Calculation policy: Multiplication
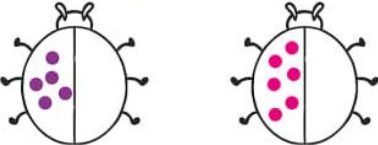
## Key language: double, groups of, lots of, equal groups, repeated addition, times, multiplied by, product, factor, multiplier, multiplicand

6 × 3 = 18
Factor (or Multiplier)   Factor (or Multiplicand)   Product

EYFS

- They solve problems including doubling

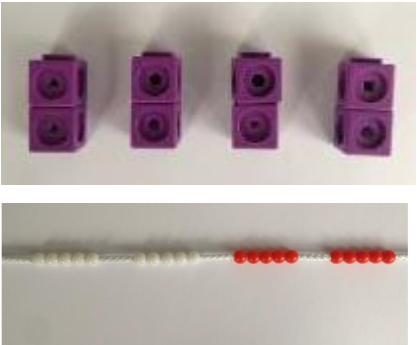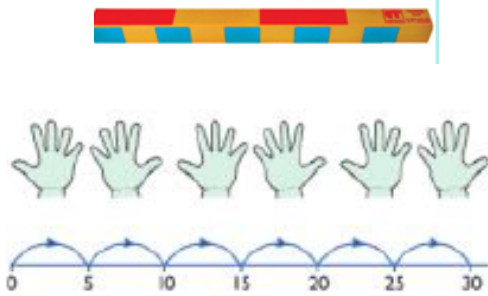| Concrete	Pictorial	Abstract
Use a range of familiar objects to understand the concept of doubling, e.g. socks, hands, gloves, fingers, cubes, lego, numicon, dominos	Paint on half a butterfly and fold it to see doubling. Draw pictures to show doubles. Double 5 is _____ Double 6 is _____	Singing Recall doubles
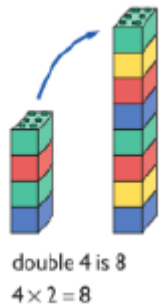
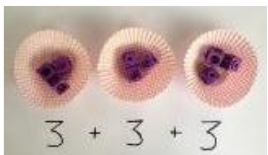|	Draw pictures to show how to double a number.	
double 4 is 8 $4 \times 2 = 8$	**Double 4 is 8**	

Band 1

- solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
- count in 2s, 5s and 10s

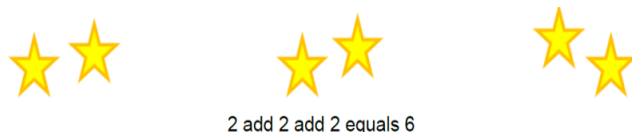| Concrete	Pictorial	Abstract
Counting in multiples Count in multiples supported by concrete objects in equal groups.	Use a counting stick, number line or pictures to continue support in counting in multiples. Splat the multiples on a hundred square	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30 Count with hidden groups of 2, 5 and 10. 5 people in each tent

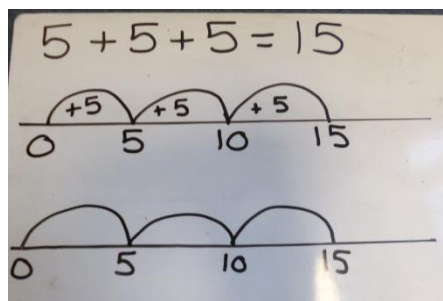|		
Repeated addition Children use different objects to add equal groups 	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there? 2 add 2 add 2 equals 6 5 + 5 + 5 = 15 5 + 5 + 5 = 15 	Write addition sentences to describe objects and pictures. 2 + 2 + 2 + 2 + 2 = 10
Create arrays using children/counters/ cubes to show repeated addition as '….rows of…'. or …'lots of…' and commutativity.	Draw arrays in different rotations to find **commutative** multiplication sentences.	Children to be able to use an array to write a range of calculations and understand the meaning of the equals sign e.g.
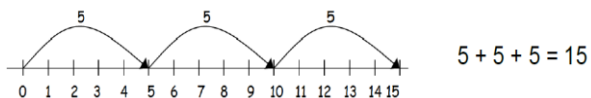
4 rows of 5 is 20
5 rows of 4 is 20
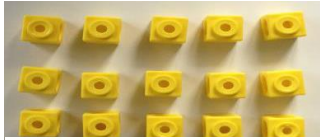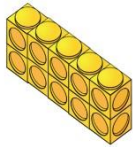
2 lots of 5   5 lots of 2

Children to count in 2s, 5s or 10s when counting their total number in the array.
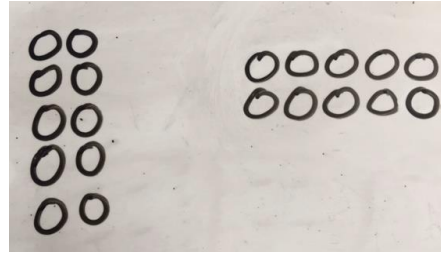
$2 + 2 + 2 + 2 + 2 = 10$
$10 = 5 + 5$

Band 2

- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Concrete	Pictorial	Abstract
Recognising equal groups Use a range of visuals to support understanding of equal groups and making equal groups 3 equal groups of 2	2 equal groups of 10	There are ___ equal groups with ___ in each group. There are three ____. ___ + ___ + ___ = 12

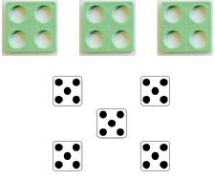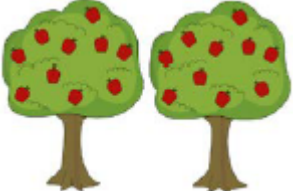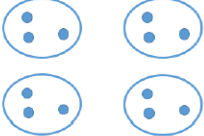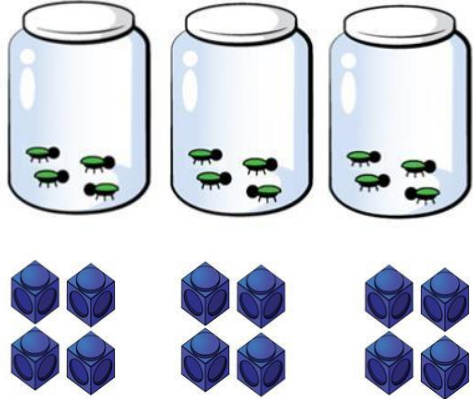|		
Recognising the relationship between multiplication and repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
Create arrays using children/counters/ cubes to show repeated addition, multiplication and commutativity. 4 rows of 5 is 20 4 x 5 = 20 5 rows of 4 is 20 5 x 4 = 20	Draw arrays in different rotations to find **commutative** multiplication sentences. .4 x 3 = 12 3 x 4 = 12 	Children to be able to use an array to write a range of calculations e.g. 10 = 2 x 5 5 x 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5
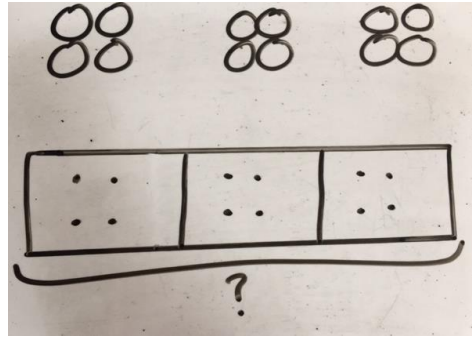
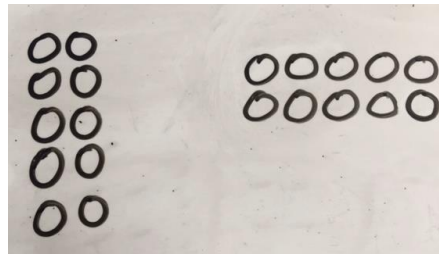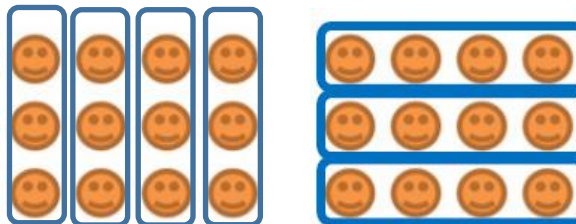|		
Number lines to show repeated groups- 3×4 Cuisenaire rods can be used too.	Represent this pictorially alongside a number line e.g.:	Abstract number line showing three jumps of four. $3 \times 4 = 12$
	Use bar model to show relationship between whole/ parts for multiplication and makes links to division. $4 \times 3 = 12$ $12 \div 3 = 4$ $12 \div 4 = 3$	Use of the triangle to identify the 4 linked number sentences. $4 \times 3 = 12$ $3 \times 4 = 12$ $12 \div 3 = 4$ $12 \div 4 = 3$
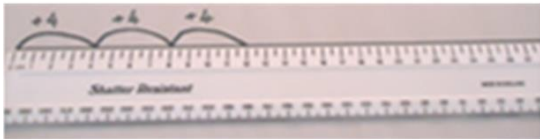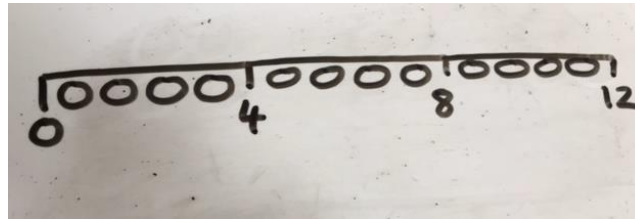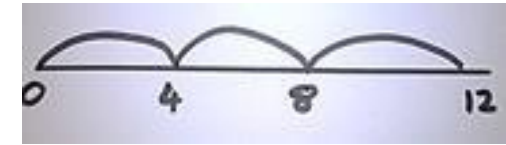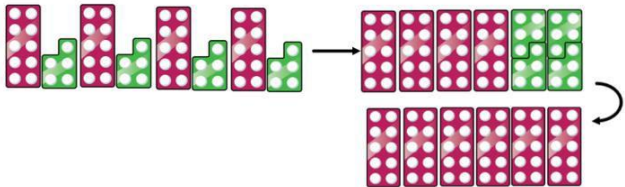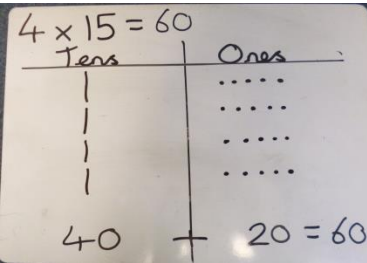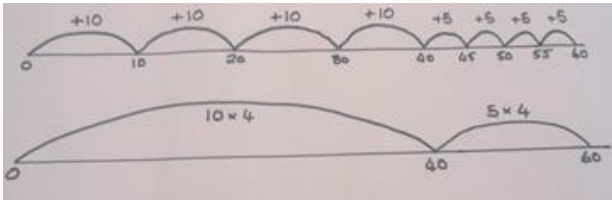
Band 3

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and 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
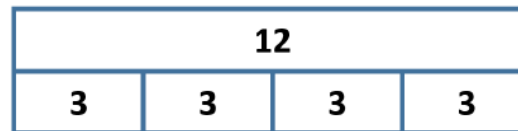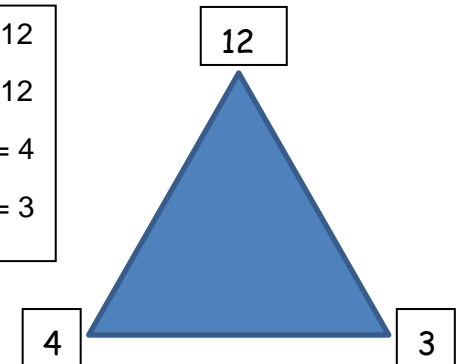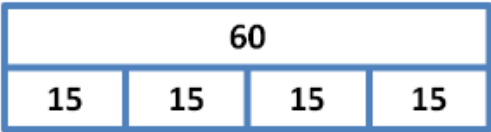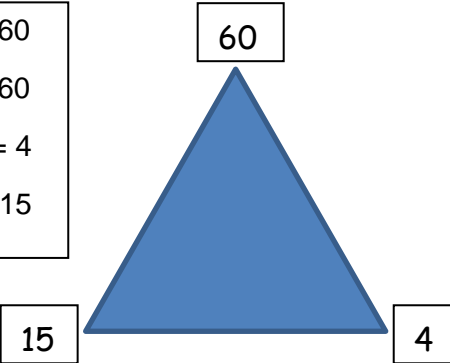- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Concrete	Pictorial	Abstract
Concrete resources to solve the number sentence, e.g. numicon, dienes, place value counters, **4 x 15 = 60** 	Use bar model to show relationship between whole/ parts for multiplication and makes links to division. 4 x 15 = 60 60 ÷ 15 = 4 60 ÷ 4 = 15	Use of the triangle to identify the 4 linked number sentences. 15 x 4 = 60 4 x 15 = 60 60 ÷ 15 = 4 60 ÷ 4 = 15
Partition to multiply Partition to multiply with place value counters (dienes, numicon can also be used.) 3×23 Multiply the parts knowing known multiplication facts. 2 colours show distributive law. 4 x 15 = 60 	4 x 15 = 60 	A blank number line can be drawn. 4 x 15 = 60

Grid method
Show the link with arrays to first introduce the grid method.

4 x 13 = 52

4 rows of 10
4 rows of 3
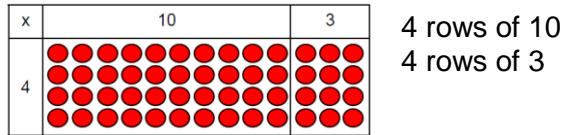
Move on to using dienes to move towards a more compact method.

4 rows of 13
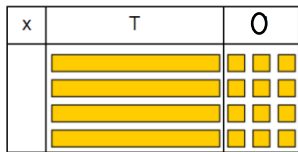
Move on to place value counters to show how we are finding groups of a number.We are multiplying by 4 so we need 4 rows.

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.

4 x 13 = 52
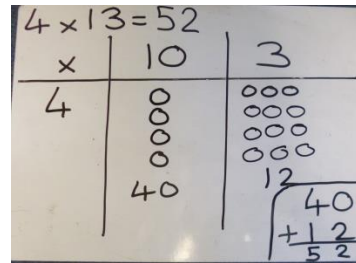
Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

x	10	3
4	40	12

40 + 12 = 52

Formal expanded written method

```
        13
   X     4
        12  = 4 x 3
        40  = 4 x 10
        52  = 12 + 40
```

Band 4
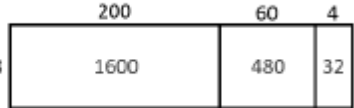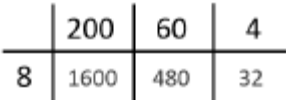
Pupils should be taught to:
- recall multiplication and division facts for multiplication tables up to 12 × 12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs 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.

Concrete	Pictorial	Abstract
Grid method Use place value counters or dienes to support understanding, as seen in Band 3.	264 x 8 = 2112 $$\begin{array}{c c\|c\|c} & 200 & 60 & 4 \\ \hline 8 & 1600 & 480 & 32 \end{array}$$	$$\begin{array}{r} 53 \\ 2\,6\,4 \\ \times\ 8 \\ \hline 2\,1\,1\,2 \end{array}$$

Band 5

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally drawing upon known facts
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
- solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

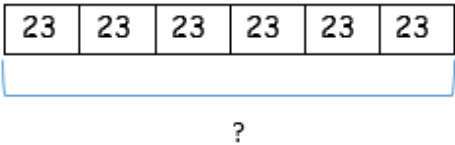| Concrete	Pictorial	Abstract
Grid method Use place counters to show how we are finding groups of a number. We are multiplying by 13, so we need 13 rows. $18 \times 13 = 234$ 	Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below. $18 \times 13 = 234$ <table><tr><td>x</td><td>10</td><td>8</td></tr><tr><td>10</td><td>100</td><td>80</td></tr><tr><td>3</td><td>30</td><td>24</td></tr></table> $130 + 104 = 234$	**Formal written method** Expanded written method $\begin{array}{r} 18 \\ \times\ \ 13 \\ \hline 24\ = 8 \times 3 \\ 30 = 3 \times 10 \\ 80 = 10 \times 8 \\ \underline{100} = 10 \times 10 \\ \hline 234 = 24 + 30 + 80 + 100 \end{array}$ Short column multiplication $\begin{array}{r} 18 \\ \underline{\times\ 13} \\ 234 \\ {\scriptstyle 2} \end{array}$
264×8 <table><tr><td></td><td>200</td><td>60</td><td>4</td></tr><tr><td>8</td><td>1600</td><td>480</td><td>32</td></tr></table>	<table><tr><td></td><td>200</td><td>60</td><td>4</td></tr><tr><td>8</td><td>1600</td><td>480</td><td>32</td></tr></table>	$\begin{array}{r} {\scriptstyle 5\ \ 3} \\ 2\,6\,4 \\ \underline{\times\ 8} \\ 2\,1\,1\,2 \end{array}$

Band 6

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- divide numbers up to 4 digits by a two-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 two-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
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the four operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Conceptual variation; different ways to ask children to solve 6x23			
?	Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week? With the counters, prove that 6 x 23 = 138	Find the product of 6 and 23 $6 \times 23 =$ $= 6 \times 23$ $\begin{array}{r} 6 \\ \times\ 23 \\ \hline \end{array}$ $\begin{array}{r} 23 \\ \times\ 6 \\ \hline \end{array}$	What is the calculation? What is the product?