St Stephen's CE Primary School Calculation Policy

This mathematics calculation policy is a guide for all staff, parents and children at St Stephen's CE Primary School.

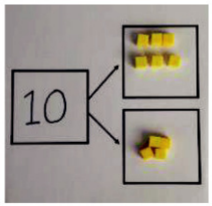
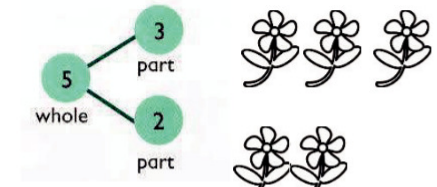
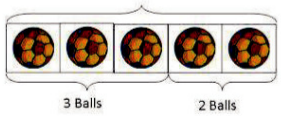
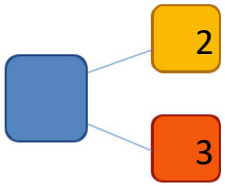
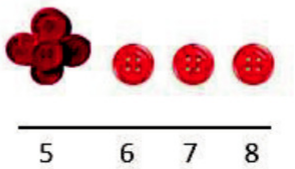
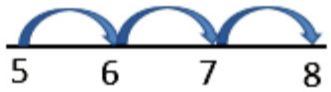
It is designed to be used alongside any teaching resources that teachers wish to use and does not recommend one scheme over another. All staff have access to White Rose Premium resources which provide quality teaching and learning materials and key models to explain mathematical content. The school has also bought into Classroom Secrets and Twinkl and these again provide ideas, resources and plans to support learning.

Whilst this calculation policy is separated into year group phases, **these are intended to be used only as a guide** and it is the teachers' professional judgement as to when the pupils move onto the next phase or whether further work is required from a previous phase to scaffold learning, especially in light of the COVID-19 pandemic.

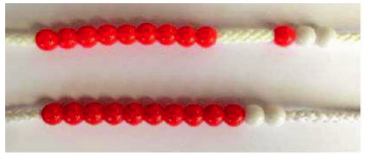
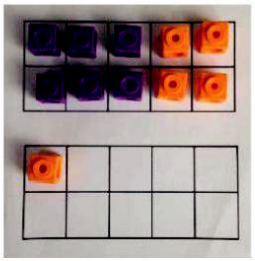
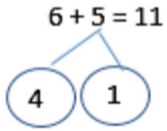
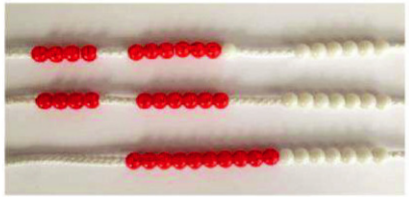
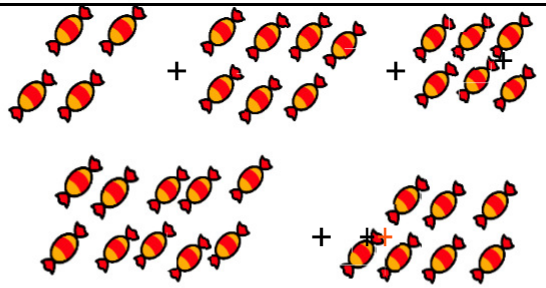
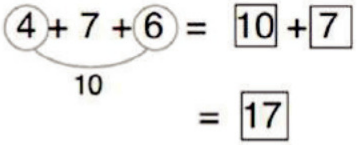
All teachers have been given the scheme of work from White Rose Maths based in Halifax and this policy has been derived from this scheme by the Surrey Plus Maths Hub. Staff are encouraged to base their planning around their recommended modules. These modules use the Singapore Maths Methods and are affiliated to the workings of the New Mathematics Curriculum that is now running throughout the school. Much research has been done on Singapore Maths and there are now more resources available to support the teaching behind the methodology. It is a sequential programme of study that is underpinned by promoting fluency in number. It emphasises that all pupils must have a thorough grounding in the four basic rules of number before progressing on to the next level. This philosophy is evident on the White Rose scheme and has been embedded being at St Stephen's CE Primary School. This complete understanding gives pupils more confidence in dealing with number activities and in turn, leads to mastery of the four operations.

Matthew Roberts – Maths Lead December 2021

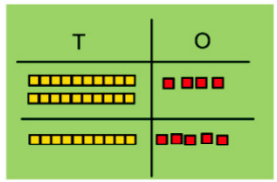
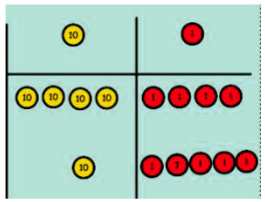
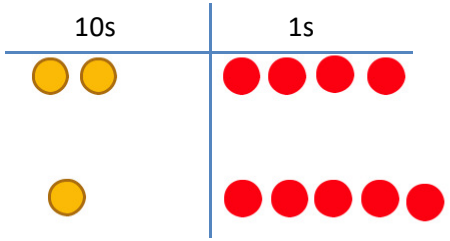
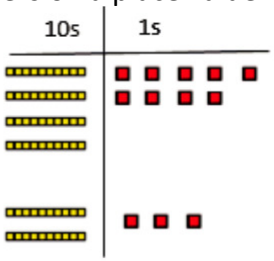
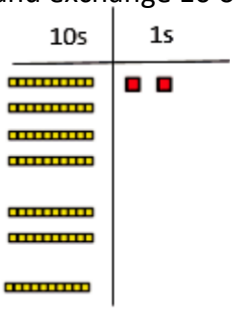
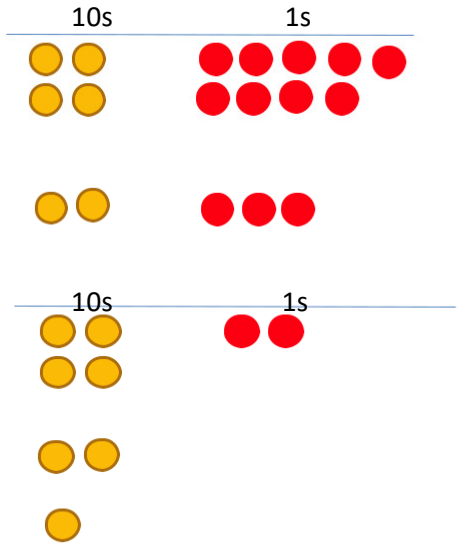
CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
Year 1	Number bonds of 5, 6, 7, 8, 9 and 10	  Use cubes to add two numbers together as a group or in a bar. 	  Use pictures to add two numbers together as a group or in a bar.  	2+3=5 3+2=5 5=3+2 5=2+3  Use the part-part-whole diagram as shown above to move into the abstract.
	Counting	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.  	Use a number line to count on in ones.  	5+3=8

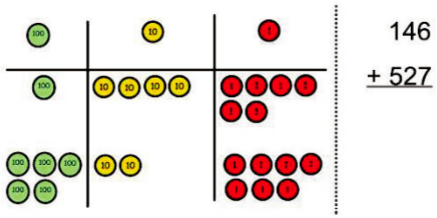
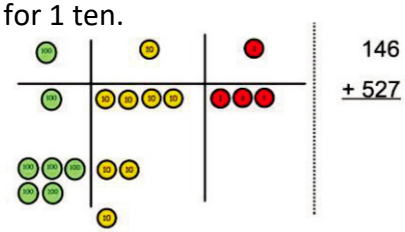
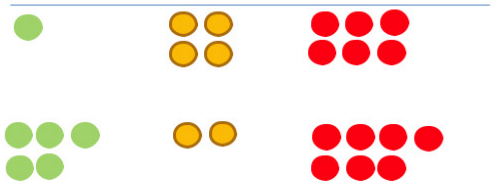
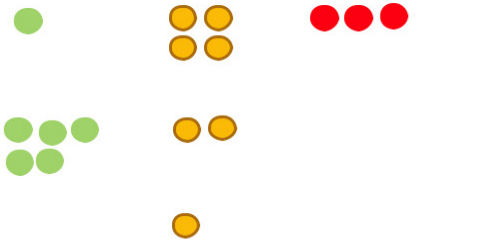
CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
Year 1	Regrouping to make 10	  6+5=11 Start with the bigger number and use the smaller number to make 10.	  6 + 4 =10 10 + 1 = 11	6+5=11
Year 2	Adding 3 single digit numbers	4+7+6=17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 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.

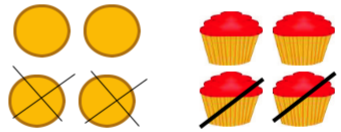
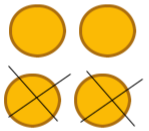
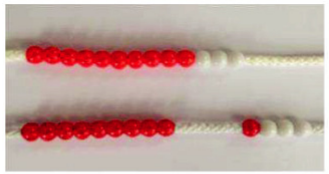
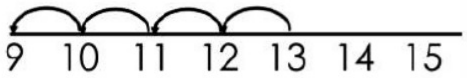
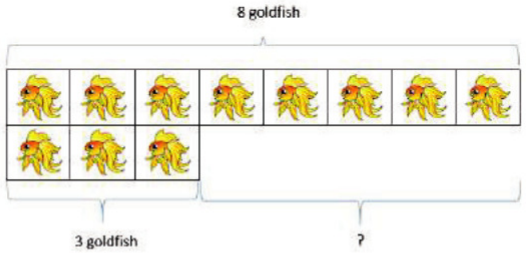
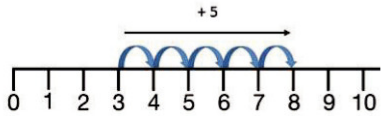
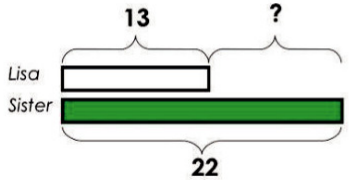
CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
Year 2	Column method without regrouping	Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters. 24+15=  44+15= 	After physically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.  	24+15=39 24 + 15 39
	Column method with regrouping	Make both numbers on a place value grid.  Add up the units and exchange 10 ones for 1 ten.  	Using place value counters, children can draw the counters to help them to solve additions.  	40+ 9 20+ 3 60+12=72

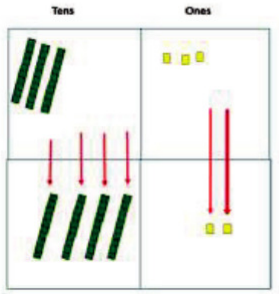
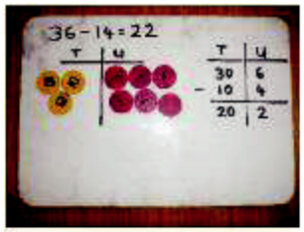
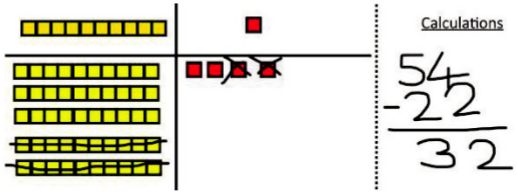
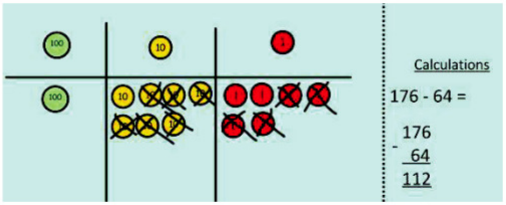
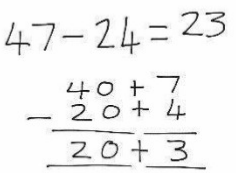
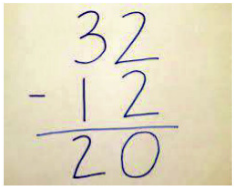
CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
Year 3/4	Column method with regrouping	Make both numbers on a place value grid.  146 + 527 Add up the units and exchange 10 ones for 1 ten.  146 + 527 As children move on to decimals, money and decimal place value counters can be used to support learning. **NB** By Year 4 children will progress on to adding four digit numbers.	100s 10s 1s  100s 10s 1s  Children can draw a **pictoral representation** of the columns and place value counters to further support their learning and understanding. **NB** Addition of money needs to have £ and p added separately.	100+40+6 500+20+7 600+70+3=673 As the children progress, they will move from the expanded to the compacted method. 146 + 527 673 1 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.
Year 5/6	Column with regrouping	**Consolidate** understanding using numbers with more than 4 digits and extend by adding numbers with up to 3 decimal places.		

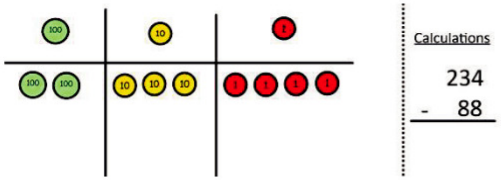
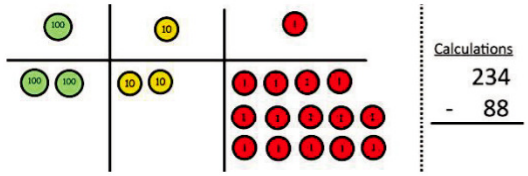
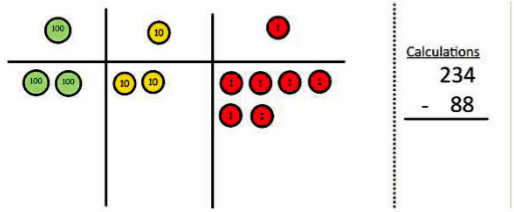
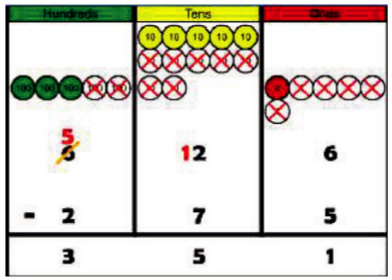
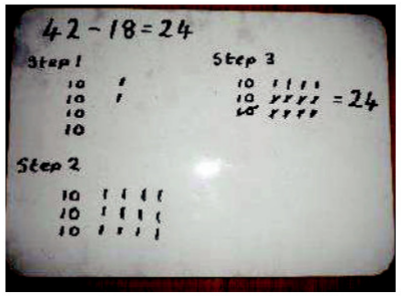
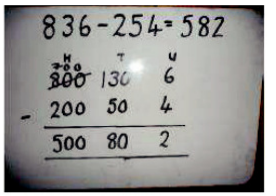
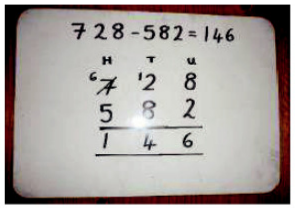
CALCULATION GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
Year 1	Taking away ones	Use physical objects, counters, cubes etc. to show how objects can be taken away. 4 2 = 2 	Cross out drawn objects to show what has been taken away. 4 2=2 	4 2=2
	Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.  13 4 = 9	Count back on a number line or number track  Start at the bigger number and count back the smaller number, showing the jumps on the number line.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.
	Find the difference	Compare amounts and objects to find the difference.  Use cubes to build towers or make bars to find the difference. Use basic bar models with items to find the difference.	 Count on to find the difference. *Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.*  Draw bars to find the difference between 2 numbers.	Hannah has 8 goldfish. Helen has 3 goldfish. Find the difference between the number of goldfish the girls have.

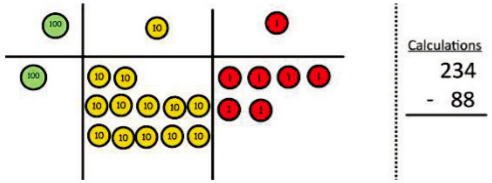
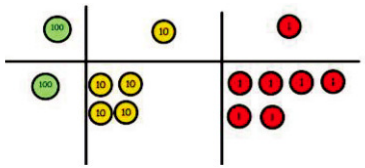
CALCULATION GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
	Column method without regrouping	75 42=33  Use Base 10 to make the bigger number then take the smaller number away. Show how you **partition** numbers to subtract. Again make the larger number first.  	 Draw the Base 10 or place value counters alongside the written calculation to help to show working.  	 This will lead to a clear written column subtraction. 

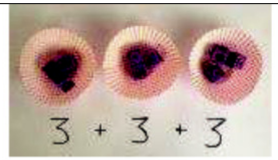
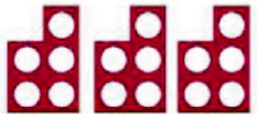
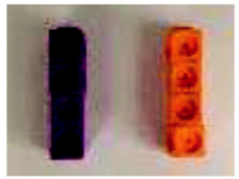
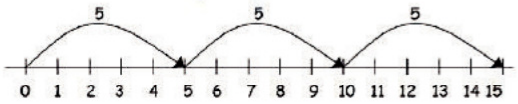
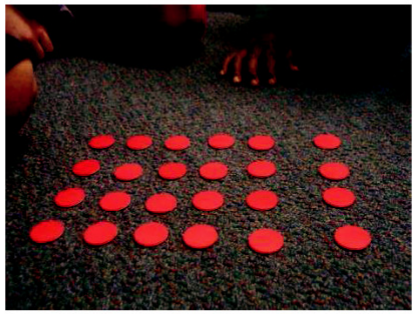
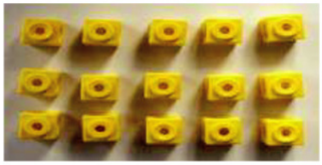
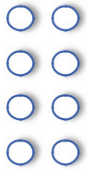
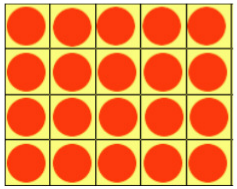
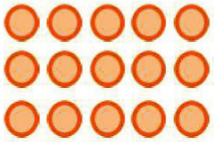
CALCULATION GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
Year 3 onwards	Column method with regrouping	Use Base 10 to start with before moving on to place value counters. Start with one **exchange** before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters  Start with the ones, can I take away 8 from 4 easily? I need to **exchange** 1 of my tens for 10 ones.  Now I can subtract my ones.  	 Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the **exchanges** you make. When confident, children can find their own way to record the **exchange/regrouping**. Just writing the numbers as shown here shows that the child understands the method and knows when to **exchange/regroup**.  	 Children can start their formal written method by **partitioning** the number into clear place value columns.  Moving forward the children use a more compact method. This will lead to an understanding of subtracting any number including decimals. 5 12 1 2 6 3 . 0 - 2 6 . 5 2 3 6 . 5

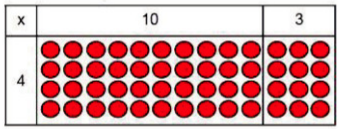
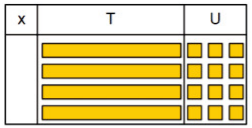
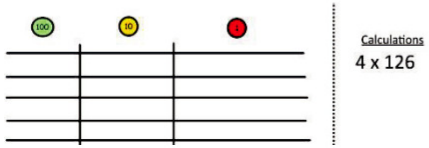
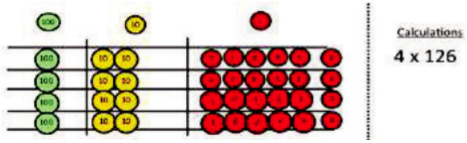
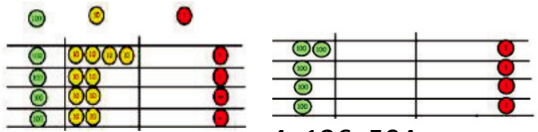
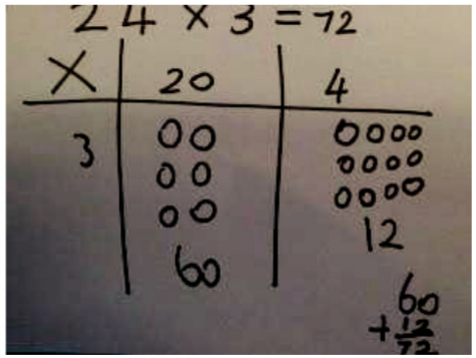
CALCULATION GUIDANCE: Subtraction

	Objective	Concrete	Pictorial	Abstract
Year 3 up	Column method with regrouping	Now look at the tens, can I take away 8 tens easily? I need to exchange 1 hundred for 10 tens.  Calculations 234 - 88 Now I can take away 8 tens and complete my subtraction.  Calculations ~~2~~ 1 ~~3~~ 2 ~~4~~ - 88 146 Show children how the concrete method links to the written method alongside your working. Cross out the numbers when **exchanging** and show where we write our new amount.		

CALCULATION GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
Year 1/2	Repeated addition	   Use different objects to add equal groups.	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?  2+2+2=6  5+5+5=15	Write addition sentences to describe objects and pictures.  2+2+2=6
	Arrays- showing commutative multiplication	Create arrays using counters/cubes to show multiplication sentences.  	Draw **arrays** in different rotations to find **commutative** multiplication sentences.  4×2=8 2×4=8  2×4=8 4×2=8 Link **arrays** to area of rectangles. 	Use an **array** to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

CALCULATION GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
Year 3/4	Grid method	Show the link with **arrays** to first introduce the grid method.  4 rows of 10 4 rows of 3 Move on to using Base 10 to move towards a more compact method.  4 rows of 13 Move on to place value counters to show how we 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.  4×126=504	Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use 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
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7	210	35 | 210 + 35 = 245 Moving forward, multiply by a 2 digit number showing the different rows within the grid method. |	10	8
---	---	---
10	100	80
3	30	24	 	X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16 | |				
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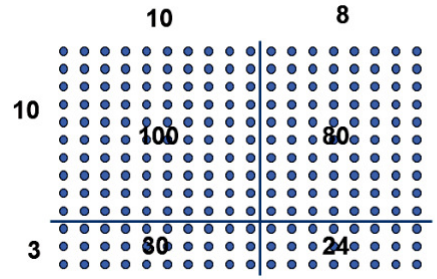
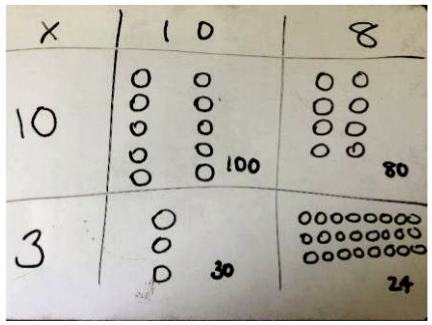
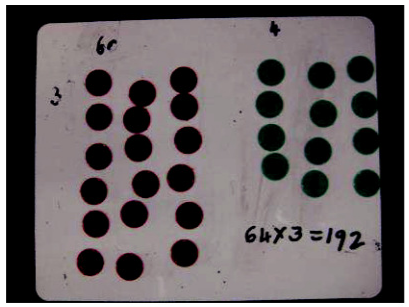
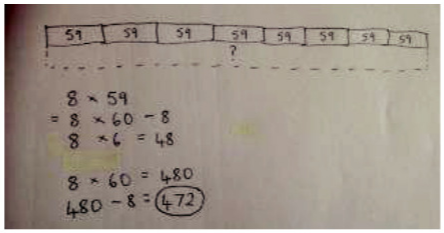
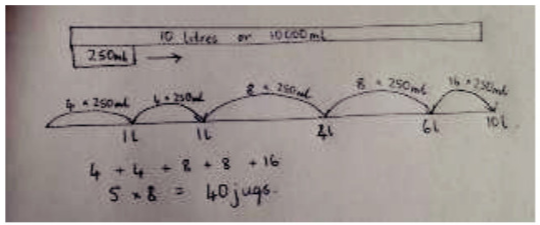
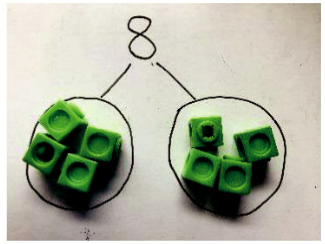
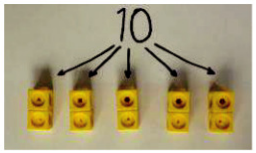
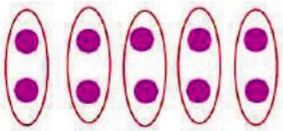
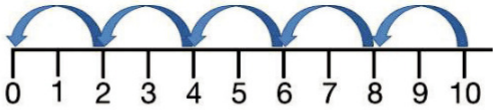
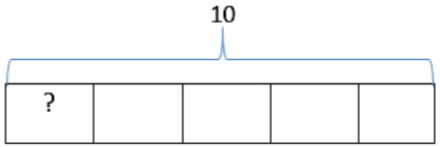
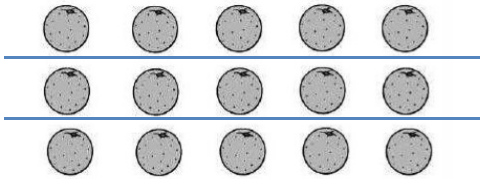
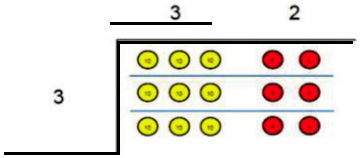
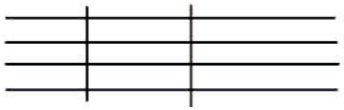
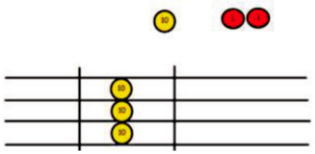
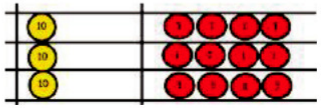
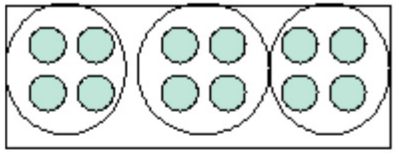
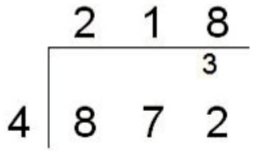
CALCULATION GUIDANCE: Multiplication

	Objective	Concrete	Pictorial	Abstract
	Expanded method	Show the link with **arrays** to first introduce the expanded method. 		Start with long multiplication, reminding the children about lining up their numbers clearly in columns. 18 x 13 24 (3 x 8) 30 (3 x 10)) 80 (10 x 8) 100 (10 x 10) 234
Year 5/6	Compact method	Children can continue to be supported by place value counters at the stage of multiplication.  It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.  	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer. 7 4 x 6 3 1 2 2 1 0 2 4 0 + 4 2 0 0 4 6 6 2 This moves to the more compact method. 1342 x 18 13420 10736 24156

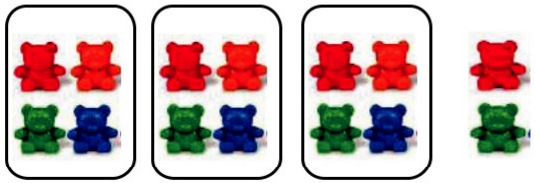
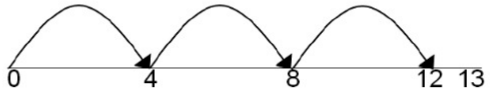
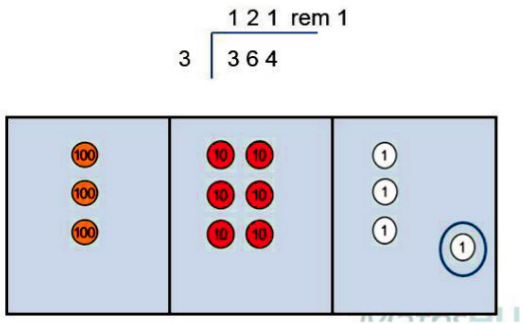
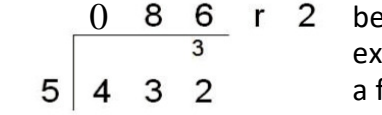
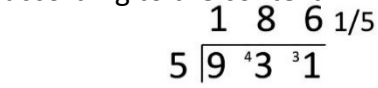
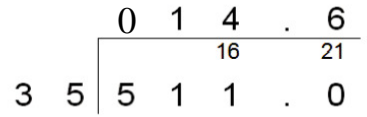
CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 1/2	Sharing	I have 8 cubes, can you share them equally between two people?	Children use pictures or shapes to share quantities.  8÷2=4	Share 8 buns between two people. 8÷2=4 
	Grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	Use a number line to show jumps in groups. The number of jumps equals the number of groups.  Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within  10 ÷ 5 = ? 5 x ? = 10	10÷5=2 Divide 10 into 5 groups. How many are in each group?

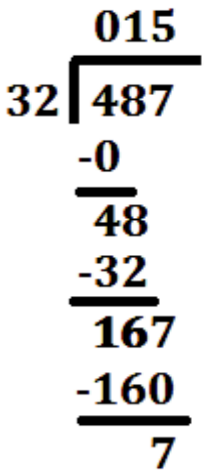
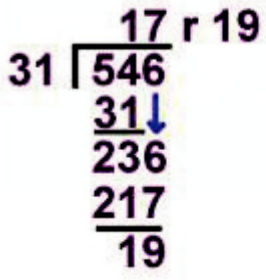
CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 3/4	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 four linking number sentences. 5 x 3 = 15 3 x 5 = 15 15÷5=3 15÷3=5
	Short division	Use place value counters to divide using the short division method alongside. 96÷3  42÷3 Start with the biggest place value. We are  sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over. We exchange this ten for 10 ones and then share the  ones equally among the groups. We look at how many are in each group. 	Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  Encourage them to move towards counting in multiples to divide more efficiently.	Begin with divisions that divide equally with no remainder. 

CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 5/6	Division with remainders	14÷3= Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a **remainder.**  Draw dots and group them to divide an amount and clearly show a **remainder**. 	Complete written divisions and show the **remainder** using r. 
	Short division with **remainders**	364 ÷ 3 = 		Move onto divisions with a **remainder.** Once children understand **remainders**,  begin to express as a fraction or decimal according to the context.  

CALCULATION GUIDANCE: Division

	Objective	Concrete	Pictorial	Abstract
Year 6	Long Division			Children will use long division to divide numbers with up to 4 digits by 2 digit numbers.  

Glossary

- Array: an arrangement of objects, pictures, or numbers in rows and columns
- Commutative: a law that states that with addition and multiplication of numbers, you can change the order of the numbers in the problem, and it will not affect the answer (i.e. subtraction and division operations are not commutative)
- Consolidate: the process at the end of which such automatic actions can be brought into use and incorporated into mathematical activity
- Exchange: the process of 'carrying over' or moving a unit of place value to the next lowest place value to calculate e.g. taking a 100 over to the 10's column to have enough to subtract with
- Partition: a way of splitting numbers into smaller parts to make them easier to work with
- Pictorial representations: visible or tangible drawings of showing mathematical ideas – such as diagrams, number lines, graphs, arrangements of drawn objects or drawn manipulatives
- Remainder: an amount left over after division