FELSTED PRIMARY SCHOOL

CALCULATION POLICY 2024

Nurturing today's minds for tomorrow's challenges

- Be Respectful
- Be positive
- Be the best you can be
- Save our world!

1 Aims and objectives

1.1 This policy supports the White Rose Maths scheme used throughout the school. Progression within each area of calculation is in line with the programme of study in the 2014 National Curriculum. This calculation policy should be used to support children to develop a deep understanding of number and calculation.

1.2 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

2 Mathematics Mastery

2.1 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 should be taught and used in Years R to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

3 How to use the policy

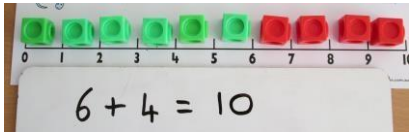
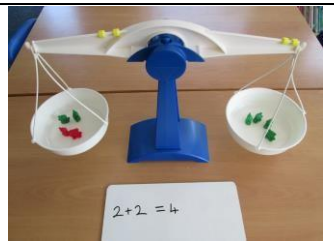
3.1 This mathematics policy is a guide for all staff at Felsted Primary School. All teachers have been given the scheme of work from the White Rose Maths Hub and are required to base their planning around their year group's modules and not to move onto a higher year group's scheme work.

3.2 Teachers have flexibility to adapt the learning and teaching to meet the individual needs of the pupils in their class.

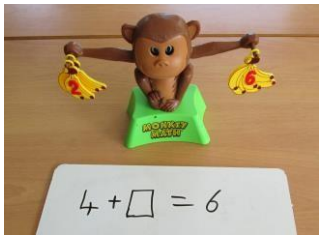
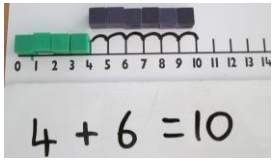
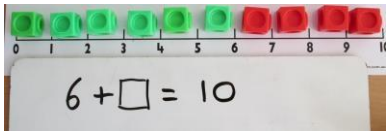
3.3 Teachers can use any teaching resources that they wish to use and the policy does not recommend one set of resources over another, rather that, a variety of resources are used.

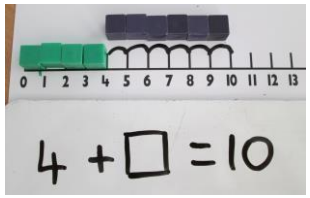
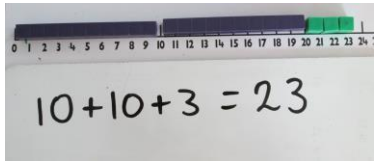
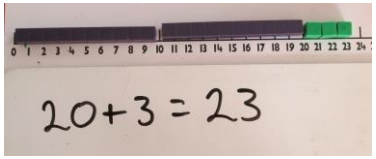
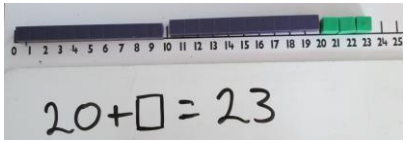
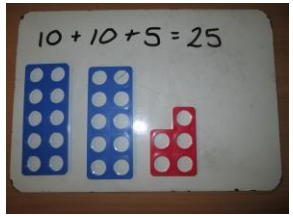
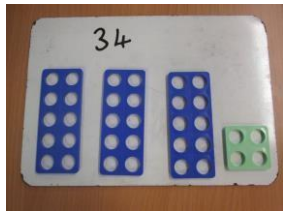
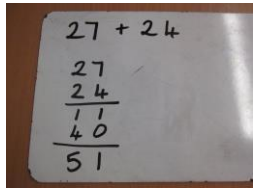
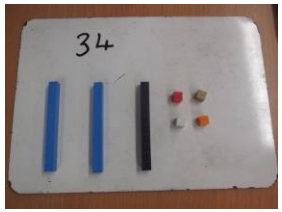
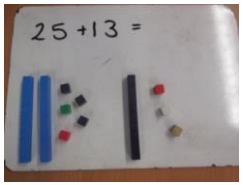
3.4 For each of the four rules of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach [Make it, Draw it, Write it] is for children to have a true understanding of a mathematical concept, they need to master all three phases within a year group's scheme of work.

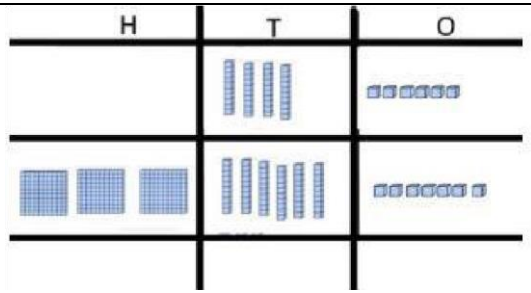
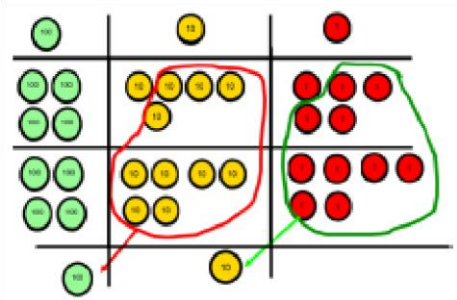
Addition

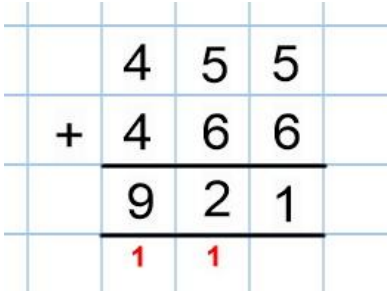
Year Group	Activities	What it looks like
Foundation	- counting on using objects / Numicon, supported by number track - Count beyond 20 emphasising the 'teen' numbers - one more than - making sets of objects and combining - language of addition, use of balance scales and counting objects (such as compare bears) to show equivalence - using Cuisennaire, multilink, Numicon and other apparatus to build a picture of numbers to 20	 

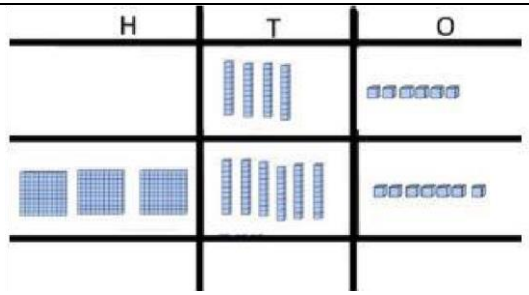
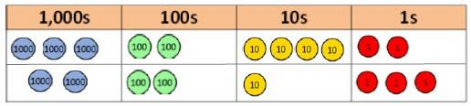
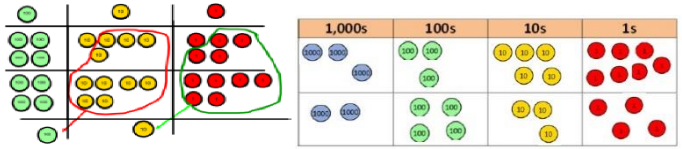
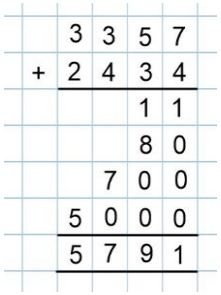
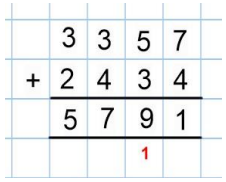
One	- number bonds to 10 – fingers, Numicon, tens frame, counters - use understanding of teen numbers to find bonds to 20. number facts for all numbers to 10 – fingers, Numicon, count on. - use cubes supported by number tracks / lines. - place number in head and count on fingers (beyond 10) - solve missing number problems using objects and pictorial representations. - begin to represent tens and units using apparatus (including coins - tens and ones, base 10 apparatus, numicon) - focus on understanding of teen numbers. - add a single digit to numbers to 100. - know 1 more for all numbers to 100.	

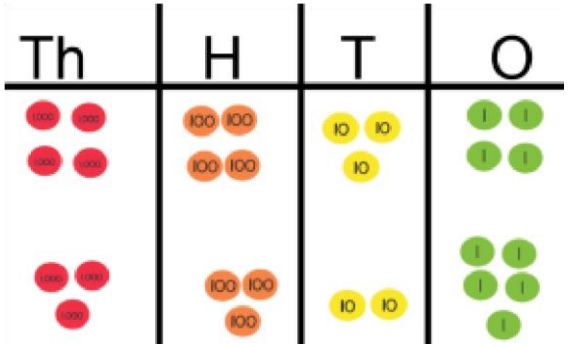
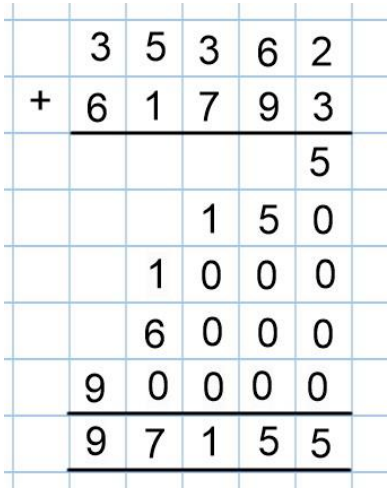
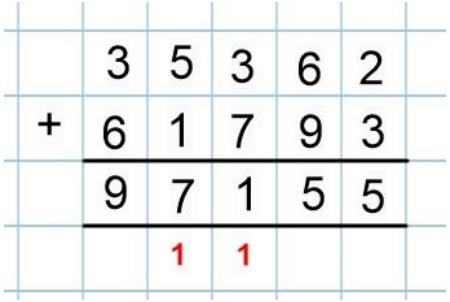
		 4 + 2 = 6   4 + □ = 6  + = + = 4 + 2 = 6  0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 4 + 6 = 10   0 1 2 3 4 5 6 7 8 9 6 + □ = 10 

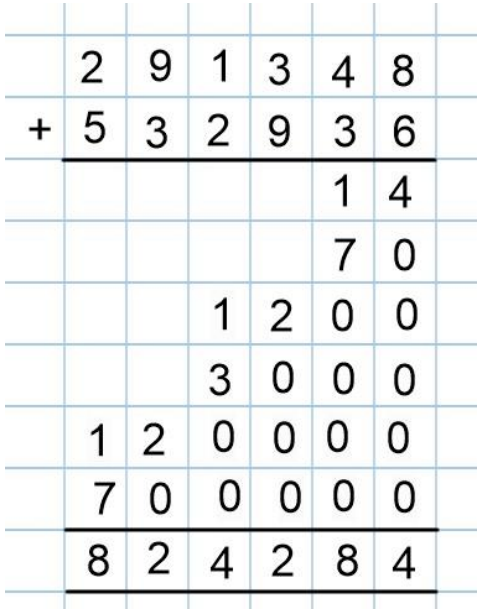
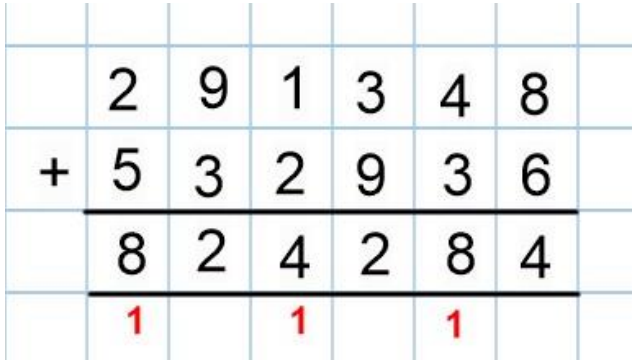
Two	-counting on in 10s and units from any number – base 10, Numicon, pictorial representations. -missing numbers -continue number lines supported by equipment -introducing partitioning with Base 10 equipment, Numicon, coins, tens frames, pictorial representations. - empty box questions 4 + ☐ = 9 - use of balances to show equivalence - begin to use understanding of place value and partitioning to derive number facts e.g. 6 + 3 = 9 (known fact) 16 + 3 = 19 26 + 3 = 29 - Add by counting on to ten and adding what is left – supported by tens frames, Numicon, base 10 apparatus. - know that addition can be done in any order - add two 2-digit numbers by counting on in tens and then ones – use knowledge of partitioning and recombining. - Cross the 10s barrier – practically with base 10 apparatus, coins, Numicon, counters. -add two 2-digit numbers by adding the tens, then ones and re-combine (not bridging the tens barrier) - begin to use column addition to add two 2-digit numbers Then use expanded column addition to add 2 2-digit numbers. - add three single digits - use estimation to check answers.	          

Three	Add three digit numbers mentally, including three digit numbers and ones, three digit numbers and tens, three digit numbers and hundreds. Add numbers with up to three digits, using a formal written method. - Decide when it is appropriate to add mentally or use a written method. - Begin to solve addition problems beginning with no carrying and then moving on to carrying. - Use number counters and dienes to create concrete and then pictorial representations of the numbers - Model exchanging ones for tens and tens for hundreds (as prelude to carrying in formal methods) - Introduce using a formal expanded method followed by a compact method.	  4 5 5 + 4 6 6 1 1 1 1 0 8 0 0 9 2 1 4 5 5 + 4 6 6 9 2 1 1 1

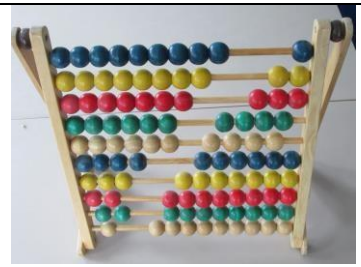


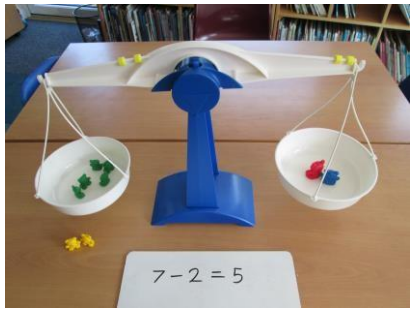
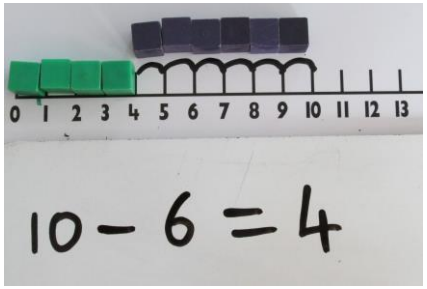
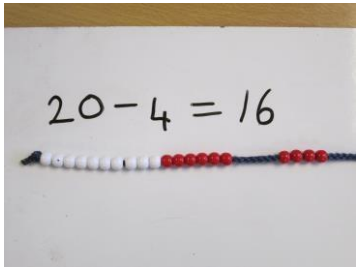
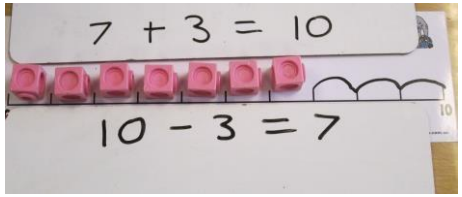
Four	Add numbers with up to 4 digits using a formal written method. - Continue to determine when calculations are best carried out using mental strategies - When written methods are more appropriate, continue use of practical apparatus to support, develop an understanding of the formal written method for column addition, initially without and then introducing carrying. - Continue (from year 3) to model exchanging ones for tens, tens for hundreds and hundreds for thousands (as prelude to carrying in formal methods) - Use number counters to create concrete and then pictorial representations of the numbers before using a formal expanded method followed by a compact method.	    

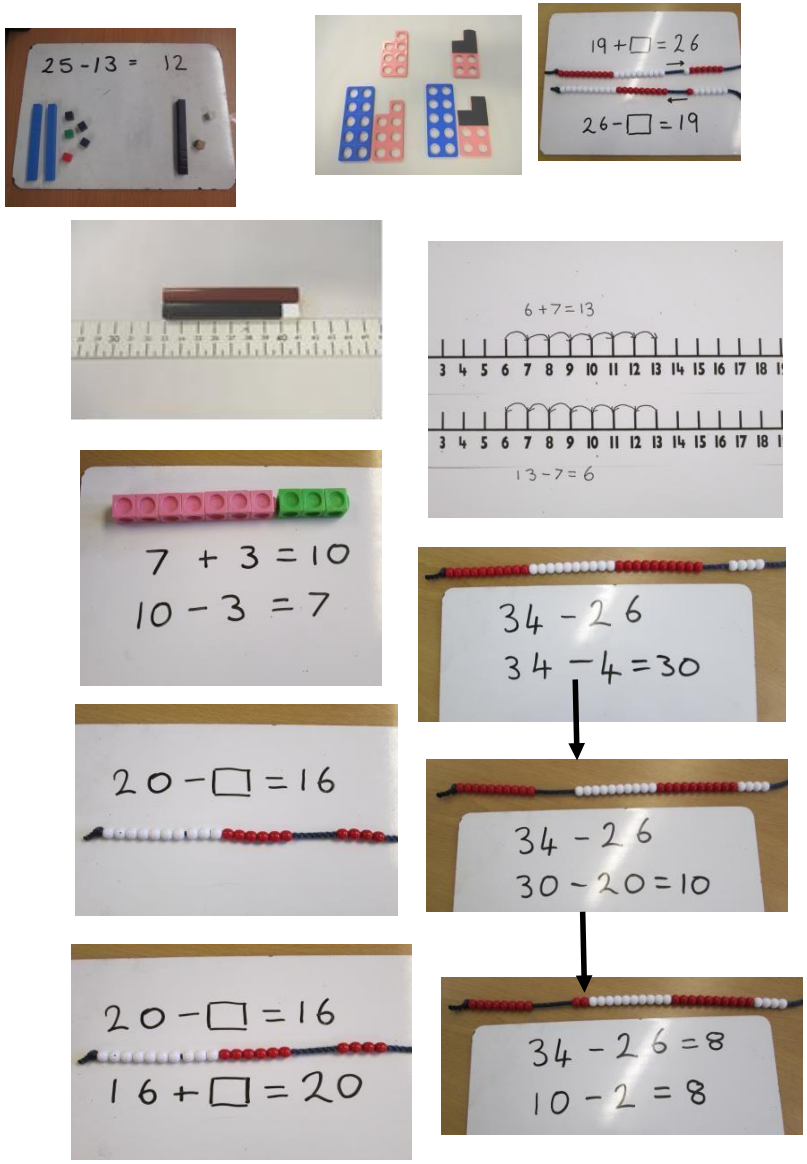
Five	Add numbers with increasingly large numbers. Add whole numbers with more than 4 digits, including using formal written methods. - mental methods using place value (jotting as appropriate). - Continue to use concrete, pictorial and abstract methods to solve addition problems leading into a formal written method of column addition - extend to using money £1, 10p and 1p coins to include a decimal point in the answer.	  

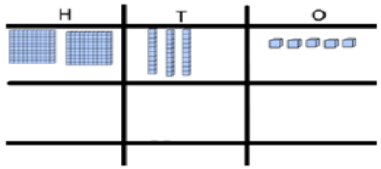
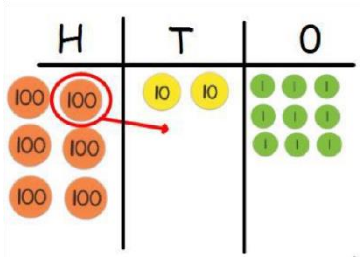
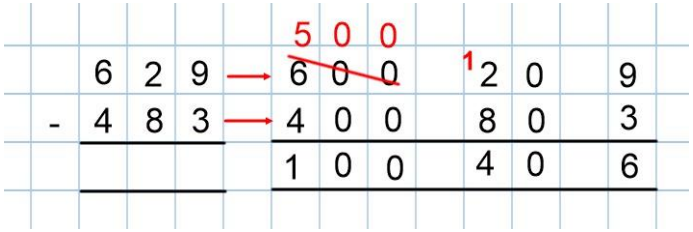
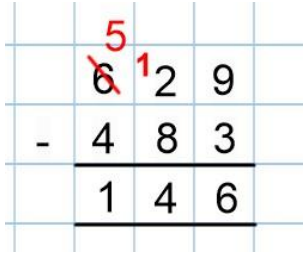
Year 6	- continue to determine when calculations are best carried out using mental strategies - develop the use of formal written method to addition of increasingly large numbers. Use expanded recording and apparatus as above to illustrate concept initially if required before moving towards the formal written method.	 

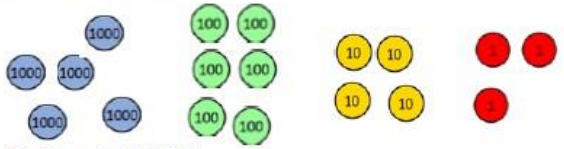
Subtraction

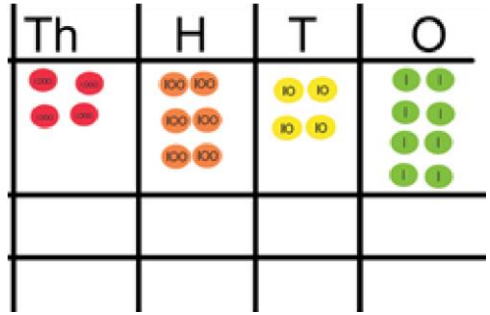
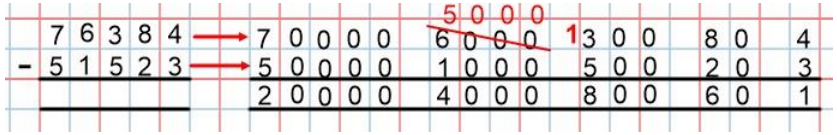
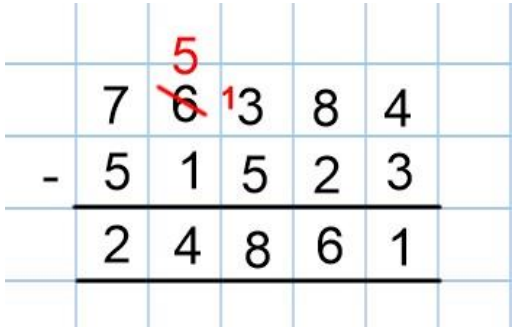
Year Group	Activities	What it looks like
Foundation	- sorting - making sets and taking objects away - 'one less' - 'how many are left?' - number stories (there were 4 cakes and I ate 2, how many did I have left?). - practical apparatus, Numicon, Multilink, pictorial representations.	  

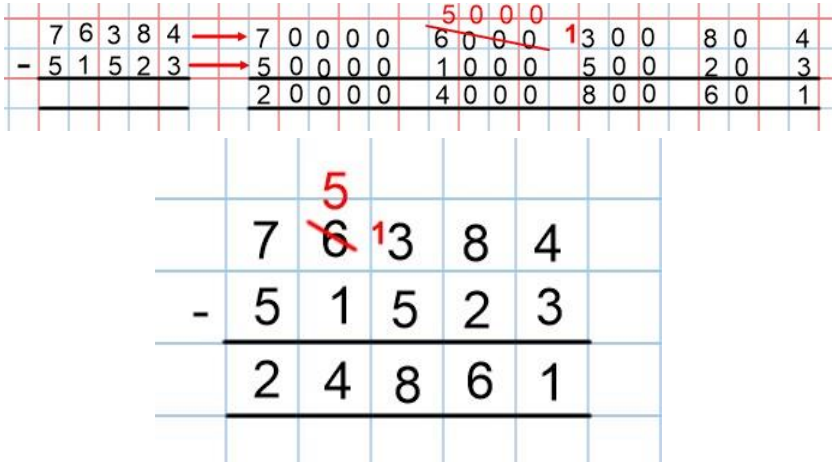
One	- Count back using number tracks / number lines / tens frames / counters / 100 grids to support the development of the concept of subtraction as take away. - Develop subtraction facts initially to ten and then to 20. - Record related number facts (and make links to related addition facts) e.g. 9 - 4 = 5, 9 - 5 = 4 4 + 5 = 9, 5 + 4 = 9 - use number bonds to support subtraction - develop understanding of the equals sign / equality and the concept of 'empty box' questions, such as 9 - ☐ = 5. - hidden number questions, e.g. 'I have 10 counters and I cover some with my hand. I can see 4. How many are under my hand?' - count backwards mentally from 10, 20, 100. - know 1 less for any number to 100. - subtract a single digit number from any number to 100, supported by pictorial representations, Numicon, counters, bead strings, etc.	   

Two	-counting back in 10s and ones - Use understanding of patterning, place value and partitioning to derive number facts. e.g. 7 - 3 = 4 (known fact) 17 – 3 – 14 27 – 3 = 24 - continue to use knowledge of addition facts to support subtraction facts (number bonds) e.g. 3 + 7 = 10 7 + 3 = 10 10 – 3 = 7 10 – 7 = 3 - solve difference problems – and use method to solve subtraction where there is a small difference. - use practical apparatus – Numicon, tens frames, counters and number tracks /and number lines to support understanding of partitioning and place value, beginning with 'teen' numbers. Also use pictorial representations. -Use number bonds within 20 to support and check with addition. -know that subtraction undoes addition and use this to check calculations. - subtract two 2-digit numbers by subtracting the tens then the ones (not bridging the tens barrier) Start by using practical apparatus – Mumicon, Begin to use the column method to subtract a 2-digit number (not bridging the tens barrier) - use estimation to check answers.	

Three	Subtract three digit numbers mentally, including three digit numbers and ones, three digit numbers and tens, three digit numbers and hundreds. Subtract numbers with up to three digits, using a formal written method. - Pupils continue to determine when calculations are best carried out using mental strategies. - mental strategies move towards counting on supported by concrete objects and pictorial representations, including place value counters. - Horizontal recording can begin to be replaced with recording in columns with a focus on place value. Use expanded recording and apparatus to illustrate concept initially if required before moving towards the formal written method. - Check subtraction answers using addition (inverse operation).	**235 - 127**  **629 - 483**   

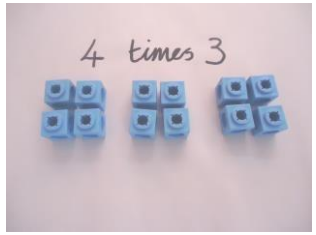
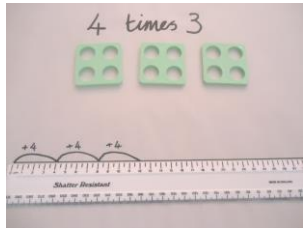
Four	Subtract numbers with up to 4 digits using a formal written method. - begin to identify which calculations are more appropriate to mental method and which require written calculations. - continue to perform mental calculations using counting on supported by jotting and number line if needed. - Continue to use concrete and pictorial methods to deepen children's understanding of subtraction. When secure, move children onto formal column methods of subtraction. Start with no exchanging and introduce it when children are more secure. - continue to check subtraction using addition.	Subtract 2,332 from the number below.  Here is a number.  Subtract 4,345. 8 8 ~~9~~ 1 2 3 - 4 2 8 3 4 6 4 0

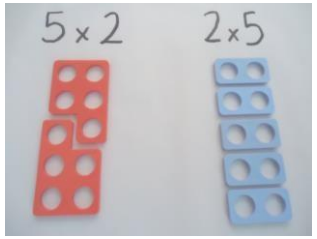
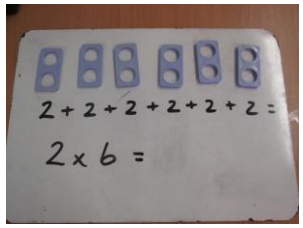
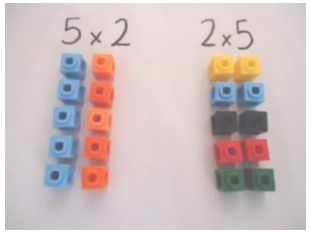
Five	Subtract numbers with increasingly large numbers. Subtract whole numbers with more than 4 digits, including using formal written methods. - Continue to determine when calculations are best carried out using mental strategies. - Use concrete and pictorial methods, including place value counters, to develop children's understanding of subtraction. Begin without exchanging, moving on when children are secure. - Develop use of the formal written method. Use expanded recording and apparatus to illustrate concept initially if required before moving towards the formal written method.	4648 – 2347   

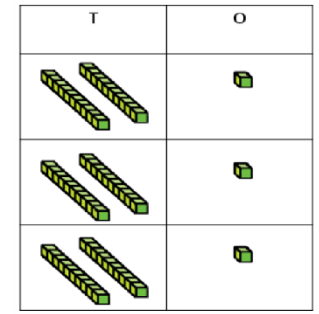
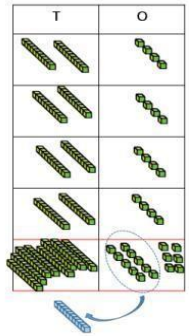
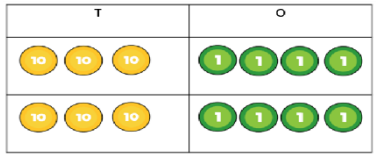
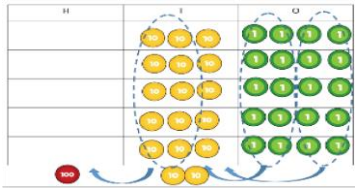
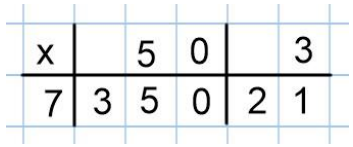
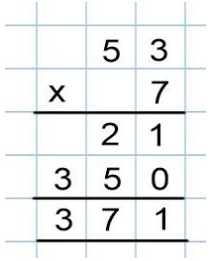
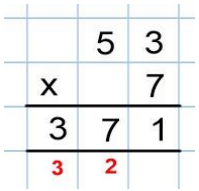
Year 6	- Continue to determine when calculations are best carried out using mental strategies. - Develop use of the formal written method to subtraction of increasingly large numbers. Use expanded recording and apparatus as above to illustrate concept initially if required before moving towards the formal written method.	

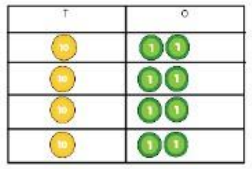
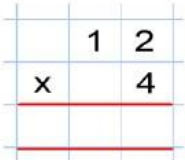
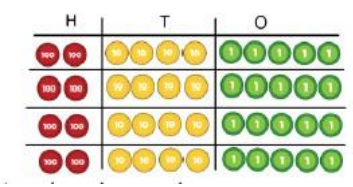
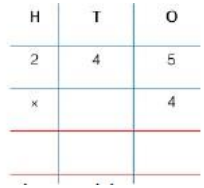
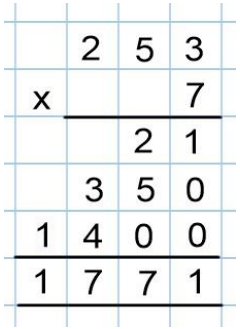
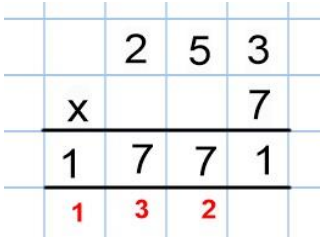
Multiplication

Year Group	Activities	What it looks like
Foundation	- count in 10s and 2s using objects – Numicon, counters, draw pictorial representations. - pairs/doubles/halves – practically – Double and share objects – counters, multilink etc. - practically make equal groups of a small given number. -recognise repeated groups (Numicon, counters, objects, etc.)	Multilink Numicon Compare bears Pairs of socks, children, shoes Grouping themselves for activities Handprints Footprints

One	- counting in 10s, 5s, 2s – Use objects, Numicon, multilink - repeated addition - arrays, pictorial representations - doubles/halves – practically and recorded. Sharing practically between 2 – draw to record. - Develop multiplication as repeated addition (repeated addition of sets of the same (equal) size) using practical apparatus (Numicon, multilink, counters, objects) and diagrams/ pictorial representations. - Develop an understanding of multiplication using arrays and number lines showing repeated groups. - Use number lines to show repeated grouping (repeated addition of sets of the same size). -use Numicon and pictorial representations to represent repeated groups. - solve simple problems involving repeated groups.	    

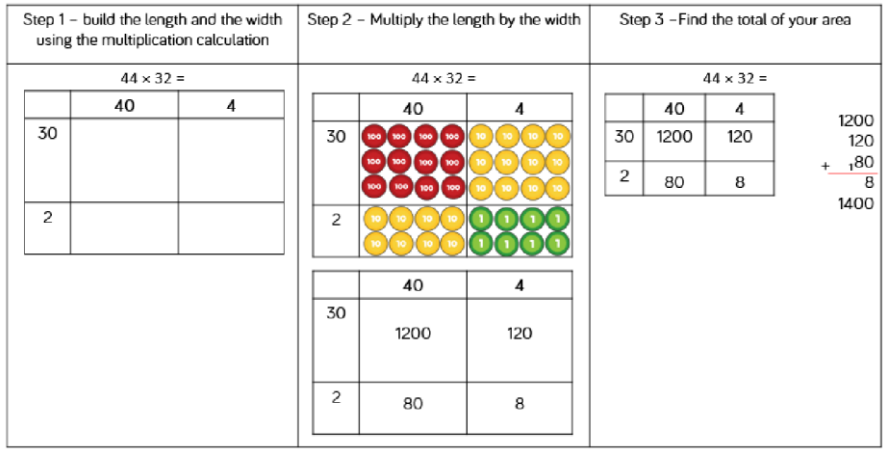
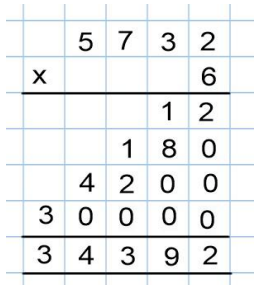
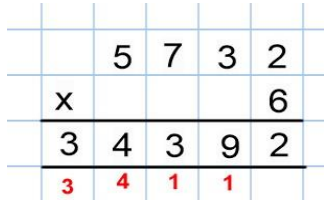
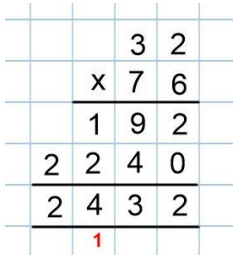
Two	- repeated addition – practically – Numicon, objects, etc. and draw pictorial representations. -sets of numbers, how many? Equal sets. - use arrays to derive and solve multiplication calculations. - Develop the use of x and = symbols to record calculations horizontally. - solve multiplication calculations practically using objects, Numicon, number lines, arrays. Use arrays and other practical apparatus to illustrate commutativity (that multiplication calculations can be carried out in any order) e.g. 2 x 5 arrives at the same product as 5 x 2. Begin to derive new facts from known facts e.g. 3 x 2 = 6 (known fact) 30 x 2 = 60 300 x 2 = 600 etc. - solve simple multiplication problems and 'apply' problems. -bronze award – 2, 5, 10 times tables - count in 3s and 4s.	     3 x 2 = 6 / 3 + 3 = 6  3 x 3 = 9

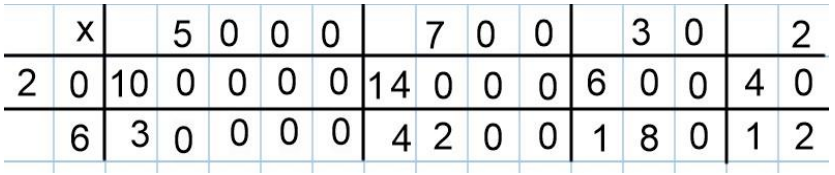
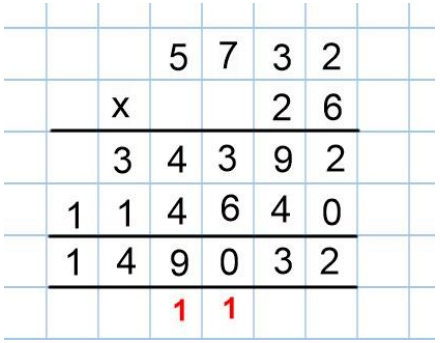
Three	Use mental and formal written methods to solve 2 digit by 1 digit multiplication problems. -repeated addition - multiplying whole numbers by 10 and 100 - begin to use concrete and pictorial methods to represent multiplication of 2 digit numbers. - Teach a range of methods, including grid method, as well as an expanded and compact method of multiplication.	      

Four	Multiply two-digit or three-digit numbers by a one digit number using a formal column method. -gold award - Use a concrete and pictorial methods, including place value charts and arrays to solve multiplication problems. - Use a range of methods, including the grid method and an expanded and compact method of formal column multiplication.	       

	2	5	3
x			7
		2	1
	3	5	0
1	4	0	0
1	7	7	1

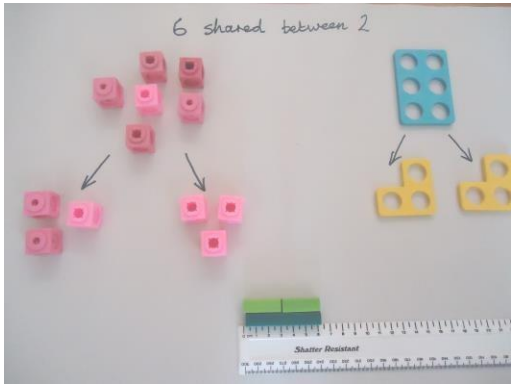
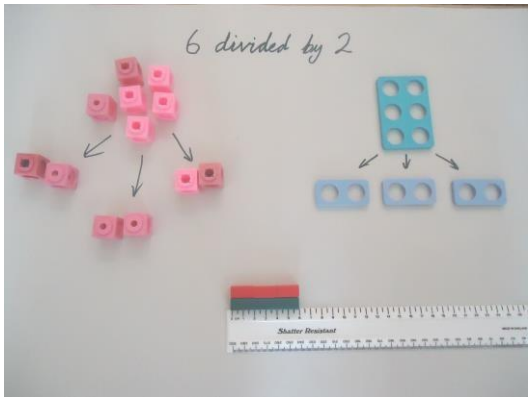
	2	5	3
x			7
1	7	7	1
1	3	2	

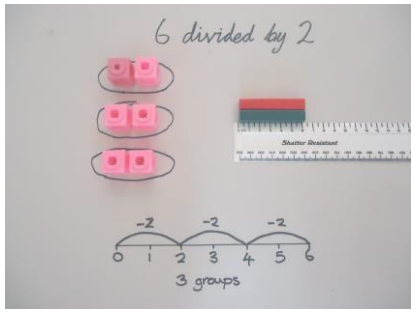
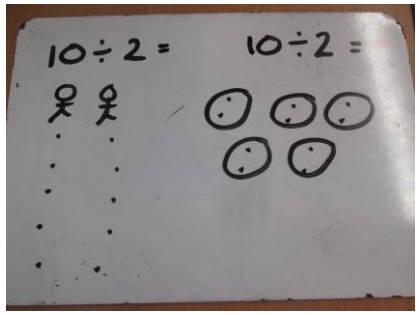
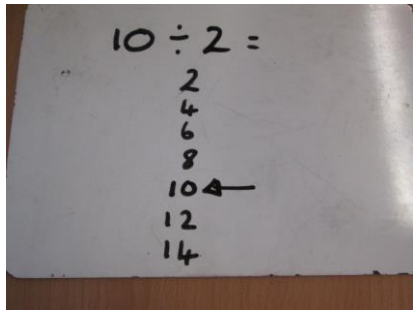
Five	Multiply up to 4 digits by a 1 or 2-digit number using a formal written method. Use long multiplication for two digit numbers. - Extend written approaches to ThHTU x U, using apparatus to support – as in Year 4 - Use a grid method, moving onto formal written method for solving problems up to 4-digit by 1-digit multiplication. - Use a formal written method of long multiplication for 2digit by 2-digit multiplication.	   

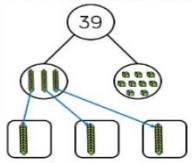
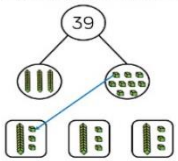
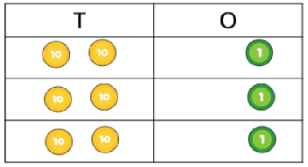
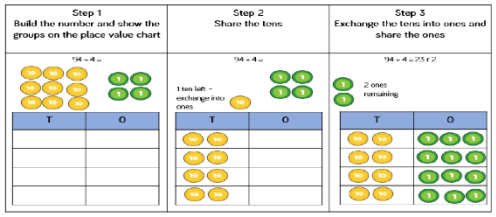
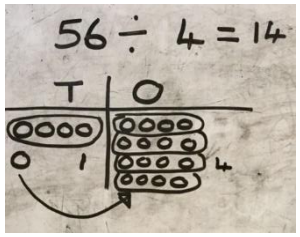
Year 6	Multiply multi-digit numbers up to 4 digits by a 2-digit whole number using the formal written method of long multiplication Perform mental calculations, including with mixed operations and large numbers. - Use a grid and long multiplication method to solve 4-digit by 2-digit multiplication problems.	 

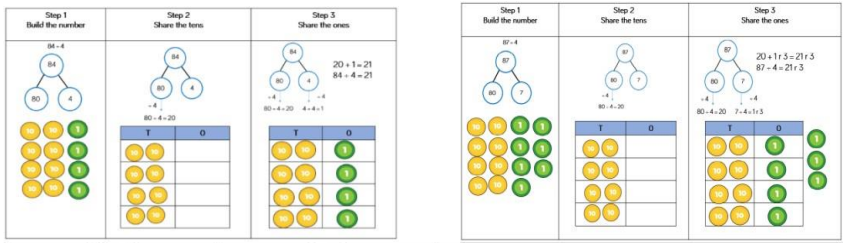
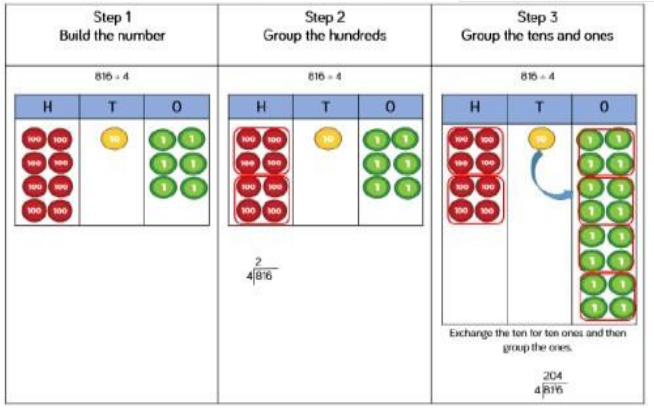
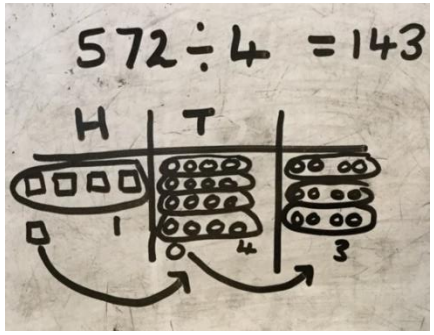
Division

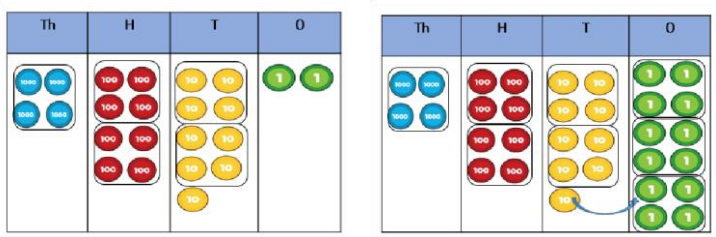
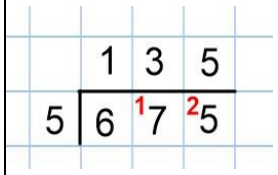
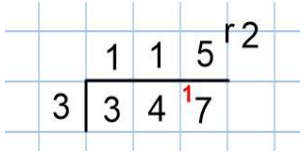
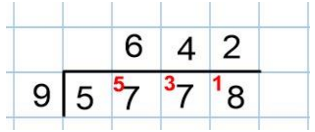
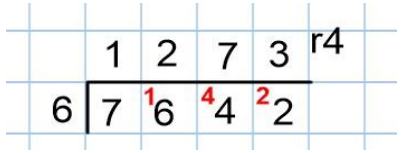
Year Group	Activities	What it looks like
Foundation	sharing fairly/equally between a given number of people – practical objects and pictorial representations. sorting objects into equal sized groups. making groups of a given amount Solving simple problems in context – E.g. get into groups of 2 in PE.	Multilink Numicon Compare bears Pairs of socks, children, shoes Grouping themselves for activities Handprints Footprints

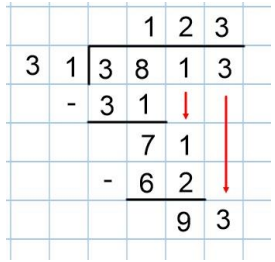
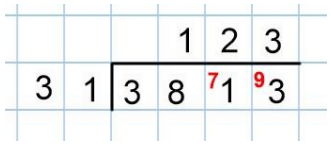
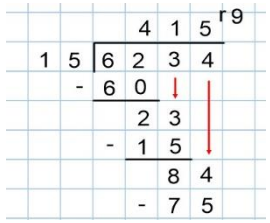
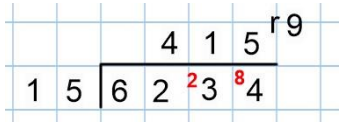
One	Develop division as dividing by **sharing equally between** a given number. Develop division as **divided into groups of** a given number. Use vocabulary dividing. use Numicon, practical objects, counters, to share and group equally. Draw pictorial representations. - halves to 20 – find half a number/amount by sharing equally between 2 and sharing into 2 groups. -practically find half/quarter of a regular shape, recognising all the parts need to be equal. solve simple division word problems.	 

Two	-Develop an understanding of division using array, Numicon, objects and pictorial representations showing repeated groups of a given number. e.g. 'How many groups of 3 can we make out of 6?' -Solve division calculations by practically sharing between a given number – use Numicon, practical apparatus and pictorial representations. Solve division calculations by practically making groups of a given number – use Numicon, practical apparatus and pictorial representations. -Develop the use of ÷ and = symbols to record calculations horizontally e.g. 6 ÷ 2 = 3 Use arrays and other practical apparatus to illustrate making of repeated groups -Begin to use knowledge of multiplication facts to solve simple division e.g. 3 x 2 = 6 so 6 ÷ 2 = 3 and 6 ÷ 3 = 2 - begin to recognise the relationship between multiplication and division – using fact families / trio numbers. Use knowledge of times tables facts (2s, 5s and 10s) to solve division calculations. Solve division word problems and 'apply' problems.	  

Three	Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods e.g. 3 x 4 = 12 so 12 ÷ 3 = 4 and 12 ÷ 4 = 3 (3 groups of 4 makes 12, so 12 can be divided up into 3 groups of 4) - Use practical apparatus, alongside pictorial methods to solve division problems. - Divide a two digit number by a single digit using a place value chart and drawing the groups.	39 ÷ 3 **Step 1:** Share the tens  **Step 2**: Share the ones  63 ÷ 3 =   

Four	Recall division facts for multiplication tables up to 12 x 12. Use concrete and pictorial methods to begin dividing two-digit or three-digit numbers by a one digit number. Move onto a formal method of short division, eventually tackling problems with remainders. Divide a three digit number by a single digit using a place value chart and drawing the groups.	  

Five	Divide numbers mentally drawing upon known facts. Divide numbers up to 4 digits using the formal written method of short division and interpret remainders appropriately for the context. Use concrete and pictorial methods to divide up to four-digits by one-digits. Begin with no remainders, then with remainders. Move onto a formal written short division method to solve problems up to ThHTO ÷ O.	4892 ÷ 4     

Year 6	Divide numbers up to 4-digits by a 2-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Divide numbers up to 4-digits by a 2-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. Perform mental calculations, including with mixed operations and large numbers.	   

Equal Opportunities

Careful planning and awareness of individual children's needs and interests will ensure that every child will have equal access to the Mathematics Curriculum regardless of race, gender or class.

Signed:

Date:

To be reviewed: