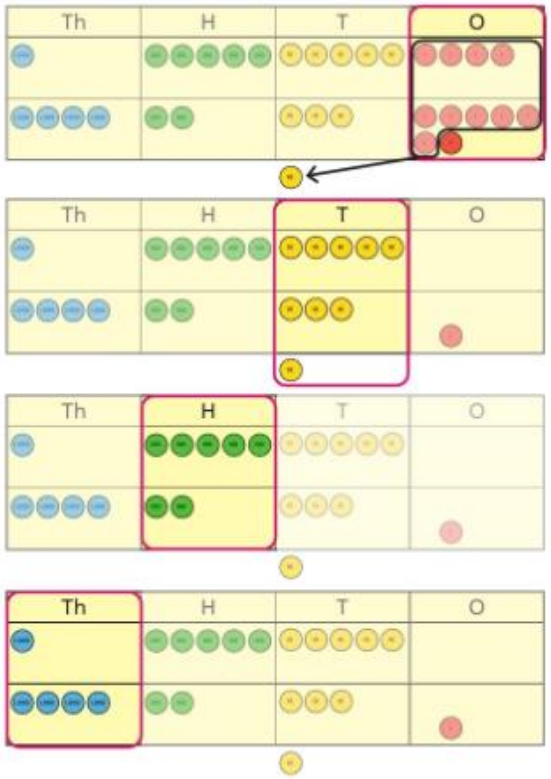
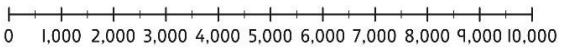
		 *184 + 20 = 204*	 *184 + 20 = ?* *I can count in 10s … 194 … 204* *184 + 20 = 204* Use number bonds within 20 to support efficient mental calculations. *385 + 50* *There are 8 tens and 5 tens.* *That is 13 tens.* *385 + 50 = 300 + 130 + 5* *385 + 50 = 435*
3-digit number + 3-digit number, no exchange	Use place value equipment to make a representation of a calculation. This may or may not be structured in a place value grid. *326 + 541 is represented as:* 	Represent the place value grid with equipment to model the stages of column addition. 	Use a column method to solve efficiently, using known bonds. Children must understand how this relates to place value at every stage of the calculation. 
3-digit number + 3-digit number,	Use place value equipment to enact the exchange required.	Model the stages of column addition using place value equipment on a place value grid.	Use column addition, ensuring understanding of place value at every stage of the calculation.

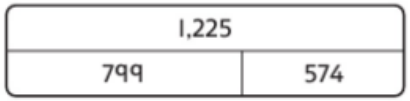
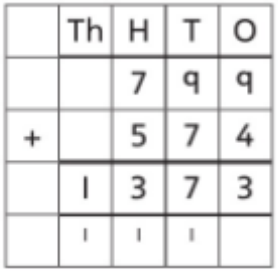
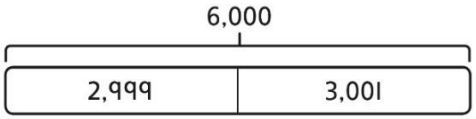
exchange required	 *There are 13 ones.* *I will exchange 10 ones for 1 ten.*		 *126 + 217 = 343* *Note:* Children should also study examples where exchange is required in more than one column, for example *185 + 318 = ?*
3-digit number + 2-digit number	Use place value equipment to make and combine groups to model addition. 	Use a place value grid to organise thinking and adding of 1s, then 10s.	Use the vertical column method to represent the addition. Children must understand how this relates to place value at each stage of the calculation.
3-digit number + 2-digit number, exchange required	Use place value equipment to model addition and understand where exchange is required. *Use place value counters to represent 154 + 72.* *Use this to decide if any exchange is required.* *There are 5 tens and 7 tens. That is 12 tens so I will exchange.*	Represent the required exchange on a place value grid using equipment. *275 + 16 = ?*	Use a column method with exchange. Children must understand how the method relates to place value at each stage of the calculation.

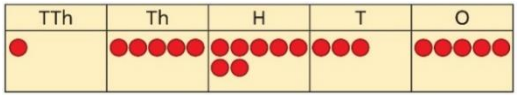
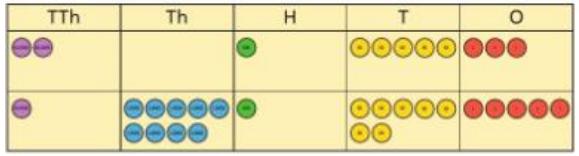
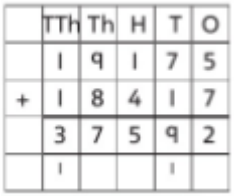
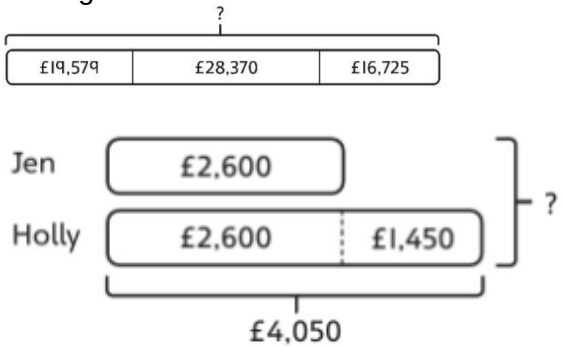
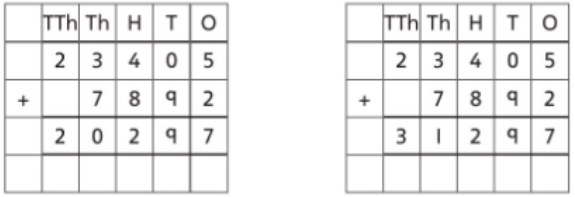
		   *275 + 16 = 291* *Note:* In this example, a mental method may be more efficient. The numbers for the example calculation have been chosen to allow children to visualise the concept and see how the method relates to place value. Children should be encouraged at every stage to select methods that are accurate and efficient.	   *275 + 16 = 291*
Representing addition problems, and selecting appropriate methods	Encourage children to use their own drawings and choices of place value equipment to represent problems with one or more steps. These representations will help them to select appropriate methods.	Children understand and create bar models to represent addition problems. *275 + 99 = ?*  *275 + 99 = 374*	Use representations to support choices of appropriate methods.  *I will add 100, then subtract 1 to find the solution.* *128 + 105 + 83 = ?* *I need to add three numbers.*

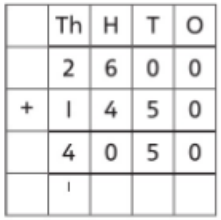
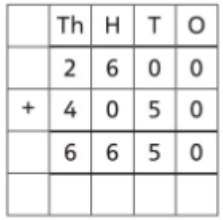
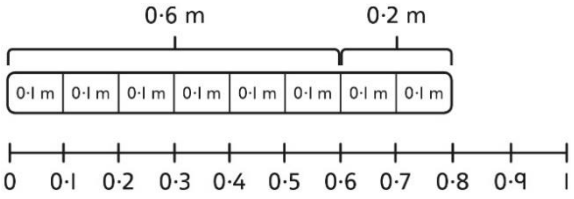
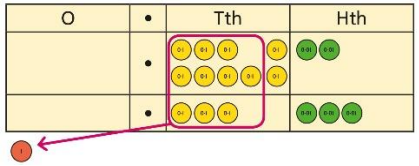
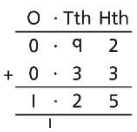
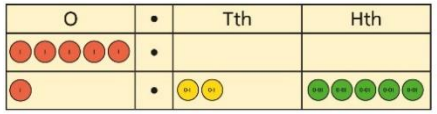
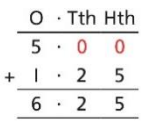
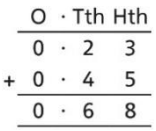
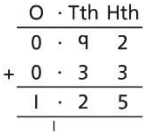
			128 + 105 = 233 

Year 4			
	Concrete	**Pictorial**	**Abstract**
Year 4 Addition			
Understanding numbers to 10,000	Use place value equipment to understand the place value of 4-digit numbers.  *4 thousands equal 4,000.* *1 thousand is 10 hundreds.*	Represent numbers using place value counters once children understand the relationship between 1,000s and 100s.  *2,000 + 500 + 40 + 2 = 2,542*	Understand partitioning of 4-digit numbers, including numbers with digits of 0.  *5,000 + 60 + 8 = 5,068* Understand and read 4-digit numbers on a number line. 
Choosing mental methods where appropriate	Use unitising and known facts to support mental calculations. *Make 1,405 from place value equipment.* *Add 2,000.* *Now add the 1,000s.* *1 thousand + 2 thousands = 3 thousands* *1,405 + 2,000 = 3,405*	Use unitising and known facts to support mental calculations.  *I can add the 100s mentally.* *200 + 300 = 500* *So, 4,256 + 300 = 4,556*	Use unitising and known facts to support mental calculations. *4,256 + 300 = ?* *2 + 3 = 5* *200 + 300 = 500* *4,256 + 300 = 4,556*
Column addition	Use place value equipment on a place value grid to organise thinking.	Use place value equipment to model required exchanges.	Use a column method to add, including exchanges.

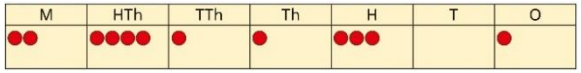
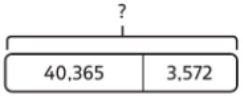
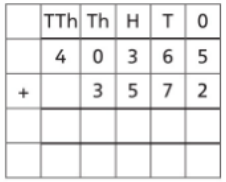
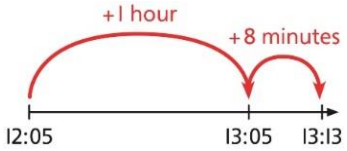
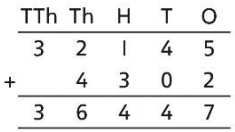
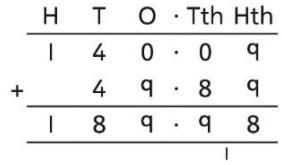
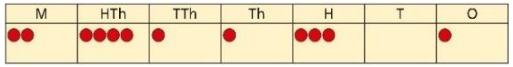
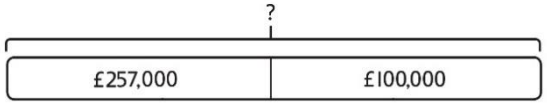
	Ensure that children understand how the columns relate to place value and what to do if the numbers are not all 4-digit numbers. *Use equipment.to show 1,905 + 775.*  *Why have only three columns been used for the second row? Why is the Thousands box empty?* *Which columns will total 10 or more?*	 Include examples that exchange in more than one column.	 Include examples that exchange in more than one column.
Representing additions and checking strategies		Bar models may be used to represent additions in problem contexts, and to justify mental methods where appropriate.	Use rounding and estimating on a number line to check the reasonableness of an addition.  *912 + 6,149 = ?*

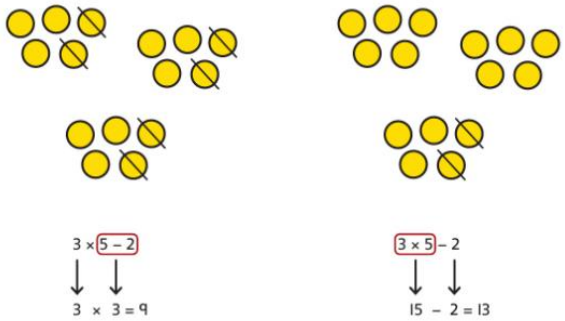
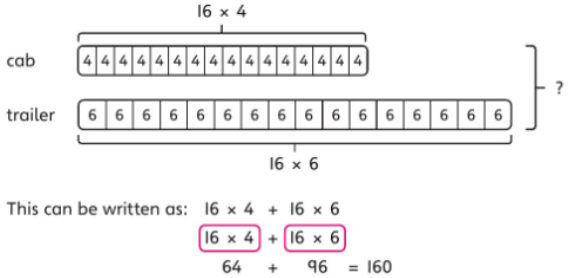
		  *I chose to work out 574 + 800, then subtract 1.*  *This is equivalent to 3,000 + 3,000.*	*I used rounding to work out that the answer should be approximately 1,000 + 6,000 = 7,000.*

Year 5			
	Concrete	**Pictorial**	**Abstract**
Year 5 Addition			
Column addition with whole numbers	Use place value equipment to represent additions. .  *Add a row of counters onto the place value grid to show 15,735 + 4,012*	Represent additions, using place value equipment on a place value grid alongside written methods.  *I need to exchange 10 tens for a 100.*  	Use column addition, including exchanges. 
Representing additions		Bar models represent addition of two or more numbers in the context of problem solving.  	Use approximation to check whether answers are reasonable.  *I will use 23,000 + 8,000 to check.*

		 	
Adding tenths	Link measure with addition of decimals. *Two lengths of fencing are 0·6 m and 0·2 m.* *How long are they when added together?* 	Use a bar model with a number line to add tenths.  *0·6 + 0·2 = 0·8* *6 tenths + 2 tenths = 8 tenths*	Understand the link with adding fractions. $\frac{6}{10} + \frac{2}{10} = \frac{8}{10}$ *6 tenths + 2 tenths = 8 tenths* *0·6 + 0·2 = 0·8*
Adding decimals using column addition	Use place value equipment to represent additions. *Show 0·23 + 0·45 using place value counters.*	Use place value equipment on a place value grid to represent additions. Represent exchange where necessary.   Include examples where the numbers of decimal places are different.  	Add using a column method, ensuring that children understand the link with place value.  Include exchange where required, alongside an understanding of place value.  Include additions where the numbers of decimal places are different. *3.4 + 0.65 = ?*

			O · Tth Hth 3 · 4 0 + 0 · 6 5 ·

Year 6			
	Concrete	**Pictorial**	**Abstract**
Year 6 Addition			
Comparing and selecting efficient methods	Represent 7-digit numbers on a place value grid and use this to support thinking and mental methods.  	Discuss similarities and differences between methods, and choose efficient methods based on the specific calculation. Compare written and mental methods alongside place value representations.   Use bar model and number line representations to model addition in problem-solving and measure contexts.  	Use column addition where mental methods are not efficient. Recognise common errors with column addition. *32,145 + 4,302 = ?*  *Which method has been completed accurately?* *What mistake has been made?* Column methods are also used for decimal additions where mental methods are not efficient. 
Selecting mental methods for larger numbers where appropriate	Represent 7-digit numbers on a place value grid and use this to support thinking and mental methods.  *2,411,301 + 500,000 = ?*	Use a bar model to support thinking in addition problems. *257,000 + 99,000 = ?*  *I added 100 thousands then subtracted 1 thousand.*	Use place value and unitising to support mental calculations with larger numbers. *195,000 + 6,000 = ?* *195 + 5 + 1 = 201* *195 thousands + 6 thousands = 201 thousands*

	This would be 5 more counters in the HTh place. *So, the total is 2,911,301.* *2,411,301 + 500,000 = 2,911,301*	*257 thousands + 100 thousands = 357 thousands* *257,000 + 100,000 = 357,000* *357,000 – 1,000 = 356,000* *So, 257,000 + 99,000 = 356,000*	*So, 195,000 + 6,000 = 201,000*
Understanding order of operations in calculations	Use equipment to model different interpretations of a calculation with more than one operation. Explore different results. *3 × 5 − 2 = ?*  	Model calculations using a bar model to demonstrate the correct order of operations in multi-step calculations.  	Understand the correct order of operations in calculations without brackets. Understand how brackets affect the order of operations in a calculation. *4 + 6 × 16* *4 + 96 = 100* *(4 + 6) × 16* *10 × 16 = 160*