Park House English School
Calculation Policy Year 1 & 2

Park House
English School

At Park House Primary School, we wish to teach calculation with understanding, and not just as a process that is to be remembered. This Calculation Policy clarifies progression in calculation with examples that are 'mathematically transparent', in other words the way the calculation works is clear and supports both the development of mathematical concepts and closely links it to the mental strategies that are taught alongside the written methods.

AIMS OF THE POLICY

• To ensure consistency and progression in our approach to calculation and enable a smooth transition between year groups and phases.

• To ensure that children develop an efficient, reliable, formal written method of calculation for all operations.

• To ensure that children can use these methods accurately with confidence and understanding.

• To ensure pupils understand important concepts and make connections within mathematics.

• To ensure pupils show high levels of fluency in performing written and mental calculations.

• To ensure that pupils are ready for the next stage of learning and have been given strong foundations in mental methods, the use of practical equipment, allowed to explore jottings in a range of forms and then to move onto more formal recording using a strong knowledge of place value, number lines labelled or blank, partitioning before eventually using compact written methods.

• To ensure that pupils are competent in fluency, reasoning and problem solving and can make informed and appropriate choices about the methods they wish to use (mental or written) to solve mathematical problems efficiently and effectively.

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Introduction:

- The policy is set out in subjects, addition, subtraction, multiplication and division. Within each specific area there is a progression of skills, knowledge and layout for written methods. The calculation strategies which will be used will reflect this ideology – moving from concrete to pictorial and then abstract recording leading to more formal written methods. Mental methods and strategies will work in partnership with these methods.
- The basis of our maths calculation policy is that mental and written methods are integral to each other and should not be seen as taking separate paths but developed in conjunction with each other. It is envisaged that the development of mental skills will lead to jottings, (which support mental calculation) and then into more formalised jottings in the form of number lines and partitioning which in turn leads to expanded column methods and ultimately compact algorithms.
- It is important to always show the links between operations and not teach them in isolation or without showing, in practical problem-solving activities and across all mathematical topics, how these operations can be applied.
- It is important that staff always use correct mathematical language and encourage this from every pupil. This will take place in class discussions as well as through oral and written feedback, next steps and target setting.

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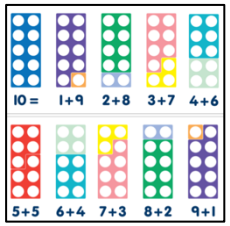
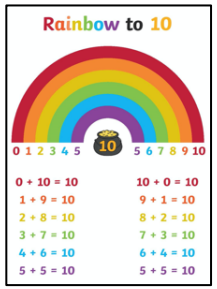
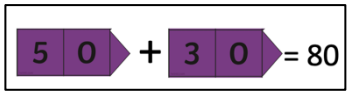
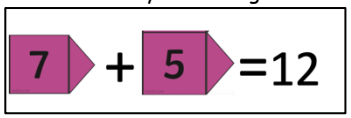
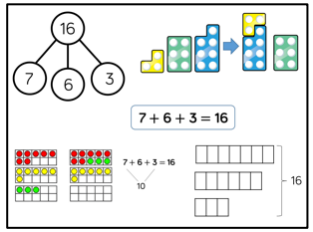
	Year 1	Year 2
Mental Addition	**Using Place value:** • Counting in ones/Counting in tens, e.g., knowing 45+1 or 45+10 without counting on in ones e.g., 23+10=33 • Count in multiples of twos, fives, and tens. **Counting on:** • Count on in ones, 11+2= 13, 7+4= 11 • Count on in tens, e.g., 45+20 as 45 ,55, 65 **Using Number Facts:** • Number bonds to 10, e.g., 5+5, 6+4, 7+3, 8+2, 9+1, 10+0 • Patterns using known facts, e.g., 4+3=7 so we know 24+3, 34+3, 44+3, 74+3 etc  	**Using Place value:** • Know 1 more or 10 more than any number, e.g., 1 more than 67 or 10 more than 85 • Partitioning, e.g. 55+37 as 50+30 and 5+7 finally combining the two totals: 80 +12   =80+12=92 **Counting on:** • Add ten and multiples of ten, e.g., 76+20 as 76,86,96 or in one hope 76+20 • Add two 2-digit numbers by counting on in tens and then in ones, e.g., 55+37 as 55 add 30 (85) add 7 (92) • Add near multiples, e.g., 46+19 or 63+21 **Using Number Facts:** • Know pairs of numbers which make the numbers up to and including 10, e.g., 8=4+4, 3+5=8, 2+6=8, 1+7=8 and 10= 5+5, 4+6=10, 3+7=10, 2+8=10, 1+9=10 and 0+10=10 • Patterns of known facts, e.g., 6+3=9 so we know 36+3=39, 66+3=69 53+6=59 • Bridging ten, e.g., 57+5 as 57 add 3 then add 2 more. • Adding three or more single digit numbers, spotting bonds to 10 or doubles e.g., 6+7+4+2 as 10+7+2 

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Written Addition

+ and = signs and missing numbers

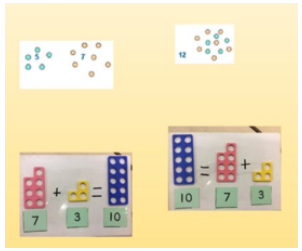
- Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equal sign so that the sign is not just interpreted as the 'answer'.

e.g. 2=1+1 and 1+3=4+1

- Missing numbers need to be placed in all possible places.

3+4= ? ? = 3+4

3+?= 7 7 = ?+4

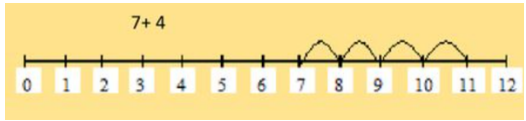


Counting and combining sets of objects

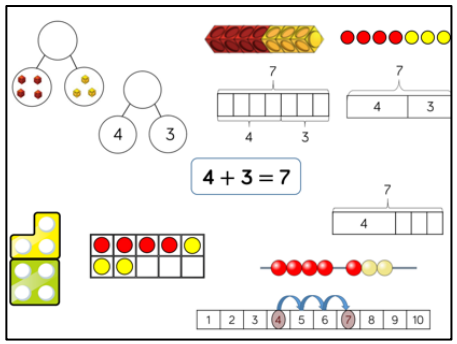
- Combining two sets of objects (aggregation) which will progress onto adding on to a set (augmentation)

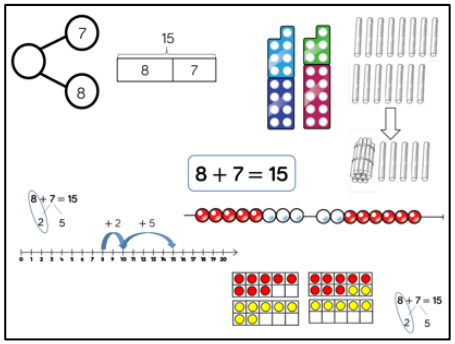
Understanding of counting on with a number track.

Understanding of counting on with a number line (supported by models and images)



Further examples of how to use concreate and pictorial representations.





Missing number problems

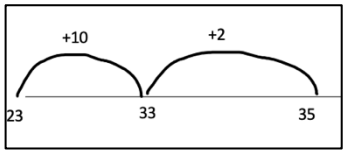
- Missing number problems, e.g. 14+5=10+? 32+?+ ?=100 35=10+?+5
- It is valuable to use a range of representations (see below) to support the understanding of missing number problems.

Counting on in tens and ones using number lines to support.

23+12=23+10+2

=33+2

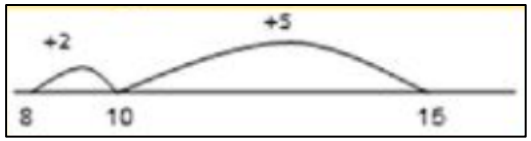
=35



Partitioning and bridging through 10

The steps in addition often bridge through a multiple of 10 e.g. children should be able to partition the 7 to relate adding the 2 and then the 5.

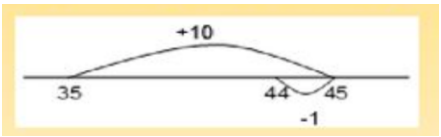
8+7 =15



Adding 9 or 11 by adding 10 and adjusting by 1

- E.g., Add 9 by adding 10 and adjusting by 1

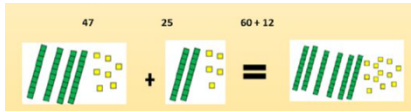
35+9=44

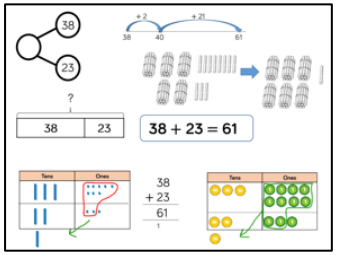


Written methods using concrete objects and pictorial representations and partitioning.

- Add 2-digit numbers with ones.
- Add 2-digit numbers with tens.
- Add two 2-digit numbers.
- Show addition of 2 numbers can be done in any order.

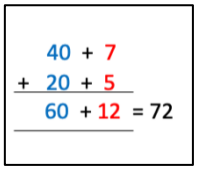
e.g- 47+25

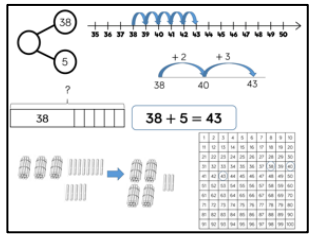




- Use the expanded written method

e.g., 47+25=





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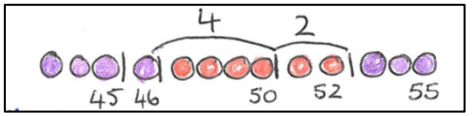
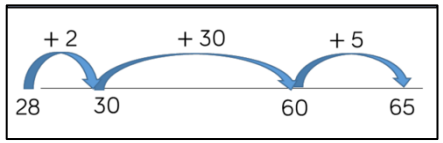
	Year 1	Year 2
Mental Subtraction	**Using Place Value:** • Count back in ones/ Count back in tens, e.g. knowing 53 -1 or 53 -10 without counting back in ones. **Taking away:** • Count back in ones, e.g. 11 -3= or 15-4= • Count back in tens, e.g. 53 – 20 as 53, 43, 33 **Number facts:** • Knowing number facts fluently for 4 ,5, 6, 7, 8, 9 e.g. 7 – 1= 6 and 7 -2 = 5 and 7 – 3 =4 etc. • Number bonds to 10, e.g. 10 -1 =9, 10 -2=8, 10 -3 = 7 etc. • Patterns using known facts, e.g. 7-3 = 4 so we know 27 – 3 = 24 or 47 – 3= 44	**Using Place Value:** • Know 1 less or 10 less than any number, e.g., 1 less than 74 or 10 less than 82. • Partitioning, e.g. 55-32 as 50 – 30 and 5 – 2 and then combining the answers 20 + 3 **Taking away:** • Subtract ten and multiples of ten, e.g. 76 – 20 as 76, 66, 56 or in one hop 76-20=56. • Subtract two 2 -digit numbers by counting back in tens and then in ones, e.g. 67 – 33 as 67 subtract 30 (37) then count back 3 (34) • Subtracting near multiples, e.g. 74 – 21 or 57 – 19 **Number facts:** • Know pairs of numbers which make the numbers up to and including 10. E.g. 10 – 6 = 4, 8 -3= 5, 5 – 2 = 3 etc • Patterns of known facts, e.g. 9 – 6 = 3, so we know 39 – 6 = 33, 69 – 6 = 63, 89 – 6 = 83 • Bridge ten, e.g. 52 – 6 as 52 subtract 2 then subtract 4 more  **Counting up:** • Find a difference between two numbers on a line, e.g. 65 – 28 

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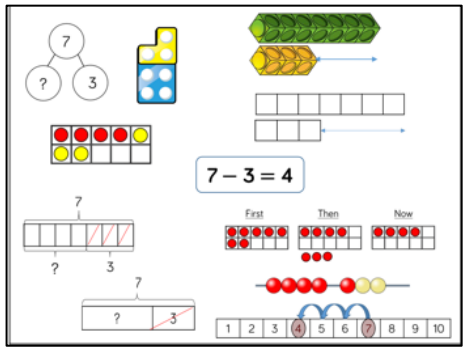
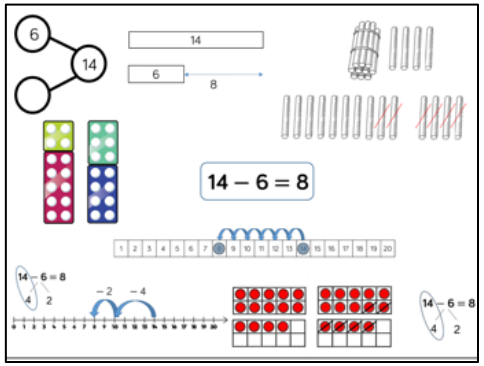
Written Subtraction

Solving missing number problems

e.g. 7= ? – 9 or 20 - ? = 9 or 15 – 5 =? Or ? - ? = 11 or 16 – 0 = ?

Use concrete objects and pictorial representations as shown below.

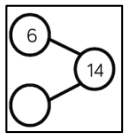


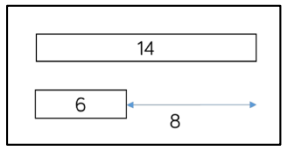


Understand subtraction as take-away using concrete and pictorial representations before beginning to use abstract notations.

Understand subtraction as finding the difference.

- To begin with the children will need to be introduced to the representations below using concrete objects that can be easily manipulated i.e.- cards with pictures. Once the children have grasped this they can progress onto pictorial representations as shown below.
- The use of other images is also valuable for modelling subtractions e.g. Numicon, bundles of straw, Dienes apparatus, bead strings, cubes.

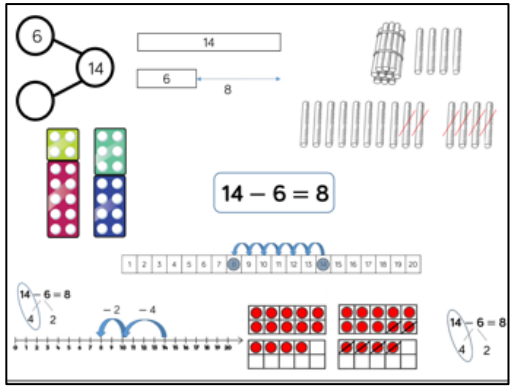


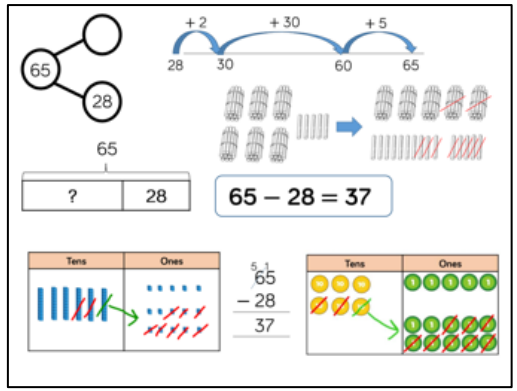


Solving missing number problems

e.g. 52 – 8=? Or ? – 20 = 25 or 22= ? – 21 or 6 +? + 3= 11

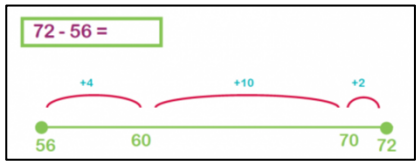
Continue to use concrete objects and pictorial representations as shown below.

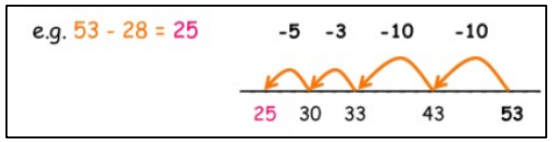




Continue to use number lines to model take-away and difference as subtraction.

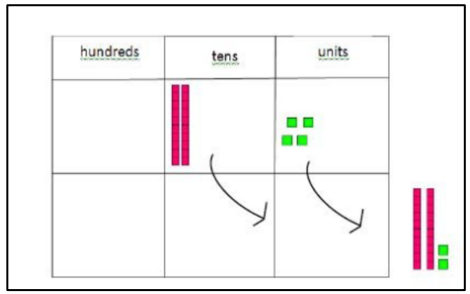
- The bar model and part whole model should be used to support the modelling of subtraction.





Written methods:

- Recording subtraction in expanded columns can support the understanding of place value and prepare for efficient written methods with larger numbers. The numbers may be represented with Dienes (Base 10) apparatus to begin with e.g. 46- 22



	40	6
-	20	2
	20	4

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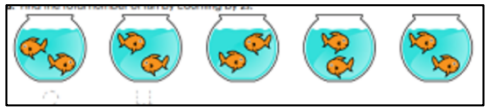
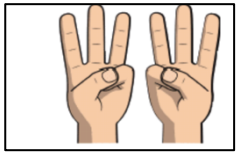
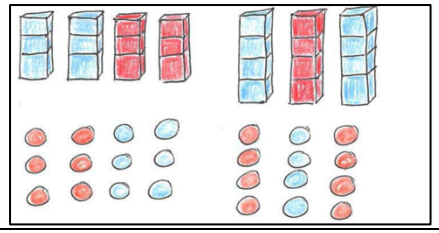
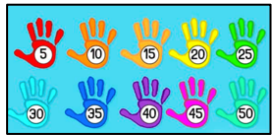
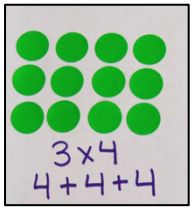
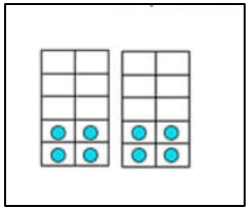
	Year 1	Year 2
Mental Multiplication	**Counting in steps:** • Count in 2s and 10s  **Doubling and halving:** • Find doubles to double 6 using fingers.  **Grouping:** • Begin to use concrete and pictorial representations such as arrays and 'sets of' objects to find the answers to '3 **lots** of 4' or '2 **lots** of 5' etc. 	**Counting in steps:** • Count in 2s, 5s, and 10s • Begin to count in 3s  **Doubling and halving:** • Begin to know doubles of multiples of 5 to 100, e.g. double 35 is 70 **Grouping:** • Use arrays to find answers to multiplications and relate to counting, e.g. 3x4 as three **lots of four** or 3 **steps** in the 4x tables. • Understand that 5 x 3 can be worked out as three 5s or five 3s (commutativity)  **Number facts:** • Know doubles to double 20 e.g.- double 4 = 8  • Start learning 2x, 5x, 10x tables relating these to counting on in 2s, 5s, and 10s e.g. 5 x 10 = 50 and 10, 20, 30, 40, 50 is five steps in multiples of 10.

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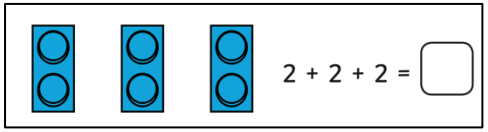
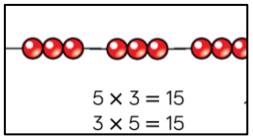
Written Multiplication

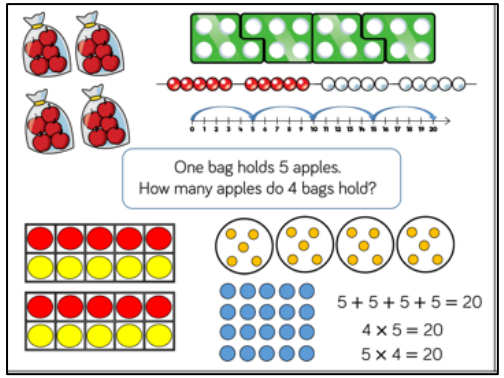
Understand multiplication is related to doubling and combining groups of the same size (repeated addition).

- Using concrete objects such as Numicon, bundles of straw, bead strings and other practical resources to support.

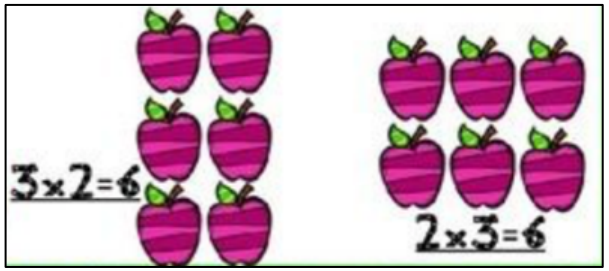




Problem solving with concrete objects (including money and measure)



Use arrays to show multiplication can be done in any order (commutative)

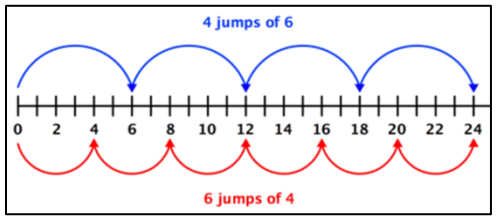


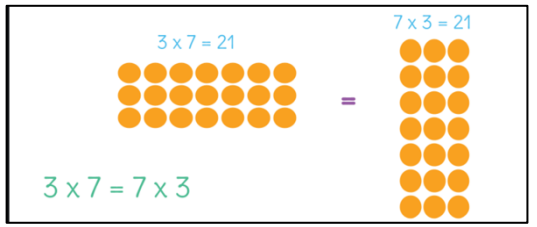
Expressing multiplication as a number sentence using x

- Using understanding of the inverse and practical resources to solve missing number problems.

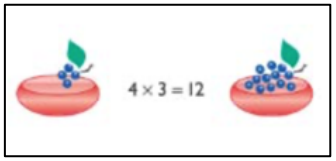
7 x 2 = ?	? = 2 x 7
7 x ? = 14	14 = ? x 7
? x 2- 14	14 = 2 X ?
? x ? = 14	14 = ? X ?

Develop understanding of multiplication and commutativity using arrays and number lines



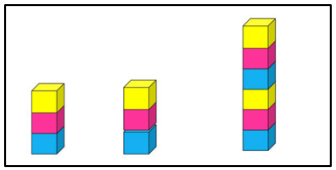


Begin to develop understanding of multiplication as scaling.



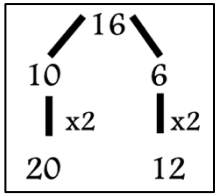
Double numbers up to 10 +10

- Link with understanding of scaling e.g. double 3
- 3x2 = 6



Written methods:

- Use jottings to develop an understanding of doubling two-digit numbers.



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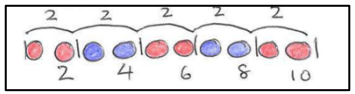
	Year 1	Year 2
Mental Division	**Counting in steps:** • Count in 2s and 10s  **Doubling and halving:** • Find half of even numbers up to 12 including realising that it is hard to halve an odd number. **Grouping:** • Begin to use concrete and pictorial representations such as arrays and 'sets of' objects to find the answers to 'how many towers of 3 can I make with 12 cubes?' **Sharing:** • Begin to find half of a quantity using sharing, e.g. half of 16 cubes by giving one each repeatedly to two children.	**Counting in steps:** • Count in 2s, 5s and 10s **Doubling and halving:** • Find half of a number up to 40, including realising that half of an odd number gives a remainder of 1 or an answer containing a $\frac{1}{2}$ • Begin to know half of multiples of 10 to 100, e.g.. half of 70 is 35 **Grouping:** • Relate division to multiplication by using arrays or towers of cubes to find answers to division, e.g. How many towers of five cubes can I make from 20 cubes as ? x 5 = 20 and also 20 ÷ 5 = ?  • Relate division to counting in steps and hence to multiplication, e.g. how many 5s do I count to get to 20? **Sharing:** • Begin to find half or a quarter of quantities using sharing, e.g. $\frac{1}{4}$ of 16 cubes by sorting the cubes into four piles. • Find $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of small quantities. (practically) **Number facts:** • Know halves of even numbers to 24. • Know 2x, 5x, 10x division facts. • Begin to know 3x division facts.

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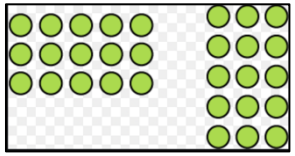
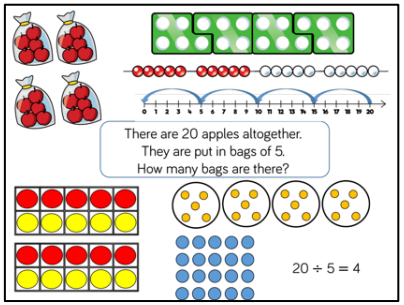
Written Division

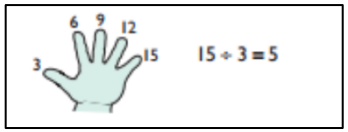
Grouping:

- Use of pictorial representations such as arrays for division e.g. 15÷5=3 There are 3 groups of 5.



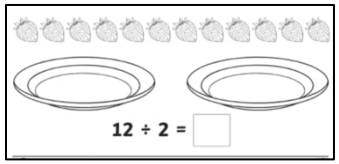


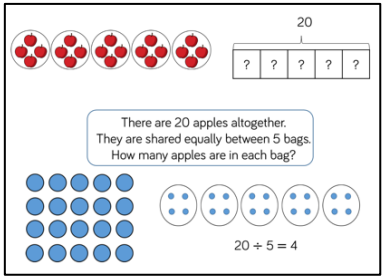
- Children should also use their counting skills to develop some understanding of grouping. E.g. how many 3s in 15



Sharing:

- Using concrete apparatus to show how sharing works.



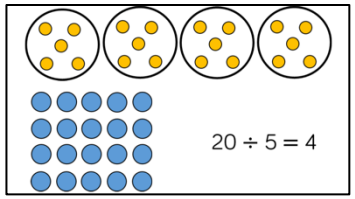


- Children should be able to find ½ and ¼ and simple fractions of objects, numbers, and quantities (practically).

÷ and = signs and missing numbers:

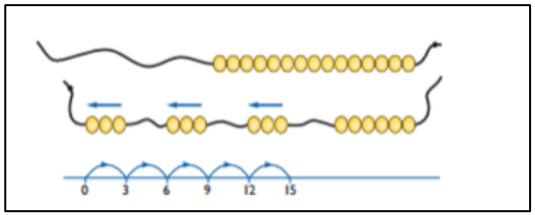
6 ÷ 2 = ?	? = 6 ÷ 2
6 ÷ ? = 3	3 = 6 ÷ ?
? ÷ 2 = 3	3 = ? ÷ 2
? ÷ ? = 3	3 = ? ÷ ?

- Know and understand sharing and grouping – introducing children to the ÷ sign.
- Children should continue to use grouping and sharing for division using concrete apparatus and pictorial representations such as arrays.



Grouping using a number line:

- Group from zero in jumps of the divisor. E.g., how many groups of 3 are there in 15? Use beaded strings and number line.



- Continue work on arrays, Support children to understand how multiplication and division are inverse.