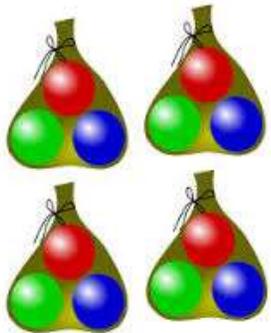
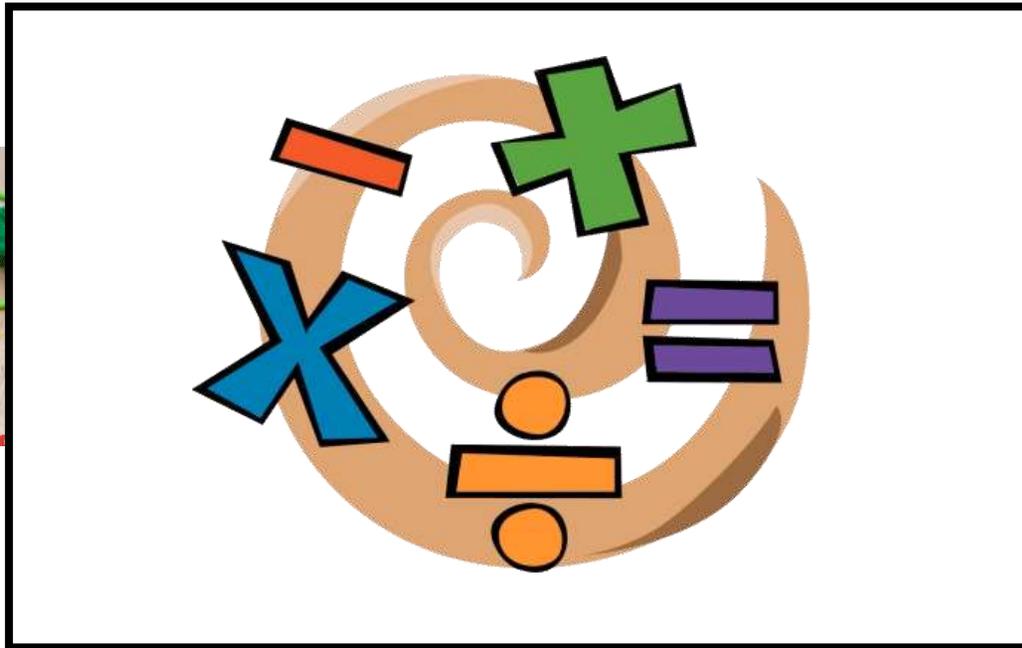


# Approach to Calculation

(Adapted on 2<sup>nd</sup> February 2016 to meet the new curriculum)



	7 seven
	8 eight

**All learning starts with the concrete and practical approach.  
More formal methods will be introduced when the concept of the operation is understood.**

## Rationale

Children will be given a really solid foundation in the basic building blocks of mental and written arithmetic. Through being taught **place value**, they will develop an understanding of how numbers work. By the end of KS1 they should be confident in manipulating 2 digit numbers and able to read and say numbers to 100 and beyond. All number understanding will be developed through practical hands-on experiences, developing into memorisation techniques and pictorial representations, leading onto abstract problem solving and confident number manipulation.

All calculation skills will be presented within a variety of contexts to deepen their understanding and develop mastery skills within mathematics. Where appropriate mathematics will be embedded within all other curriculum subjects to develop life number skills.

Children will be encouraged to discuss and reason to enable to make their thinking clear to themselves and others. Quality discussions will be used to probe and remedy any misconceptions.

It is important to know all of the related vocabulary within each concept and for children to understand and use this confidently (ie. plus, add, addition, total, sum, altogether).

# Place Value

Children read, use and understand this **vocabulary**: tens, ones, digits, greater than, less than, order, more, less, fewer, altogether, equal to

## Foundation

Count actions or objects accurately showing 1:1 correspondence.

**Count from 0 to 10 then 20 reliably.**

Begin to add/count (1's, 2's, 5's, 10's) on mentally using rhymes and begin to record in the context of play or practical activities e.g.;

Recording with marks, stamps or objects

Join two groups together by counting all of them.

**Recognise the written numerals to 10 then 20.**

**Recognise the pattern/organisation of dots on a dice (or other apparatus) first by counting and then by recognition.**

Use the language of 1 more by adding one to a group e.g. tower of cubes

**Recognise and order the digits representing numbers to 20.**

**Identify the number one more or one less than a given number under 20.**

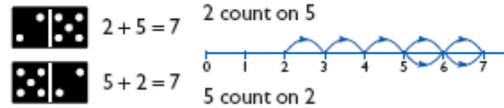
Introduction of tens and ones in a variety of ways such as money (10x1p coins), Numicon, cups.... Anything that visually shows the difference between 10 and 1.

## Year 1

**Count to and across 100 forwards and backwards beginning with 0 or 1 or any given number.**

**Identify the '1 more than' number from a random number to 100 and beyond.**

Count on from the first number using fingers, objects, number lines, themselves etc.

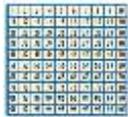


Teacher should model drawing jumps on the numbered number line to support understanding of the mental method.

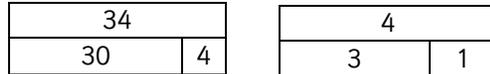
**Count, read and write numbers to 100 in numerals (and words): count in multiples of 2, 5, 10.**

**Recognise 2 and 3 digit numbers as hundreds, tens and ones.**

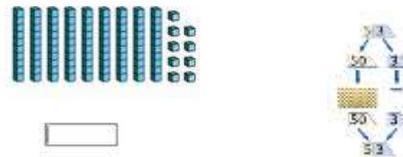
Apply the skill of counting in 10's when counting a group of tens rods – mentally identifying the next ten. Use the hundred square to find 10 more by looking at the number underneath.



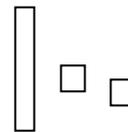
Use Bar Model to reason.



Learn place value of 2 digit numbers to add in tens and ones.



Progress to draw tens and ones to show a partitioned number.



Use partitioning to add two, two digit numbers together.

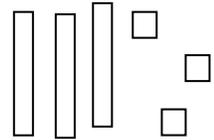
This can be done using a variety of resources such as money (10x1p coins), Numicon, cups.... Anything that visually shows the difference between 10 and 1.

## Year 2

**Identify, represent and estimate numbers using different representations, including number lines, teens and ones, physical everyday objects, Numicon.....**

Use Bar model.

Draw tens and units to show partitioned numbers.



**Count in steps of 2, 3, 5 from 0, and in tens from any number, forwards and backwards.**

Using number sticks, real objects, songs, actions.....

**Compare and order number from zero up to 100 using < > =**

Use correct vocabulary of greater than, fewer than (countable items), less than (singular mass nouns)

**Count, read and write numbers to 100 in numerals (and words): count in multiples of 2, 5, 10.**

# Addition

Children read, use and understand this **vocabulary**: and, more, add, addition, sum, total, altogether, double, equal, the same as, calculation, number sentence, difference, plus, fewer (anything you can count), less (for singular mass nouns ie, salt, money), commutative, inverse.

## Foundation

**Count from 0 to 10 then 20 reliably.**

Begin to add/count (1's, 2's, 5's, 10's) on mentally using rhymes and begin to record in the context of play or practical activities e.g.;

Recording with marks, stamps or objects  
Join two groups together by counting all of them.

Combine 2 groups of objects to say a total. – Practical no recording.



Use the language of 1 more by adding one to a group e.g. tower of cubes

**Identify the number one more or one less than a given number under 20.**

Add three groups of objects together including 0.



Double a given amount of objects and say the total. e.g. 5 fingers add 5 fingers makes 10 fingers.

**Recall doubles to 5+5**

Add in stories and role play, encouraging use of language for

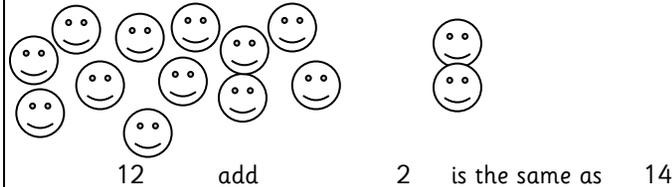
## Year 1

**Read write and interpret mathematical statements involving (+) addition and (=) equals in any order (commutative).**

Understand the concept of equality before using the = sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as the 'answer'. E.g.  $2 = 1+1$  and  $2+3 = 4+1$   
Begin to record addition number sentences using + and =.

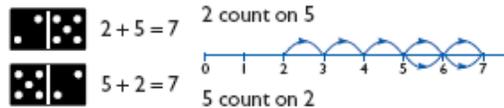
**Add one digit and two digit numbers to twenty, including zero.**

Combine 2 or 3 groups of objects. Through cutting and sticking and drawing symbols to represent an addition sentence



Manipulate Bar model.

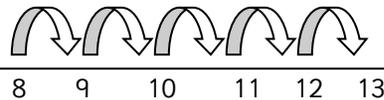
Count on from the first number using fingers, objects, number lines, themselves etc.



Teacher should model drawing jumps on the numbered number line to support understanding of the mental method.

Add through 10, some children bridging through 10.

$8+5 = 13$  using a number line



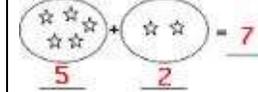
Learn that addition can be done in any order and are taught that it is more efficient to put the larger number first.

Retain a number in head and add on the given number using sticky fingers.

## Year 2

**Read write and interpret mathematical statements involving (+) addition and (=) equals in any order (commutative).**

**Solve problems with addition** using concrete objects and pictorial representations, including those involving numbers, quantities and measures.

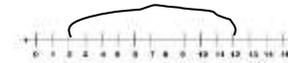


Add 3 single digit numbers to any number under 100 using a chosen strategy.

Manipulate Bar model.

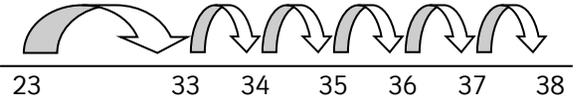
**Count in 10's and 1's from any number.**

Represent 10 jumps (bigger) and 1's jumps on a number line.



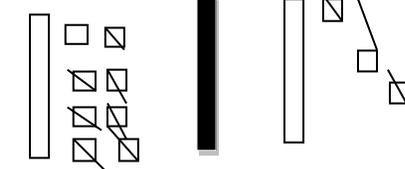
Progress to draw blank number lines and draw how many they are counting on.

$23+15$



OR draw tens and units – add the units first – cross off 10 units 'Stop-and-swap' draw a ten.

$18 + 13 = 31$



addition.



9 and 1 more is 10  
9 add 1 equals 10  
 $9 + 1 = 10$



Use number lines and 100 squares (number tiles) to identify one more and other patterns.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Use the actions to put a number in head and add on one sticky finger – identifying 1 more.

Retain a number in their heads and count on an amount using sticky fingers up to 20.



Combine 2 or 3 groups of objects through cutting and sticking and picture representation of an addition sentence.



3 and 2 makes 5

Missing numbers need to be placed in all possible places within the number sentence.

$$4 + \square = 7$$

$$\square + 2 = 8 \text{ To be solved using objects or number lines.}$$

Also cover up operations as well as numbers.

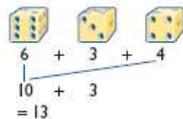


$$3 + \square = 5$$



Use addition in terms of 'how many more' to calculate the *difference* practically. – Bead strings, cube towers etc.

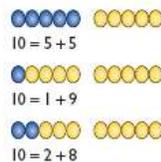
Begin to add 3 single digit numbers, by looking for pairs of numbers or doubles to aid mental calculation.



**Represent and use addition number bonds to 20.**

Memorise and reason with number bonds.

Learn number bonds to 10 and 20 pictorially using beads and Numicon.



Investigate and reason the effect of adding zero.

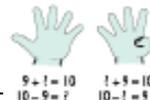
**Solve one step problems that involve addition using concrete objects and pictorial representations.**

Begin to use addition to solve simple word problems.



Problems should include the terms: *put together, add, altogether, total, distance between, difference between, more than, to that pupils develop the concept of addition and are enabled to use these operations with flexibility.*

Begin to recognise that addition is the inverse of subtraction.



Add a two digit number and multiples of 10.  $34 + 20 =$

Add two 2-digit numbers by partitioning.

$$23 + 41$$

$$= 20 + 3 + 40 + 1$$

$$= 40 + 20 + 3 + 1$$

$$= 60 + 4$$

$$= 64 + 4$$

$$48 + 36 =$$

$$40 + 30 \quad 8 + 6$$

$$70 + 14 \quad 70 + 10 + 4 =$$

$$\begin{array}{r} \textcircled{2}3 + \textcircled{4}1 \\ 20 + 40 \quad 3 + 1 \\ 60 + 4 = 64 \end{array}$$

(bridging a ten)

Use objects and pictorial representation to understand addition facts and identify the missing number to the number fact.

Solve simple problems within a practical context involving; addition of money, combining amounts to make a particular value, adding measurements, calculating time totals and differences.

Including missing numbers:

$$3 + ? = 10$$

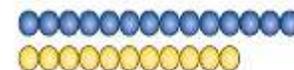
$$? + 24 = 39$$

$$3 + ? = 10 - 5$$

$$70 + ? = 20 + ?$$

**Find the difference between numbers by counting on using sticky fingers.**

Find the difference by counting on the number line.



The difference between 11 and 14 is 3.

$$14 - 11 = 3$$

$$11 + \square = 14$$



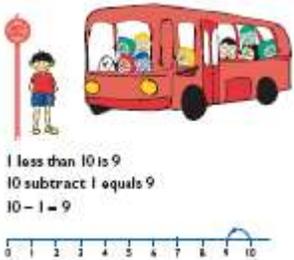
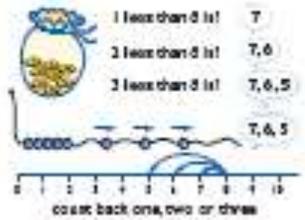
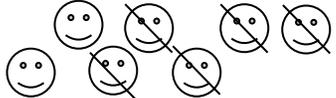
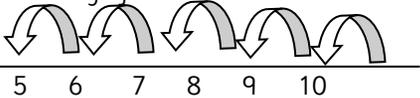
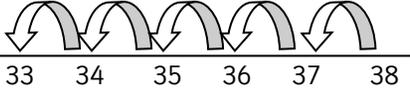
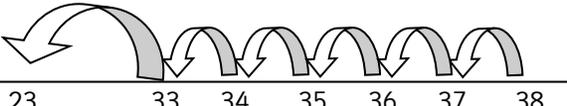
Investigate using apparatus to understand and know that subtraction is the inverse of addition.

**Recording addition in columns to prepare for formal written methods with larger numbers.**

Choose the most appropriate strategy independently to solve a range of 1 and 2 step addition problems.

# Subtraction

Children read, use and understand this **vocabulary** : *Less, subtract, subtraction, leaves, left, fewer, decrease, minus, difference, equal, the same as, calculation, number sentence, reduce*

Foundation	Year 1	Year 2
<p><b>Count backwards from 10 to 0 reliably.</b></p> <p>Begin to subtract (1's, 2's, 5's, 10's) mentally using rhymes and begin to record in the context of play or practical activities e.g.; Recording by taking away / hiding / crossing out objects</p> <p>Remove a number of objects from a group including 0.</p> <p>'I have 5 apples and I take one away how many are left?'</p> <p>Use the language of 1 less by taking 1 from a group e.g. tower of cubes</p> <p><b>Count backwards from 20 to 0 reliably</b></p> <p>Subtract in stories such as role play encouraging use of language of subtraction.</p>  <p>1 less than 10 is 9 10 subtract 1 equals 9 <math>10 - 1 = 9</math></p>	<p><b>Children begin to record subtraction number sentences using - and =.</b></p> <p>Understand the concept of equality before using the = sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as the 'answer'. E.g. <math>2 = 5 - 3</math> and <math>5 - 3 = 10 - 8</math></p> <p><b>Subtract one digit and two digit numbers to twenty, including zero.</b></p> <p>Manipulate Bar model.</p> <p>Count back 1 from the first number using fingers, objects, themselves etc.</p>  <p>1 less than 8 is 7 2 less than 8 is 7, 6 3 less than 8 is 7, 6, 5 7, 6, 5 count back one, two or three</p> <p>Learn that subtraction must start with the larger number and count back the smaller number.</p> <p>Practically subtract two single digits then three numbers including 0.</p> <p>Represent a subtraction calculation by drawing a set and crossing some out.</p>  <p>7 take away 5 leaves 2</p> <p>Teacher should model drawing jumps on the numbered number line to support understanding of the mental method.</p> 	<p><b>Subtract numbers using concrete objects, pictorial representations, and mentally.</b></p> <p>Retain a number in head and subtract the given number using sticky fingers.</p> <p>Use concrete objects and pictorial representations to solve a simple subtraction problem.</p> <p>Manipulate Bar model.</p> <p>Learn that subtraction must start with the larger number and count back the smaller number. IT IS NOT COMMUTATIVE.</p> <p>Learn to represent jumps backwards in tens and ones on the number line.</p> <p>Progress to draw blank number lines and draw how many they are counting back.</p> <p><math>38 - 5</math></p>  <p>33 34 35 36 37 38</p> <p>Progress to taking away just tens. <math>25 - 10 = 15</math> <math>35 - 20 = 15</math></p> <p>Progress to jumping in tens then ones. – Units first as the children are used to then when using tens and units.</p> <p><math>38 - 15 =</math></p>  <p>23 33 34 35 36 37 38</p> <p>Subtract 3 single digit numbers from any number under 100 using a chosen strategy.</p>

Use a number line and one hundred squares (floor tiles) to identify one less and other patterns.

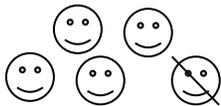


**Identify a number 1 less than a number under 20.**

Retain a number in their heads and count back an amount using sticky fingers from 20.



Representation a subtraction sentence pictorially.



5 take away 1 leaves 4

Retain a number in their head and take away a single digit from a given number under 100 using sticky fingers.

Solve missing number problems including spaces in all possible places within the number sentence. Also when operations are covered up.



Find the difference using subtraction.



$$8 - 5 = 3$$

Represent and use related subtraction facts within 20.

Memorise and reason with subtraction number bonds to 10 and 20.

$$\text{If } 16 - 7 = 9$$

$$\text{Then } 7 = 16 - 9$$

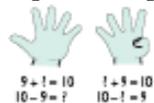
To understand the effect of subtracting zero.

Apply the skill of counting back in 10's when subtracting a group of tens rods – mentally identifying the ten fewer.

Begin to subtract to solve simple word problems.

*Problems should involve the terms takeaway, distance between, difference between, less than, fewer than...*

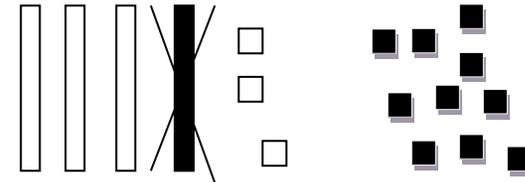
Begin to recognise that subtraction is the inverse of addition.



When using place value to subtract over a tens boundary use 10 rods made of multilink, physically “crack-open” a ten to produce 10 units and then complete the calculation.

Draw tens and units. Subtract over the boundary by cracking-open a ten and crossing it out and then draw the 10 single units. Then continue the calculation.

$$43 - 9 =$$



Recognise and use the inverse when solving problems such as missing numbers or operations and to check accuracy of answers.

$$100 - \square = 40$$

Begin to solve written calculations using jottings, beginning to record formally when subtracting larger 2 digit numbers by partitioning the second number only.

$$\begin{aligned} 37 - 12 &= 37 - 10 = 27 \\ &= 27 - 2 \\ &= 25 \end{aligned}$$

Subtract by bridging through 10 where necessary. (subtract units first)

$$\begin{aligned} 33 - 15 &= 33 - 5 = 28 \\ &= 28 - 10 \\ &= 18 \end{aligned}$$

**Practise subtraction facts to twenty to become increasingly fluent in deriving facts such as:**

$$10 - 7 = 3$$

$$7 = 10 - 3$$

$$100 - 70 = 30$$

$$70 = 100 - 30$$

**Choose the most appropriate strategy independently to solve a range of subtraction problems.**

Solve simple problems within a practical context involving; Subtraction of money, reducing amounts to make a particular value, change, subtracting measurements, calculating time differences.

**Recording subtraction in columns to prepare for formal written methods with larger numbers.**

# Multiplication

Children read, use and understand this vocabulary: *doubling, groups of, sets of, repeated addition, arrays, pattern, the same, amount, value, altogether, equals, the same as, total, multiply, multiplication, multiple, times, odd, even.*

## Foundation

Begin to count in groups of 1's, 2's, 5's and 10's using objects, recite counting, songs, rhymes and stories.

Count related groups of the same size in games and practical activities. E.g. Noah's Ark, counting boots, gloves, socks.

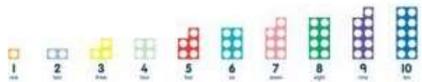
Represent their groupings with pictorial representation e.g. stamps, cutting and sticking, stamps, drawings, photographs.



Combine 2 or more groups of the same number of objects to say a total.



Use Numicon to visualise the repeated adding of the same number. Draw around or print as a way of recording.



Reinforce that multiplication is adding the same number repeatedly.

Organise groups of things into arrays e.g. two rows of 3 eggs in a box makes six, 5 digits on 2 hands make a total of ten.

## Year 1

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

Manipulate Bar model.

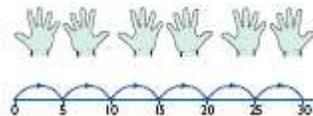
Group objects in 1's, 2's, 5's and 10's.

Start to use visual images as repeated addition.



$$8+8+8+8=32$$

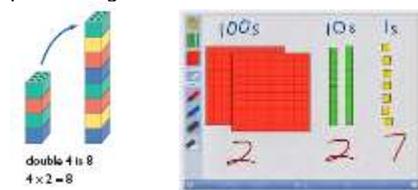
Model how to use number tracks in 1's, 2's, 5's and 10's to reinforce counting in jumps of the same size.



Identify patterns of counting in jumps of 1's, 2's, 5's and 10's. E.g. on a 100 square, drawing around and printing Numicon, record them in pictures which they can explain to others.

Understand and identify odd and even numbers and relate this to the two times table.

Double numbers to 10+10 and link this with multiplying by 2 practically.

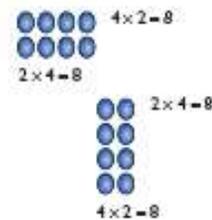


## Year 2

Use repeated addition number sentences to calculate multiplication;

$$4 \times 3 = 3+3+3+3$$

Show visual representation of a calculation using an array and record this as a number sentence. Be able to discuss this with others.



Use Numicon to make the visualisation of repeated addition more concrete.

Can progress to recording a calculation demonstrating the equivalent repeated addition.

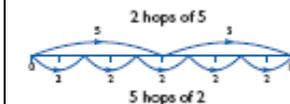
$$5 \times 3 = 5 + 5 + 5$$

**Calculate mathematical statements for multiplication using multiplication table and writing them using signs.**

Manipulate Bar model.

Explore the fact that multiplication, like addition, can be done in any order (commutative).

Calculate multiplication questions by jumping in groups on a number line.



Investigate rules that apply to answers of multiples. E.g. multiples of 10 always end with a 0.

Extend into problem solving e.g. how many digits on 4 hands? etc.

Use the tally system to identify groups of 5 and then count in 5's.

**Know the answer is the same no matter what the object is.**

**2 chairs + 2 chairs = 4 = the same as  
2 teddies + 2 teddies = 4 = the same**

**as**

**2 chairs + 2 teddies = 4**

### Recall doubles of numbers to 10+10

**Identify the number 10 more than a multiple of 10.**

Collect and make sets using practical apparatus. Then record this as sets or groups.



Investigate everyday objects that are arranged in arrays and use this organisation to solve problems e.g. chocolate bars, egg boxes, chocolate boxes,

Draw groups/sets within an array to match a calculation.



- This array could be  $4 \times 2$  but if it was placed on a whiteboard and turned it would show  $2 \times 4$

**Know that an array can be organised both ways.**

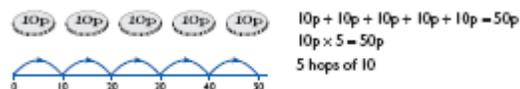
**$4 \times 5 = \text{or } 5 \times 4 =$**

**Rote count on in 2's, 10's and beginning to in 5's from 0**

Read the calculation and solve it through memory recall or pictorial representation.

Solve practical problems involving multiplication including measure, shape and money such as;

There are 4 bikes. Each bike has 2 wheels, how many wheels is that?



Each cup holds 10ml how much would 7 cups hold?

Counting in 5's to add minutes.

### Recall and use multiplication facts for the 2's, 5's, and 10's.

**Connect them to each other – numbers that are common to all. (Link to doubling).**

Progress to develop an understanding of the multiplication facts of numbers to work out the missing numbers e.g.

$$\square \times \bigcirc = 15 \quad 4 \times \square = 8$$

Use multiplication to solve more complex word problems including those using measure, shape and money.

One teddy is 5cm, It takes 10 teddies to measure the length of a table – how long is the table?

Use partitioning to multiply two digit numbers by a single digit.

$$12 \times 2 =$$

$$10 \times 2 = 20 \quad 2 \times 2 = 4$$

$$20 + 4 = 24$$

$$12 \times 2 =$$

$$13 \times 5 =$$

$$10 \times 5 = 50$$

$$3 \times 5 = 15$$

$$50 + 10 + 5 = 65$$

**Chn to progress to make links between the inverse of multiplication and division.**

$$4 \times 5 = 20$$

$$20 \div 4 = 5$$

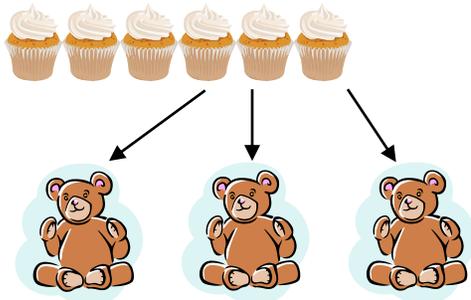
# Division

Children read, use and understand this **vocabulary**: *grouping, sharing, halving, groups, divide, division, groups, sets, each, remainder, equal, fair, even, odd*

## Foundation

Understand practical division as grouping, sharing, halving e.g. toys, snack, PE equipment, buttons, beads etc.

Share objects practically into equal groups e.g.; "Share the cakes between the three bears. How many cakes will they each have?"



Organise a tea party and sharing plates, cutlery and food emphasizing that to be fair everyone needs to be the same.

Extend a problem e.g. 'Suppose there were 3 people to share the sweets with instead of 2.'



Bake or use play dough with Numicon shapes and share out.



Investigate with Numicon to find how many smaller.

## Year 1

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

Manipulate Bar model.

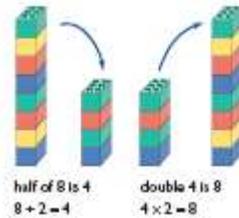
Share objects practically into equal groups



Repeat this activity with even numbers under 20.

Investigate with Numicon pieces. E.g. Find how many smaller Numicon pieces fit over a larger piece. E.g. five 2's will fit over a 10 piece. Children record this by drawing around the Numicon.

Halve to match doubling and understand it is the opposite.



**Understand that halving is the opposite of doubling.**

Sort a set of objects by grouping equally into 2's, 3's, 4's etc.

Begin to use practical grouping to solve word problems.

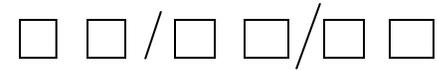
e.g.  
"There are 20 books in the library and 4 shelves. How many books on each shelf?"

Problem solve using characters of a story, events or real life situations.

## Year 2

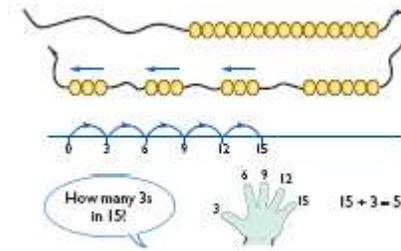
Use grouping of objects practically and relate to real life situations.

Use pictorial representation of sharing and grouping.



Begin to divide a number by counting back in equal steps model this on a number line.

Begin to understand division as repeated subtraction.



**Solve problems involving division using materials, arrays, mental methods and division facts in a variety of contexts.**

Manipulate Bar model.

Begin to record their practical division as a written calculation using  $\div$  and  $=$  in a number sentence.

Learn that division is the inverse of multiplication.

Use a variety of language to describe division.

Use the multiplication and division facts to work out missing numbers.

e.g.;

$$12 \div \square = 4$$

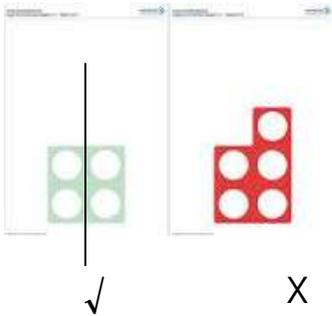
Numicon pieces fit over a larger piece. E.g. five 2's will fit over a 10 piece.

Use life resources that show arrays to organise sharing.



Ice cube trays, egg cartons etc.

Investigate Numicon resources and see that they can easily find half of an even number.



**Recall the related halving fact to the doubling fact.**

Make links to understand that multiplication is the inverse to division.

Use counters and apparatus to represent how many would be in each group.



Draw as they are sharing to represent their thinking.

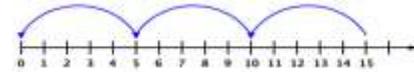
Solve more complex division word problems.

“There are 12 daffodil bulbs. Plant 3 in each pot. How many pots are there?”

Share non-moveable objects by circling and grouping.



Use number tracks to count backwards as repeated subtraction.



$$15 \div 5 =$$

$$15 - 5 - 5 - 5 = 3 \text{ jumps}$$

**Investigate, recognise and recall patterns of odd and even numbers.**

**Recognise, find and name a half as one of two equal parts of an object, shape or quantity.**

**Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.**

This needs to be done practically with a variety of objects to heighten discussion and develop understanding. CHn to experience the process.

Everyday situations and objects should be used.

Part of an apple.

Part of the juice in the glass.

Part of piece of paper.

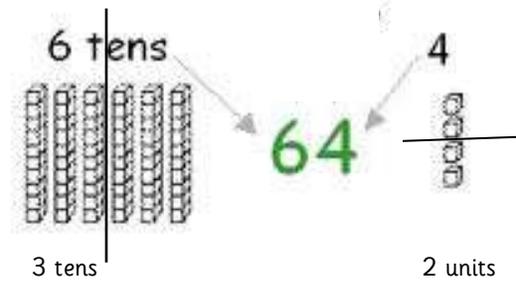
Part of the day/hour.

**Recognise, find and name 1/3, 1/4, 2/3, 3/4...of length shape, sets of objects or quantity.**

Equivalence of fractions.

Begin to relate division to fractions of numbers and shapes – e.g. 1/2 and 1/4 is the same as dividing by 2 and dividing by 4 respectively.

As a strategy practically partition two digit numbers to half them.



Partition two digit numbers to aid halving.

$$\begin{array}{r} 84 = 80 \quad 4 \\ = 40 \quad 2 = 42 \end{array}$$

$$\begin{array}{r} 76 = 70 \quad 6 \\ 35 \quad 3 = 38 \end{array}$$

**Count in fraction up to 10 starting at any number in 1/2 and 1/4.**

Use number stick/number lines to help with this.

**Investigate the concept of fractions as numbers and that they can add up to more than 1.**



**Investigate, recognise and recall patterns of odd and even numbers.**