PROGRESSION THROUGH CALCULATIONS FOR MULTIPLICATION

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE BY THE END OF THE YEAR.

YR

Related objectives: Count repeated groups of the same size; Share objects into equal groups and count how many in each group, e.g.

Add trays with small compartments for sorting to the making area. Add collections of things: bottle tops, sequins, threads, tiny pieces of fabric, etc. Model sharing out the objects equally. For example: do you all want sequins? I'll put 5 each on your trays. Can you give everybody the same number of these? Have you got the same?

Hang up 3 bags outside for making collections. Put a number 2 on each bag. Encourage the children to collect 2 of any treasured object in each bag, for example fir cones or smooth pebbles. The collections could be used inside and outside in the learning environment for different purposes, for example as a gallery of natural objects or for adding to the making area.

Y1

Related objectives:

- Solve one step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

- Children will experience equal groups of objects and will count in sequences/patterns of 2s, 5s and 10s. They will work on practical problem solving activities involving equal sets or groups, e.g. Count five hops of 2 along this number track. What number will you reach? (Children will begin to move from using number

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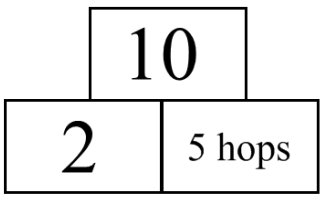
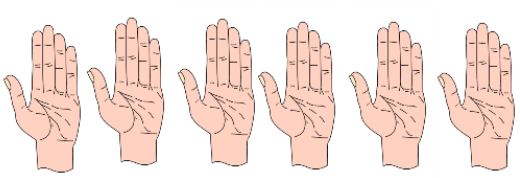
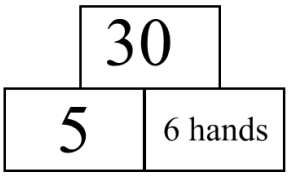
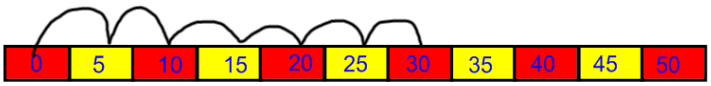
- tracks to number lines as appropriate through year 1 and 2)



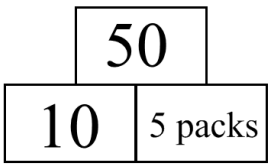
How many fingers are there altogether on six hands?

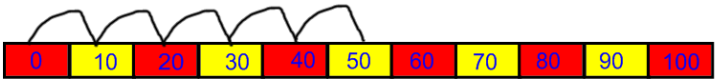






There are 10 crayons in each box.
How many crayons are there altogether?





Through grouping and sharing small quantities, pupils begin to understand: multiplication and division; doubling numbers and quantities; and finding simple fractions of objects, numbers and quantities.

Y2

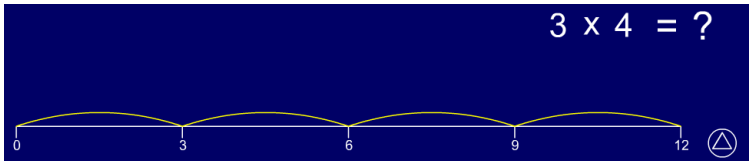
Related objectives:

- Recall and use multiplication and division facts for the x2, x5, x10s, as well as odd & even numbers.
- Calculate mathematical statements for multiplication and division within the multiplication table, and write them using the symbols ×, ÷and =
- 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.

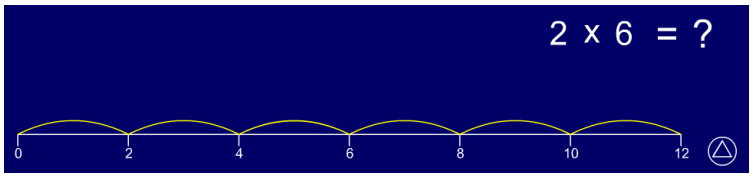
Children will develop their understanding of multiplication and use jottings to support calculation:

- **Repeated addition**

Show me on a number line how you could do:



3 ×4, how would 4 x 3 be different?



2 ×6, how would 6 x 2 be different?

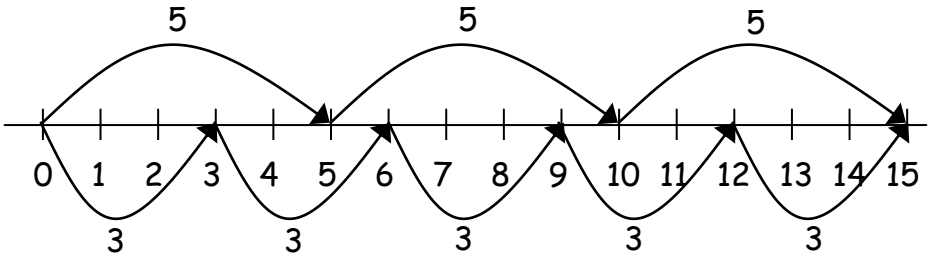
4 +4 +4 +4 +4 =20
Write this addition fact as a multiplication fact.

□ x □ = □

Multiplication can be done in any order (commutative)

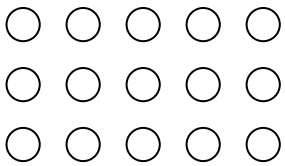
- **Commutativity**

Children should know that 3 x 5 has the same answer as 5 x 3 but describes a different situation. This can also be shown on the number line.

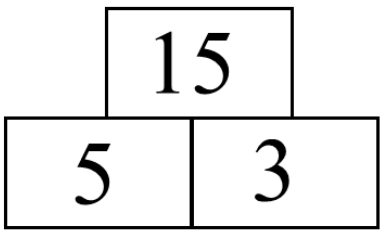


- **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method and makes links to division.



5 x 3 = 15
3 x 5 = 15



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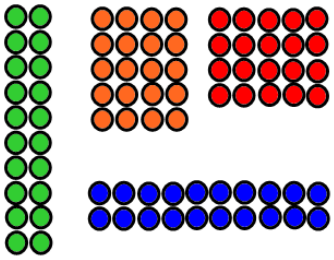
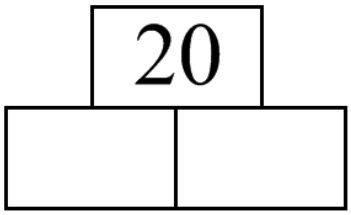


Here are 20 counters. How could you arrange them in equal rows? How could you use a number sentence to show your arrangement?

Link the above activity to missing box questions like the ones below.

What could the missing numbers be?

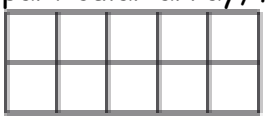


Y3

Related objectives:

- Recall and use multiplication and division facts for the x3, x4 and x8 tables (as well as x2, x5, x10 Y2).
- 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 integer scaling problems and correspondence problems in which n objects are connected to m objects e.g. 3 hats and 4 coats. How many outfits? 12

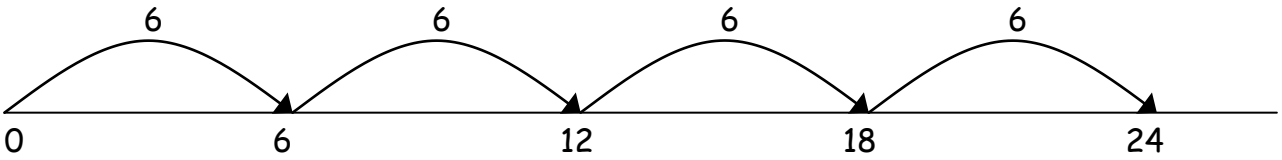
Children **understand the relationship between multiplication and division** . For example, they state two multiplication sentences and two division sentences that relate to a particular array, for example:

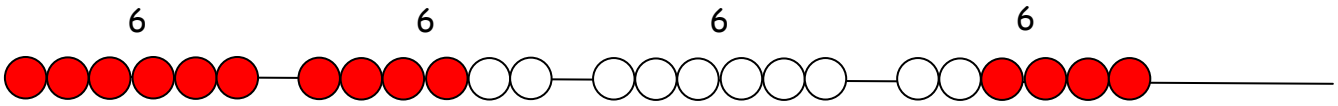


5×2=10, 2×5=10
10÷2=5, 10÷5=2

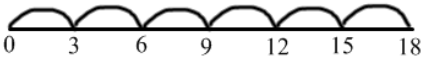
They use the image of an array to explain why, for example, 2×5 gives the same answer as 5×2. They also use the image to show how many fives make 10 and how many twos make 10.

Children should use number lines or bead bars to support their understanding.





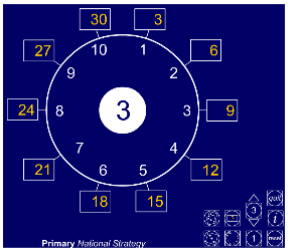
How many sides do six triangles have?

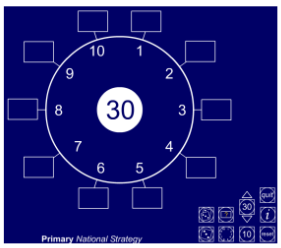


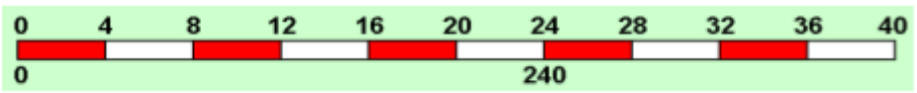
- **Scaling**

e.g. Find a ribbon that is 4 times as long as the blue ribbon

Use facts from the first number grid (Number grid ITP) to derive facts on the second.



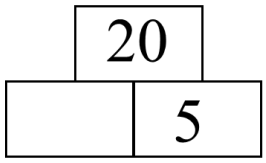




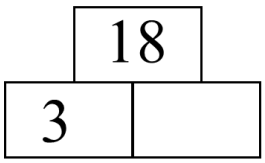
Use the counting stick to find how many 4s make 24.

Answer questions such as: 40 x 6, 4 x 60 by scaling up the product by a factor of 10.

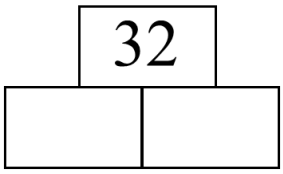
- **Using symbols to stand for unknown numbers to complete equations using inverse operations**



□ x 5 = 20



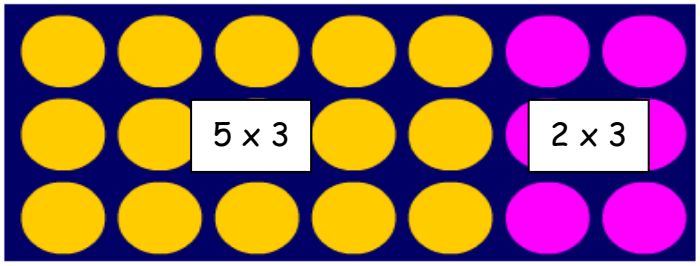
3 x △ = 18



□ x O = 32

- **Partitioning**

Children use partitioning to encourage them to us knowledge of 2, 5 and 10 times tables to work out multiples of 7, e.g. partition 7 into 5 and 2 to calculate 7 x 3, i.e.



	7 x 3	
5 x 3	+	2 x 3
15	+	6
	21	

Y4

Related objectives: 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.

Grid method

TU x U & TU x TU
They refine their written methods for multiplying and dividing TU by U and TU by TU.

Grid Method: ALWAYS PLACE THE LARGER NUMBER ON THE LEFT HAND SIDE OF THE GRID – see example
28x4 = Firstly partition the 28 into tens (20) and units (8)
Multiply the tens (20) x 4 = 80
Multiply the units (8) x 4 = 32
Add the two answers together = 112

x	4
20	80
8	32
	112

Following the grid method, pupils will move to the formal short multiplication method, practicing to become fluent in this.

Formal method Year 4 Short multiplication
TU x U (e.g. 47 x 8)
Model the calculation methods side by side so that children can see the links.
(You can use base 10 materials to show the 47)

	8
40	320
7	56
	376

4 7
x 8
5 6
3 2 0
3 7 6

x 4 7
5 8
3 7 6

(Method 2-Long multiplication) (Method 3-Short mulitiplication)

When modelling an expanded method for multiplication (method 2) remind children to "start from the right hand side" just like they do with addition and subtraction.

"Seven multiplied by 8 is 56. Write the 56 here."

"Now it's 40 multiplied by 8. Remember we can think of this as 4 x 8 x 10. Write the answer here. Make sure that you line up the digits in their correct column"

"Now add the two answers. You will need to use your column addition for this"

"Is your answer round about where you expected it to be?"

"Yes, because 50 x 8 would be 400, and 47 is a little less than 50 so my answer will be a little less than 400"

At each stage the base 10 materials can be used to show each ten rod or unit cube becoming 8 times larger (e.g. place 7 units out 8 times and count to make 56, place 4 ten rods out 8 times to make 32 tens and count to make 320) However encouraging children to use their multiplication facts is more preferable.

When modelling the compact method use language as follows:

"Seven multiplied by eight is 56. Write the 6 in the units column and carry the five tens below. Now multiply the tens column. Multiply 4 four by eight (which makes 32 tens). Remember to add the carried five tens making 37 tens altogether."

Use the same method for HTU x U.

- **Scaling (progressing to larger numbers and all times tables)**

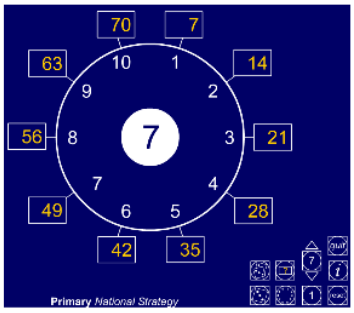
e.g. Find a ribbon that is 4 times as long as the blue ribbon

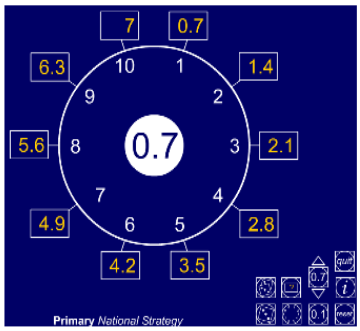
Y5

Related objectives:

- 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.





Use facts from the first number grid (Number grid ITP) to derive facts on the second by scaling down by a factor of 10
Refine and use efficient written methods to multiply and divide ThHTU ×U, ThHTU x TU,

Short multiplication
– used at least for two digit numbers

x		4	7	2	1
					6
		4	1		
	2	8	3	2	6

Long multiplication (Multiplying a 2-digit number by a 2-digit number) Year 5

When modelling long multiplication use the following language and layout.

23 x 54

		2	3
x		5_1	4
	1	9	2
1	1_1	5	0
1	2	4	2

- Start with the **units column**.
- 4 multiplied by 3 is 12. Write the 2 in the units column and carry one ten. Write the carrying figure, small, in the tens column.
- 4 multiplied by 2 is 8. Now add on the carrying figure (1) giving 9 tens altogether. (At this stage of development children will know that we are not actually multiplying 4 by 2 but 4 by 20, or 2 tens) Write the answer in the tens column
- Now multiply by the tens column. As we are multiplying by 10 place a zero in the units column.
- 5 multiplied by 3 is 15. Place the 5 in the tens column and write the carrying figure (1) small in the hundreds

Y6

Related objectives:
Pupils should be taught to:

- use common factors to simplify fractions; use common multiples to express fractions in the same denomination
- multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. 1/4 × 1/2 = 1/8)
- identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places
- multiply one-digit numbers with up to two decimal places by whole numbers
- solve problems which require answers to be rounded to specified degrees of accuracy
- recall and use equivalences between

Long multiplication – as Y5, but progressing to use of decimals

Multiplying decimals is the same as multiplying two whole numbers. You just need to remember the following:

$$\begin{array}{rcccc} & 1 & 2 & . & 3\ 5 \\ \times & & {\scriptstyle 1} & & {\scriptstyle 1}\ 3 \\ \hline & 3 & 7 & . & 0\ 5 \\ \hline \end{array}$$

When multiplying by a whole number, set out as above. If there is one digit after the decimal point in the question, there will be one digit after the decimal point in the answer.

If there are two digits after the decimal point in the question, there will be two digits after the decimal point in the answer etc.

For example to calculate 34.2 × 0.2 we work out 342 × 2 and then work out where to put the decimal point.

$$\begin{array}{r} 342 \\ \times\ 2 \\ \hline 684 \end{array}$$

There are two digits after the decimal point in the question (34.2 x 0.2), so there will be two digits after the decimal point in the answer. Therefore 34.2 × 0.2 = 6.84

You can check you have the decimal point in the right place by estimating. 34.2 x 0.2 should be a little bit more than 3 x 2; so 6.84 looks like a sensible answer.

By the end of Year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should always be encouraged to approximate their answers before calculating. Children should always be encouraged to consider if a mental calculation would be appropriate before using written methods.