WILLIAM BOOTH
PRIMARY & NURSERY SCHOOL

TRANSFORM
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Calculation policy for multiplication

Y1

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Revisit	NC objectives
Count up to 20 Count objects accurately Write numbers	Pupils should be taught to: • solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Vocabulary

Groups Lots of
Repeated addition Array
Times Rows Columns

Resources

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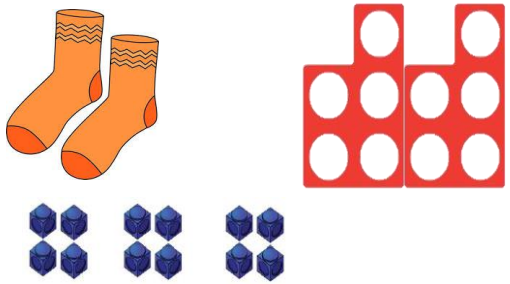
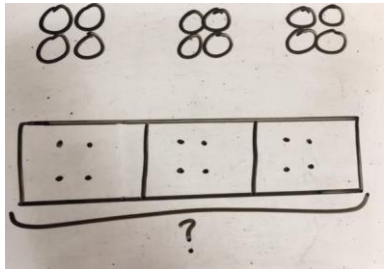
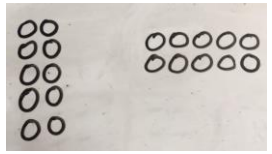
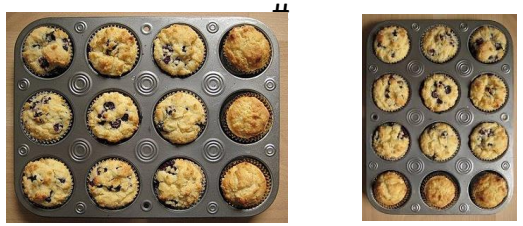
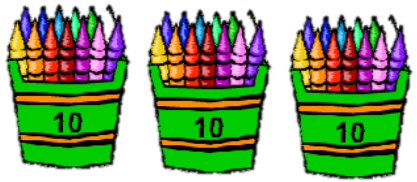
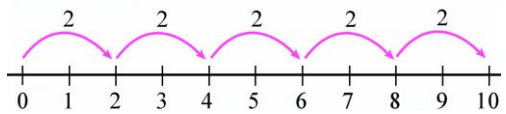
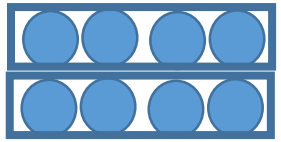
 Recognise and make equal groups	 Coloured groups of objects to be placed on top of the number line to aid counting	 Children to represent the practical resources in a picture and use a bar model.	Children to represent the calculation as repeated addition 2 + 2 + 2 + 2 = 8
Children to represent the array as repeated addition and identify commutative law 2 + 2 + 2 + 2 + 2 = 10 5 + 5 = 10	 Children draw arrays to show commutative law of multiplication	 Use arrays to highlight the commutative law of multiplication	 Children notice arrays in real life and make using object
 Children use real life objects to solve problems	 Children to represent answers to real life problems on number line	 Children to solve real life problems using arrays and link to bar model	Children to show answers to real life problems as repeated addition

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Y2

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Revisit	NC objectives
Recognise an array Count mentally in multiples of 2, 5 and 10 Write multiplication as repeated addition	Pupils should be taught to: • recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×), and equals (=) signs • show that multiplication of two numbers can be done in any order (commutative) • solve problems involving multiplication using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts.

Vocabulary

Groups Lots of Repeated addition Array
Times Rows Columns
Multiple – Multiply - Multiplication

Resources

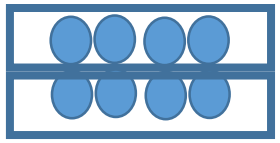
NC Objective: recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

Small Step: Recognise equal groups

Vocabulary: Groups Lots of Repeated addition Array
Times Rows Columns
Multiple – Multiply - Multiplication

Representations

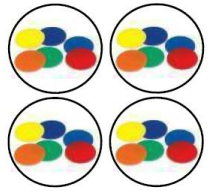
Children notice arrays in real life and make using objects



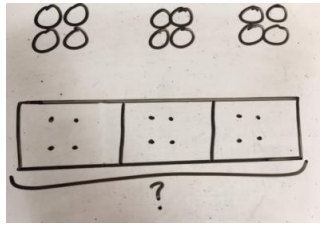
Children to solve real life problems using arrays and link to bar model

Misconceptions

Still counts in ones to find how many there are in a collection of equal groups; does not understand vocabulary, for example, 'groups of', 'multiplied by'.



Continue to use groups to find unknown amounts



Children to represent the practical resources in a picture and use a bar model.

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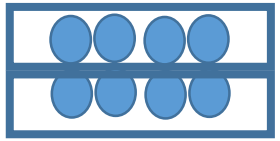
NC Objective: recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

Small Step: Make equal groups

Vocabulary: Groups Lots of Repeated addition Array
Times Rows Columns
Multiple – Multiply - Multiplication

Representations

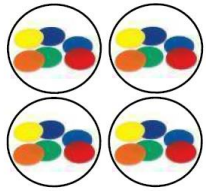
Children notice arrays in real life and make using objects



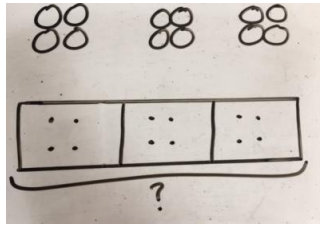
Children to solve real life problems using arrays and link to bar model

Misconceptions

Does not link counting up in equal steps to the operation of multiplication; does not use the vocabulary associated with multiplication.



Continue to use groups to find unknown amounts



Children to represent the practical resources in a picture and use a bar model.

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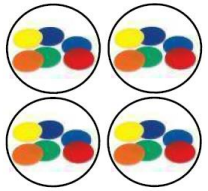
NC Objective: calculate mathematical statements for multiplication within the multiplication tables

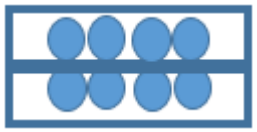
Small Step: Repeated addition

Vocabulary: Groups Lots of Repeated addition Array
Times Rows Columns
Multiple – Multiply – Multiplication

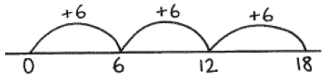
Representations



Continue to use groups to find unknown amounts



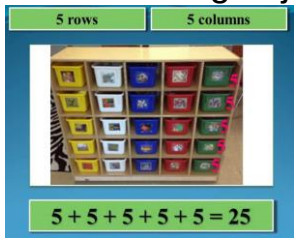
Children to solve real life problems using arrays and link to bar model



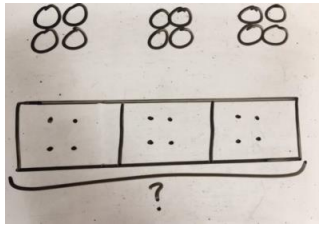
3 x 6 = ?
3 lots of 6
6 + 6 + 6 = 18
3 x 6 = 18

Children begin to show their understanding on a blank number line

Children notice arrays in real life and make using objects



Link to symbolic representation



Children to represent the practical resources in a picture and use a bar model

Misconceptions

Does not link counting up in equal steps to the operation of multiplication; does not use the vocabulary associated with multiplication.

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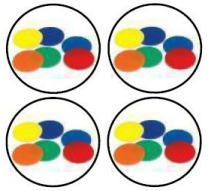
NC Objective: calculate mathematical statements for multiplication within the multiplication tables

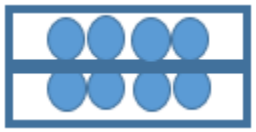
Small Step: Introduce multiplication symbol

Vocabulary: Groups Lots of Repeated addition Array
Times Rows Columns
Multiple – Multiply – Multiplication

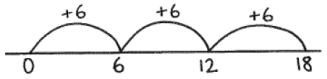
Representations



Continue to use groups to find unknown amounts



Children to solve real life problems using arrays and link to bar model



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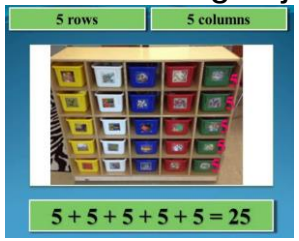
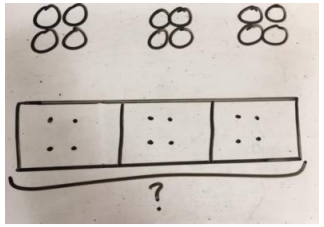
Children begin to show their understanding on a blank number line

Children notice arrays in real life and make using objects



Link to symbolic representation



Children to represent the practical resources in a picture and use a bar model.

Misconceptions

Does not link counting up in equal steps to the operation of multiplication; does not use the vocabulary associated with multiplication.

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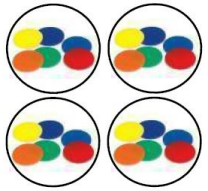
- **NC Objective:** show that multiplication of two numbers can be done in any order (commutative)

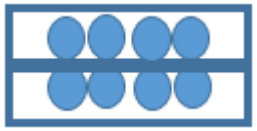
Small Step: use different representations to show commutative law

Vocabulary: Groups Lots of Repeated addition Array
Times Rows Columns
Multiple – Multiply – Multiplication

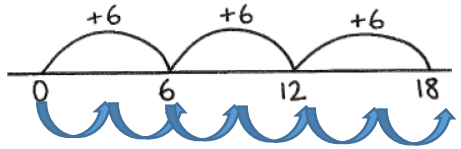
Representations



Find 4 groups of 3 and 3 groups of 4 – what do they notice?

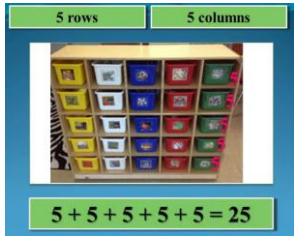


Children to solve real life problems using arrays and link to bar model

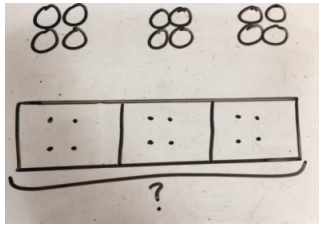


Children begin to show their understanding on a blank number line

Children notice arrays in real life and make using objects



Link to symbolic representation



Children to represent the practical resources in a picture and use a bar model.

Misconceptions

Children inaccurate when displaying arrays of cubes/objects and so pattern is not clear. Link not clear between the array and the seemingly abstract number given as the answer.

Y3

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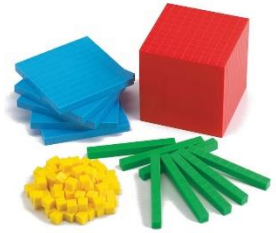
Revisit	NC objectives
Partitioning numbers Number line to subtract 2, 5 and 10 times tables and related division facts	Pupils should be taught to: recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Resources



Vocabulary

Groups Lots of Repeated addition Array
Times Rows Columns Multiple – Multiply – Multiplication
partition grid method inverse

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Misconceptions

$$\begin{array}{r} 36 \\ \times\ 3 \\ \hline 98 \\ \hline 1 \end{array}$$

Forgetting to add on the one that has been exchanged.

$$\begin{array}{r} 30 \\ \times\ 3 \\ \hline 93 \end{array}$$

from $0 \times 3 = 3$

$$\begin{array}{r} 51 \\ \times\ 4 \\ \hline 24 \end{array}$$

'$5 \times 4 = 20$ and 20 is 2 tens so 2 goes in Tens column'

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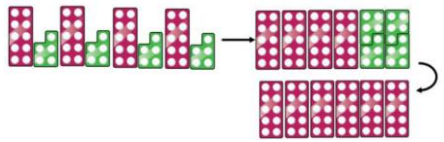
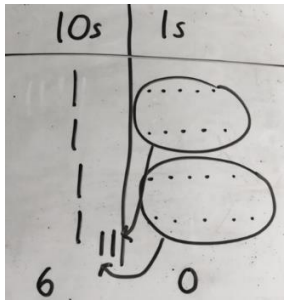
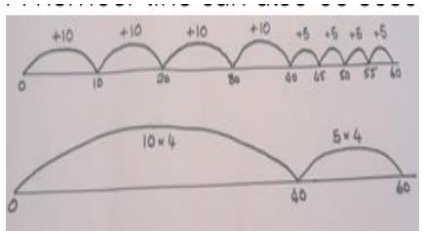


Partition to multiply using Numicon, base 10 or Cuisenaire rods.

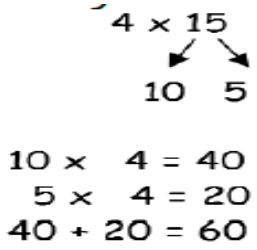
4 × 15



Use base 10 picture to show groups of…



Children show working on blank number line



Children to be encouraged to show the steps they have taken.

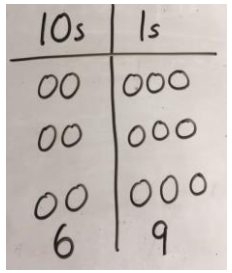
Formal written method

6 x 23 =

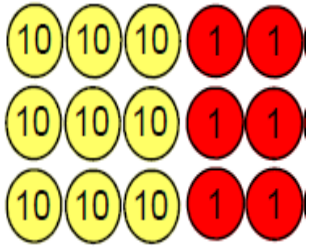
```
  23
x  6
 138
 1 1
```

```
  23
x  6
 120  (20 x 6)
  18  ( 3 x 6)
 138
```

Children draw their own PV table and counters/base 10 to represent the number before crossing out as appropriate

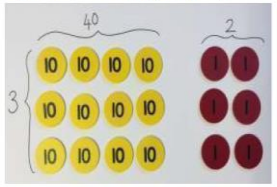


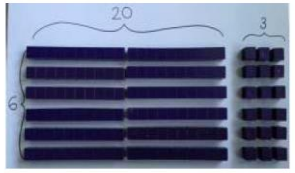
Formal column method with place value counters. 32 x 3



Initially, base 10 resources or place value counters should be used to teach this procedure to ensure children gain a deep understanding of its principles.

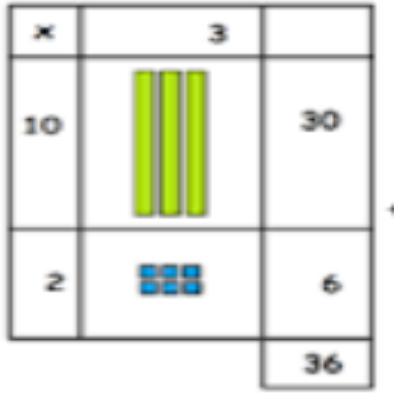
42 x 3 = 126





23 x 6 = 138

12 x 3 = 36



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Revisit	NC objectives
Partitioning numbers Fact Families Expanded notation Multiply by 1, 10 and 100	Pupils should be taught to: recall multiplication facts for multiplication tables up to 12 × 12 use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers recognise and use factor pairs and commutativity in mental calculations multiply two-digit and three-digit numbers by a one-digit number using formal written layout solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.
Resources  	**Vocabulary** Groups Lots of Repeated addition Array Times Rows Columns Multiple – Multiply – Multiplication partition grid method inverse

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Misconceptions	
Pupils do not understand that x10 and then x10 again, is the same as x100. Prefer to learn ‘add a zero’ and so limited understanding.	Children need to understand the connection between 6 x 3 and 60 x 3, understanding that the answer is 10x bigger because the number being multiplied is 10x bigger.
Children are introduced to formal written methods before fully understand the concept, becomes a test of their memory to remember the ‘rule’, and have no strategies to rely upon when they are ‘stuck’. Problems with place value can cause difficulties with written work.	Children not understand the meaning of ‘lots of’ or ‘groups of’. Children see it as a test of their memory, not linking tables facts.

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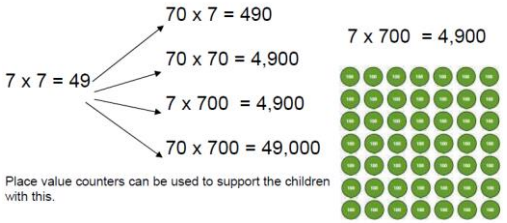
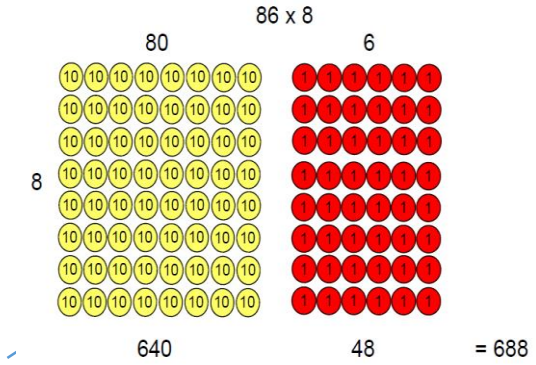
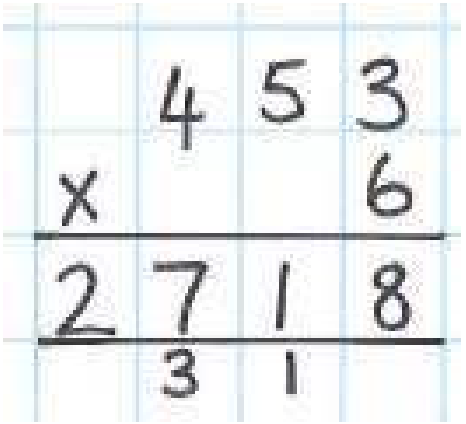
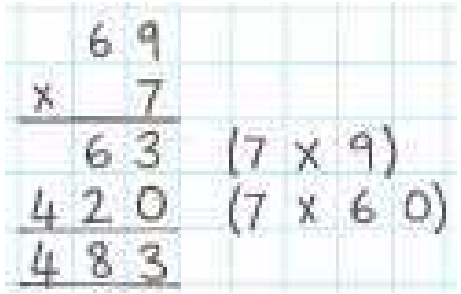
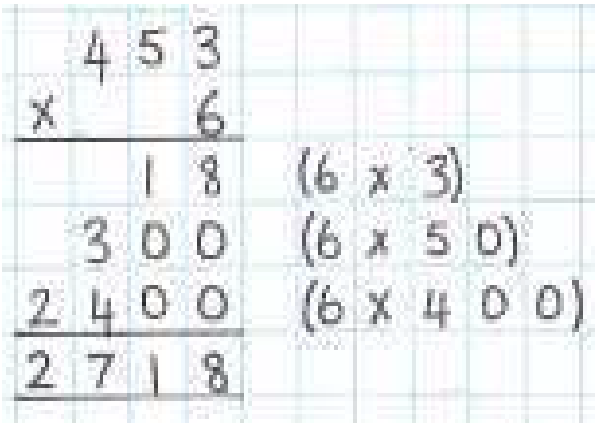


Using known multiplication and division facts, children should be able to derive other associated facts for multiples of 10 and 100.









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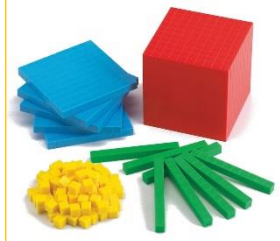
Revisit

Partitioning numbers
Times tables up to 12 x 12
Fact Families e.g. 5 x 2 = 10 so 5 x 20 = 100
Expanded notation
Multiply by 1, 10 and 100



Resources

NC objectives

Pupils should be taught to:

recall multiplication facts for multiplication tables up to 12 × 12

use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers

recognise and use factor pairs and commutativity in mental calculations
multiply two-digit and three-digit numbers by a one-digit number using formal written layout

solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Vocabulary

Groups Lots of Repeated addition Array
Times Rows Columns Multiple – Multiply – Multiplication
cube numbers, prime numbers, square numbers, common factors, prime factors, composite numbers, common factors, short division, inverse, power of.

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Misconceptions	
Pupils do not understand that x10 and then x10 again, is the same as x100. Prefer to learn ‘add a zero’ and so limited understanding.	Children need to understand the connection between 6 x 3 and 60 x 3, understanding that the answer is 10x bigger because the number being multiplied is 10x bigger.
Children are introduced to formal written methods before fully understand the concept, becomes a test of their memory to remember the ‘rule’, and have no strategies to rely upon when they are ‘stuck’. Problems with place value can cause difficulties with written work.	Children not understand the meaning of ‘lots of’ or ‘groups of’. Children see it as a test of their memory, not linking tables facts.

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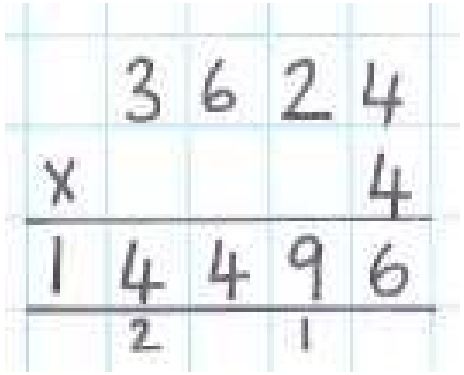

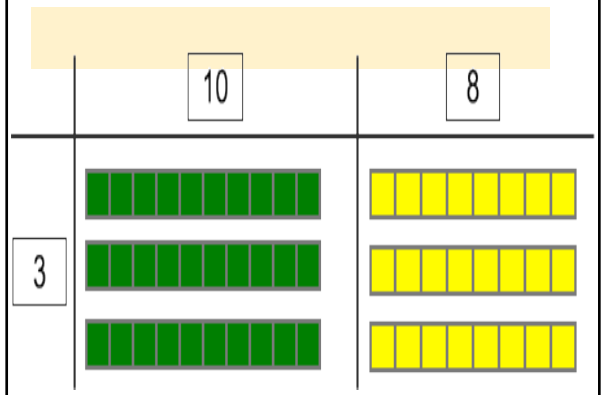

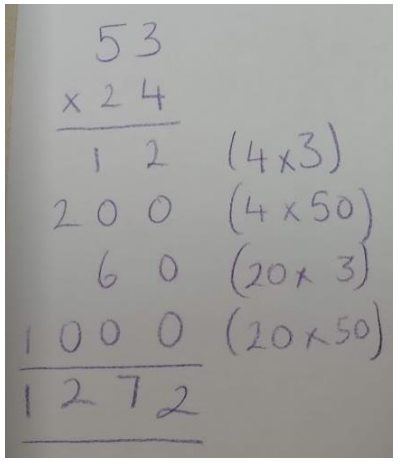

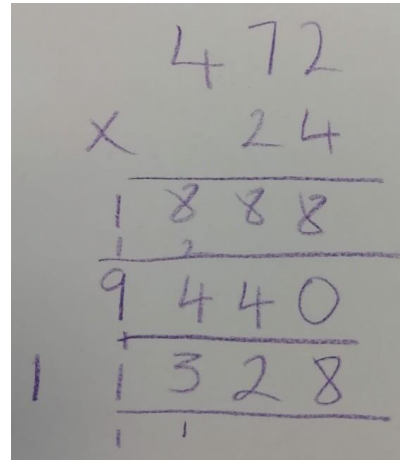

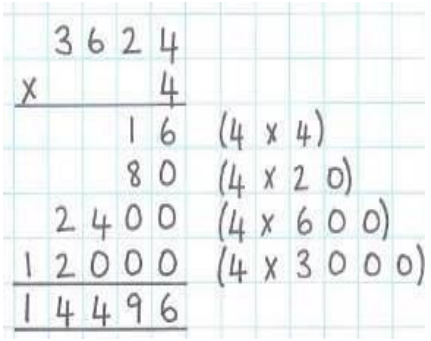

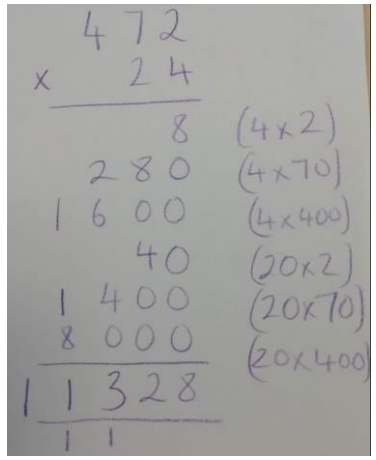

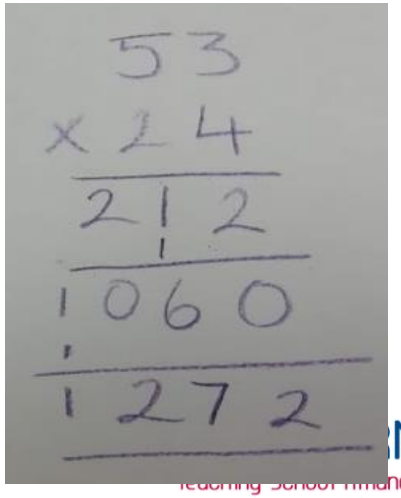

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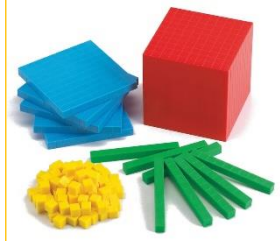
Revisit	NC objectives
Partitioning numbers – including decimals Times tables up to 12 x 12 Fact Families e.g. 5 x 2 = 10 so 0.5 x 20 = 10 Expanded notation Multiply by 1, 10 and 100 Short multiplication	Pupils should be taught to: • multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • identify common factors, common multiples and prime numbers • use their knowledge of the order of operations to carry out calculations involving the four operations • multiply one-digit numbers with up to two decimal places by whole numbers
Resources  	**Vocabulary** Groups Lots of Repeated addition Array Times Rows Columns Multiple – Multiply – Multiplication cube numbers, prime numbers, square numbers, common factors, prime factors, composite numbers, common factors, short division, inverse, power of.

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Misconceptions	
Misunderstand the concept of making a number 10/100/1000 times bigger, prefer to learn ‘add a zero’. Causes difficulties when working with decimal numbers and fractions.	Ignore decimal point, perform calculation, then ‘count how many digits after the point’. Effective shortcut, but difficulty when applying to mental work – encourage ‘why does it work?’
Children are taught to multiply single digits and count the number of zeros. 20 x 50 = 100 is a common mistake as children don’t know what to do with the ‘extra’ zero	Place value errors when performing written calculations can cause problems for even able pupils.

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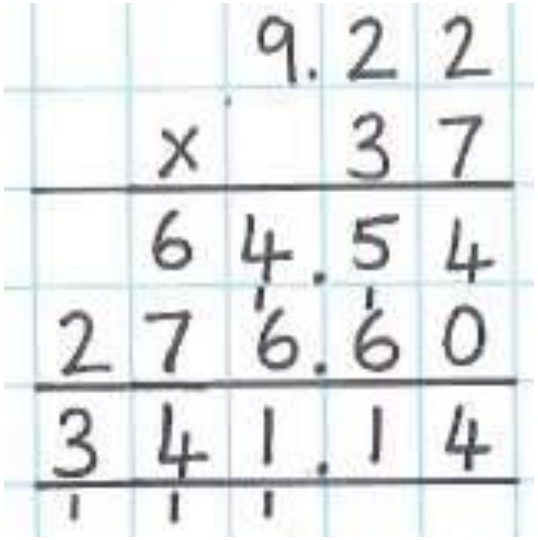	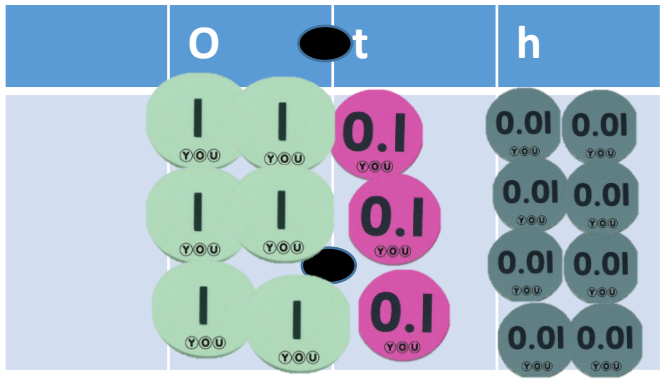

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