HORNDALE COUNTY INFANT AND NURSERY SCHOOL

Scholars Path, Newton Aycliffe, Co Durham DL5 7HB

Calculations Policy

Adopted: February 2023
Review Date: July 2025

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics at Horndale Infant School. It is also designed to give pupils a consistent and smooth progression of learning in calculations across the school.

Please note that early learning in number and calculation in Reception follows the 'Development Matters' EYFS document and this calculation policy is designed to build on progressively from the content and methods established in Early Years Foundation Stage.

Age Stage Expectations

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however, it is vital that pupils are taught according to the stage that they are currently working at, being moved onto the next level as soon as they are ready, or working at a lower stage until they are secure enough to move on.

Providing a Context for Calculation

It is important that any type of calculation is given a real-life context or problem-solving approach to help build children's understanding of the purpose of calculation and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

Children will initially be introduced to number, counting, calculations, shape, measure and geometry through practical, oral and mental activities. Once they begin to understand these concepts they will be encouraged to informally record before finally using mathematical signs and symbols to record in a more organised/ formal way. This will also involve elements of reasoning and problem-solving opportunities provided in each lesson.

At Horndale we follow the CPA (**C**oncrete, **P**ictorial, **A**bstract) approach to teaching Maths meaning that whichever of the four operations of addition, subtraction, multiplication and division is being taught children need to experience all of the following steps to completely understand it:
1) Practical use of objects.
2) Use of pictures or numicon.
3) Use of number lines, number beads, number fans and/or number squares.
4) Use of a compact/formal written method.

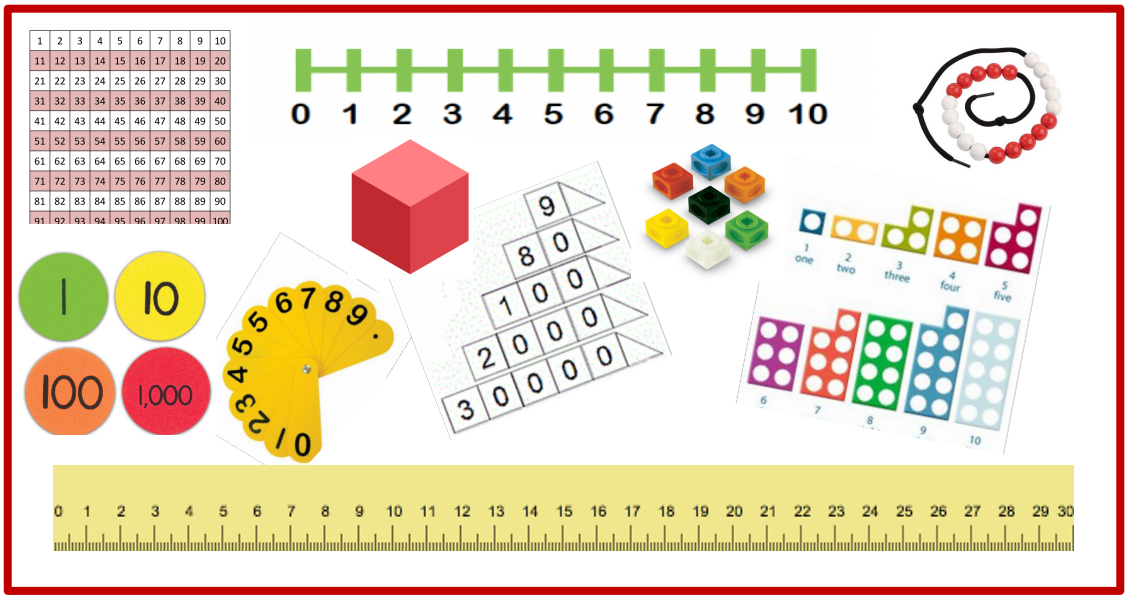
Choosing a Calculation Method
Children need to be taught and encouraged to use the following processes in deciding what approach they will take a calculation, to ensure they select the most appropriate method for the numbers involved.

Key Vocabulary

It is important that the children are exposed to and supported in developing quality and varied mathematical vocabulary. This will support them in accessing mathematical problems, as well as presenting mathematical justification, argument or reasoning. Therefore, it is crucial that quality discussion during lessons where vocabulary is modelled correctly happens alongside displaying key vocabulary within classrooms. Furthermore, visual and concrete resources should be used wherever possible to ensure the maths curriculum is accessible for all learners. Below is the list of vocabulary associated with each operation.

Addition • add • addition • plus • and • count on • more • sum • total • altogether • inverse
Subtraction • subtract • less • take away • fewer • minus • difference • count back • between • inverse
Multiplication • lots of • groups of • times • multiply • multiplication • multiple • array • double • repeated addition • commutative
Division • lots of • groups of • share • group • halve • divide • division commutative • divided by remainder

Representations



When making progress through written calculation methods children also progress through a range of resources to support their learning. This practical process will embed the children's learning and provide them with a clear understanding of calculating.

Number Line – used early in Key Stage 1 when children are beginning addition and subtraction.

100 Square – used as children begin calculating using 2 digit numbers.

Bead Strings – used for embedding number bonds and simple addition.

Multi-Link – used as an early practical resources when solving all four calculations.

Numicon – can be used to represent addition and multiplication as repeated addition.

Arrow Cards – used for partitioning 2 and 3 digit numbers, supports understanding of place value.

Dienes – used as an abstract representation of a hundred, ten and a unit. Children to use these for more partitioning and beginning column method.

Place Value Counters – used to support column addition, subtraction and division. Children can use these on a place value grid to work alongside formal written methods. Using these to 'exchange' supporting the children when 'carrying' 10 using a formal written method.

Number Fans – used to support number recognition.

Cubes – used to support addition, subtraction, multiplication and division.

Part-whole Model – to support addition and subtraction

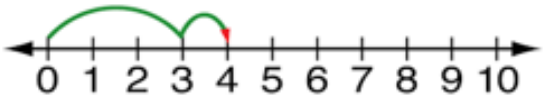
Tens Frame – used to support addition and subtraction as well as number bonds

Year 1

Key Objectives
• To read, write and interpret mathematical statements involving addition (+). • To add one-digit and two-digit numbers to 20, including zero. • To solve one-step problems that involve addition, using concrete objects and pictorial representations, and missing number problems.

In Year 1, children should build on from the prior learning in the Early Years of adding by combining two sets of objects into one group (5 cubes and 3 cubes). They should now begin to add with numbers up to 20 by using a range of counting equipment, everyday objects, number tracks and number lines and be shown numbers in different contexts. Children should be encouraged to count on in ones to add by starting with the larger number and counting on.
Children should also be taught to read and write more formal addition statements such as; 8 + 3 = __, 15 + 4 = __, 4 + __ = 6, or __ + __ = 8
solving these with the aforementioned skills.

3 + 1 = 4



8 + 5 = 13

They select the biggest number first ie: 3(or 8) and count on the smaller number in ones.

Children should be familiar with a range of number lines including increasing in 1's, 2's, 5's and 10's.

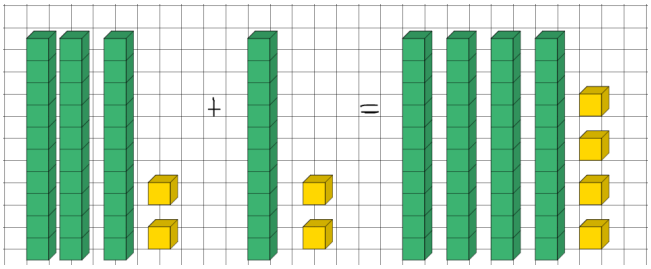
Different orientations of the 100 square help children transfer their skills and understanding between similar representations.

ADDITION

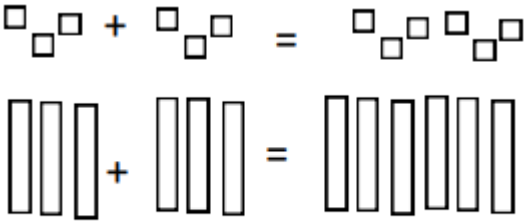
Year 2

Key Objectives
• To add numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones, a two-digit number and tens, two two-digit numbers and adding three one-digit numbers. • To solve problems with addition using concrete objects and pictorial representations, including those involving numbers, quantities and measures. • To show that addition of two numbers can be done in any order. • To recognise and use the inverse relationship and use this to check calculations and solve missing number problems.

In Year 2, children are taught to build upon what they have learned in Year 1 to solve more complex addition calculations in a range of different contexts. Children should begin by using practical resources such as Dienes blocks to secure their understanding of place value in supporting them with more complex addition calculations, moving on to pictorial representations and finally moving on to a more formal written method.



Concrete resources



Pictorial representations

	2	2
+	1	1
	3	3

Formal written methods

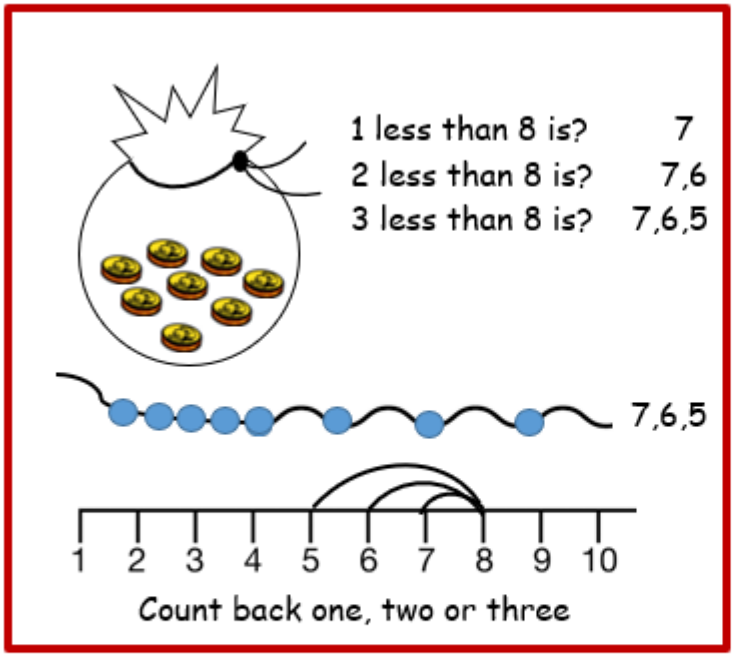
	3	6
+	1	5
	5	1

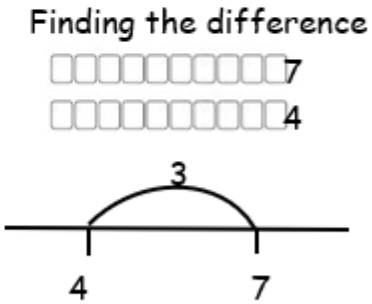
SUBTRACTION

Year 1

Key Objectives
• To read, write and interpret mathematical statements involving subtraction (-). • To subtract one-digit and two-digit numbers to 20, including zero. • To solve one-step problems that involve subtraction, using concrete objects and pictorial representations, and missing number problems.

In Year 1 children are taught to consolidate their understanding of subtraction practically from the Early Years, showing subtraction on bead strings, using cubes etc and in familiar contexts and are introduced to more formal recording using number lines as below:





This will be introduced practically with the language 'find the distance between' and 'how many more?' in a range of familiar contexts.

Once children are secure in their understanding using practically and pictorially, they should then move on to recording calculations in a more formal written way.

8 – 3 =

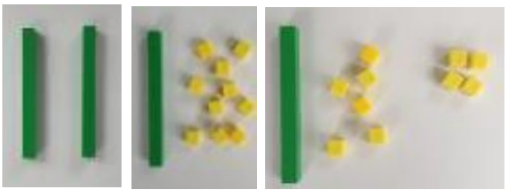
Children should also start recalling subtraction facts up to and within 10 and 20 and should be able to subtract zero.

SUBTRACTION

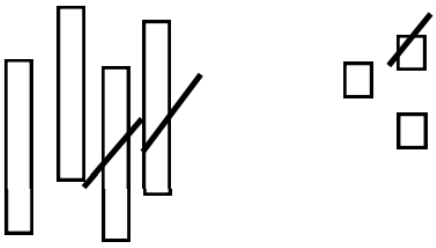
Year 2

In Year 2, children are taught to build upon what they have learned in Year 1 to solve more complex subtraction calculations in a range of different contexts. Children should begin by using practical resources such as Dienes blocks to secure their understanding of place value in supporting them with more complex subtraction calculations, moving on to pictorial representations and finally moving on to a more formal written method.

Key Objectives
• To subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones, a two-digit number and tens, two two-digit numbers. • To solve problems with subtraction using concrete objects and pictorial representations,including those involving numbers, quantities, and measures. • To show that addition of two numbers can be done in any order and subtraction of one number from another cannot. • To recognise and use the inverse relationship and use this to check calculations and solvemissing number problems.



Concrete resources



Pictorial representations

	2	5
-	1	3
	2	2

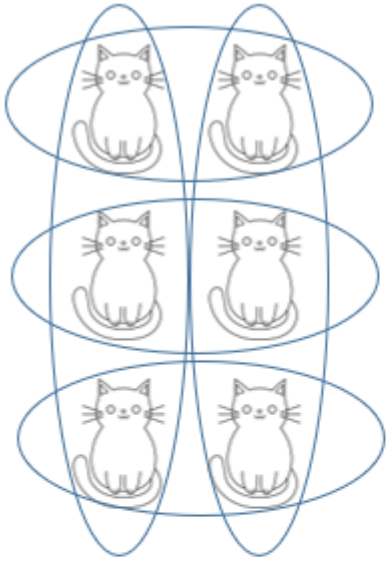
Formal written methods

	5 6	1 3
-	3	5
	2	8

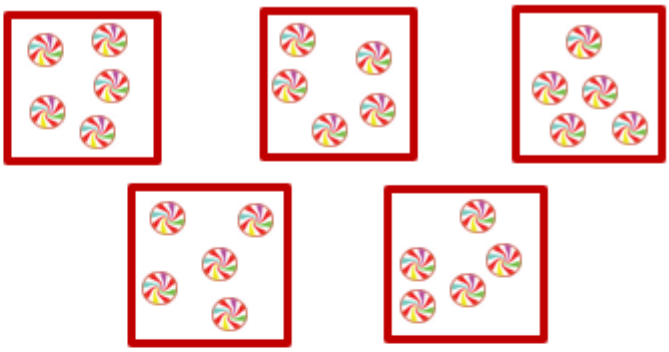
Year 1

Key Objectives
• To solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

In Year 1, children should be taught to multiply first with concrete objects then pictorial representations and finally moving on to arrays.
Children will experience using equal groups of real-life objects. They will learn to count in 2s and 10s and begin to count in 5s. They will experience lots of practical calculation opportunities involving equal sets or groups both using a wide variety of equipment and also pictorially as outlined below.

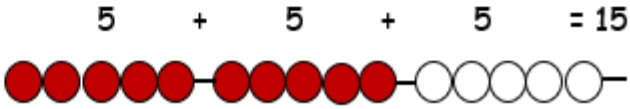


Children should use pictorial representations and may use rings to show i.e.: 3 groups of 2 and 2 groups of 3 introducing the commutative law of multiplication.



5+5+5+5+5= 25

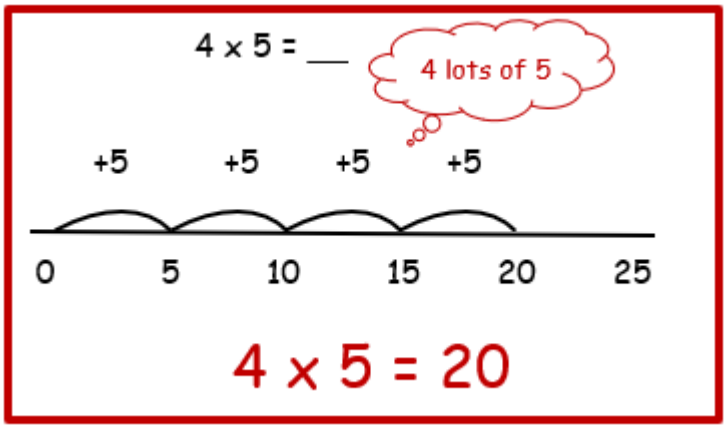
There are five sweets in one bag. How many sweets are in 5 bags altogether?



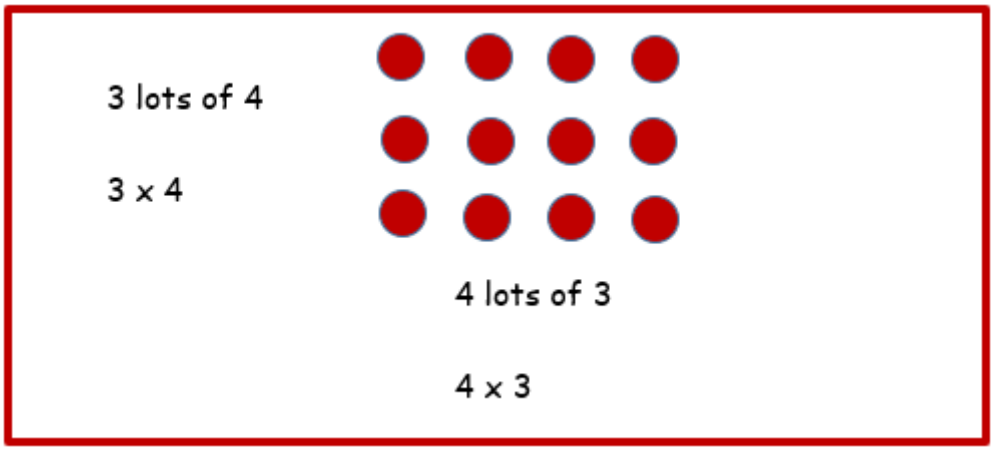
Year 2

Key Objectives
• To recall and use multiplication facts for the 2, 5 and 10 multiplication tables, includingrecognising odd and even numbers. • To calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs. • To show that multiplication of two numbers can be done in any order (commutative). • To solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts.

In Year 2, children should build upon what they have learned in Year 1. They should begin by consolidating the skill ofmultiplying using arrays and repeated addition (using at least 2s, 5s and 10s). Children should also recall multiplication facts and solve problems **in a range of different contexts** for the 2, 5 and 10 times tables through practice in counting, singing songs and understanding of the operation.



It is important to be able to visualise multiplication as a rectangular array. This helps children develop their understanding of the commutative law i.e.: 3 x 4 = 4 x 3.



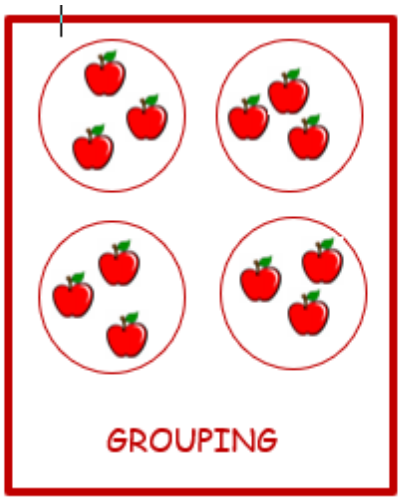
Year 1

DIVISION

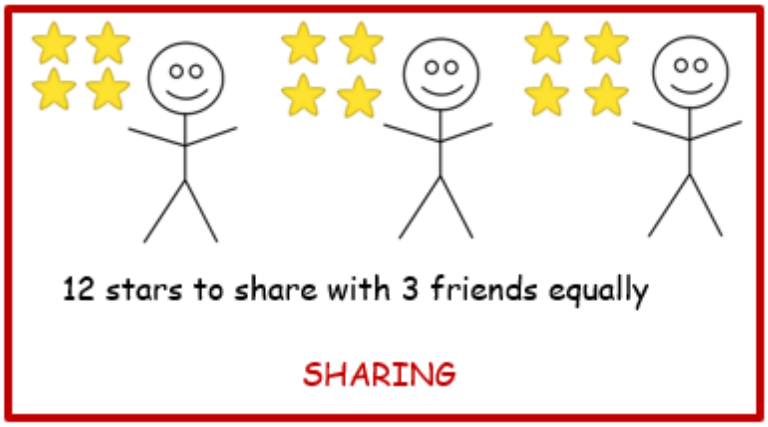
Key Objectives
• To solve one-step problems involving division, by calculating the answer using concrete objects and pictorial representations with the support of the teacher.

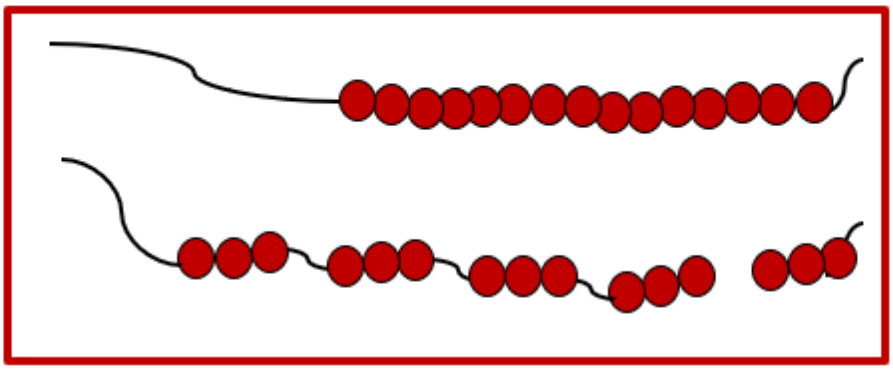
In Year 1, children should be taught to use objects, diagramsand pictorial representations to solve problems involving both grouping and sharing. They should:

- Use practical apparatus, arrays and picture representations.
- Be taught to understand the difference between grouping objects (how many groups of 2 can you make?) and sharing (share these sweets between 2 people).
- Be able to count in multiples of 2s, 5s and 10s.
- Find half of a group of objects by sharing into 2 equal groups.



How many groups of 4 can be made with 12 stars?





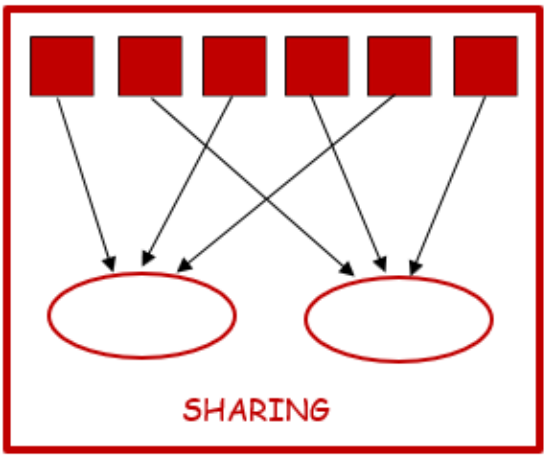
15 beads are placed in baskets with 3 in each basket. How many baskets are needed?

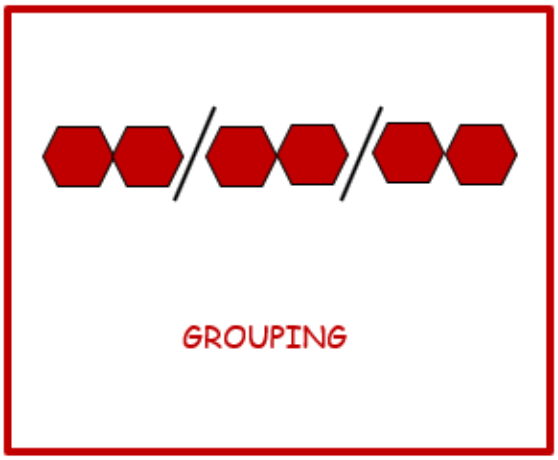
DIVISION

Year 2

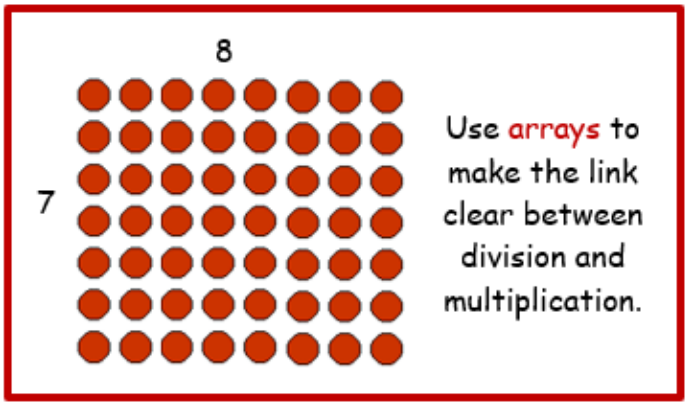
In Year 2 children should build upon their knowledge of division from Year 1, using objects, diagramsand pictorial representations to solve problems**in a range of different contexts** involving both grouping and sharing.

Key Objectives
• To recall and use division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers. • To calculate mathematical statements for division within the multiplication tables and write them using the division (÷) and equals (=) signs. • To show division of one number by another cannot. • To solve problems involving division, using materials, mental methods, and division facts,including problems in contexts.

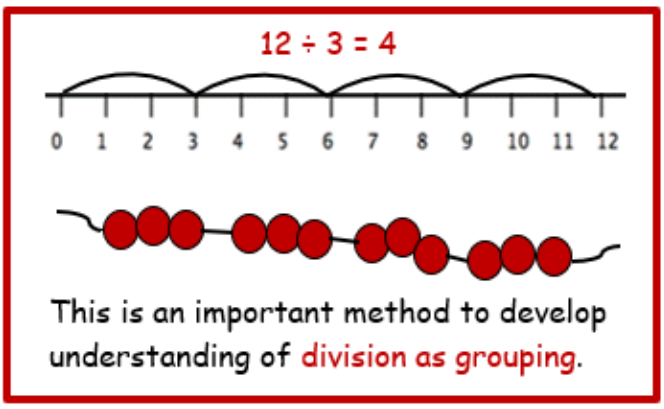




Understanding the difference between grouping and sharing.



Use arrays to make the link clear between division and multiplication.



This is an important method to develop understanding of division as grouping.