Calculating in Key Stage 1

A handy guide for our families

The curriculum states that children in KS1 should be able to do the following:

Number: Addition and Subtraction	
Year 1	**Year 2**
Pupils should be taught to: • Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs • Represent and use number bonds and related subtraction facts within 20 • Add and subtract one-digit and two-digit numbers to 20, including zero • Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? - 9	**Pupils should be taught to solve problems with addition and subtraction:** • Using concrete objects and pictorial representations, including those involving numbers, quantities and measures • Applying their increasing knowledge of mental and written methods • Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 **Add and 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 • Adding three one-digit numbers • Show that addition of two numbers can be done in any order (commutative) and subtractions of one number from another cannot • Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

Number: Multiplication and Division	
Year 1	**Year 2**
Pupils should be taught to: • 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	**Pupils should be taught to:** • Recall and use multiplications and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplications (x), division (÷), and equals (=) signs • Show that multiplications 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

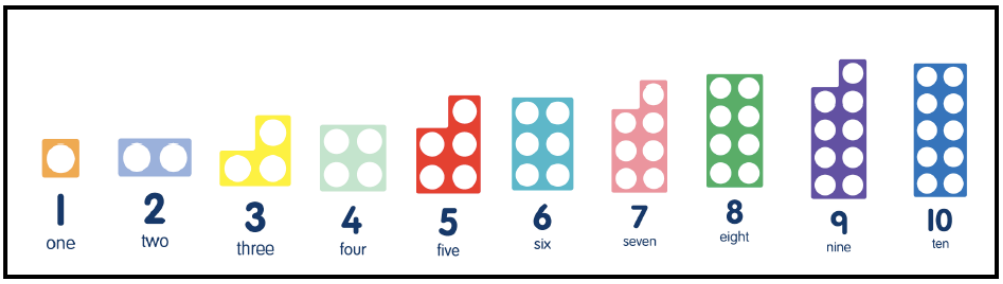
To help children achieve these objectives, we support their understanding by using a combination of real objects and pictures. Once children are secure with this, we move onto more formal written methods of calculating.

This guide aims to help you understand how we calculate in KS1 so that you can support your child's calculation work at home.

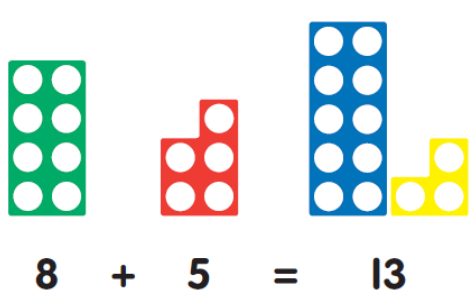
Addition and Subtraction

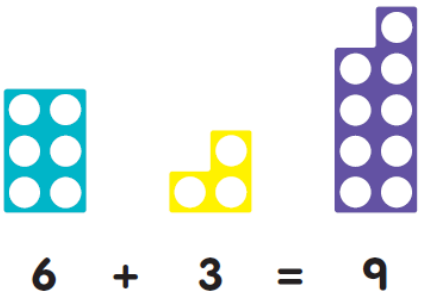
Numicon:

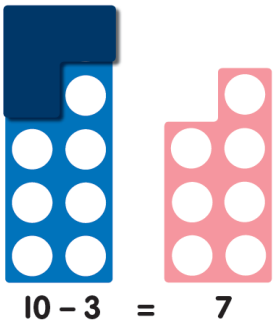
Numicon is introduced to children in the Early Years. Children learn that the coloured plates represent different **values**.

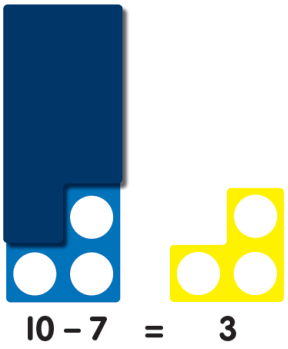


In Year 1, children use Numicon to help them calculate **addition** and **subtraction** problems.

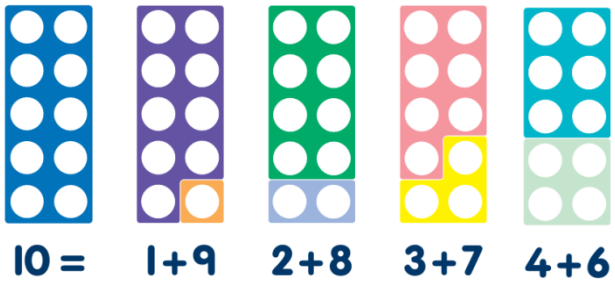








Numicon is also used to secure children's understanding of **number bonds**.

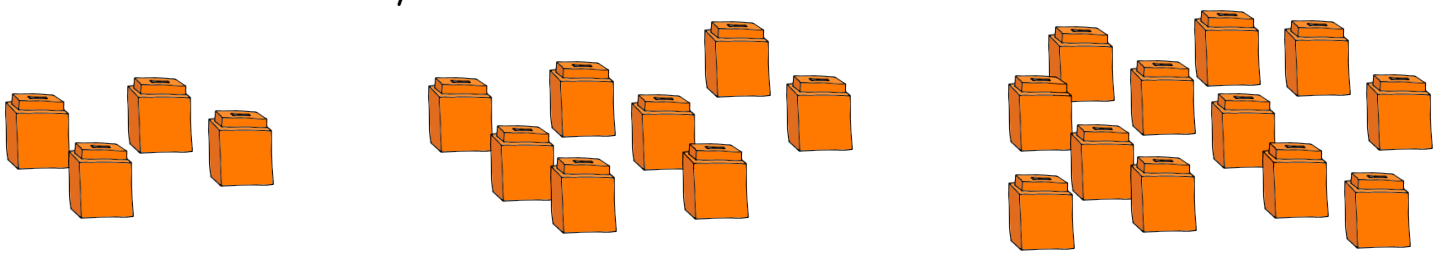


By the end of Year 1, children need to know pairs of numbers (**bonds**) that can be added together to make **any number** between 0 and 20.

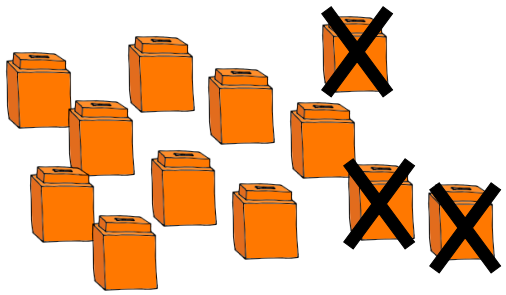
Objects:

Children will have counted all kinds of different objects in Early Years.
In Year 1, children start to combine sets of objects together in order to find the total. This is early addition. They also start to remove objects from a larger set. This is early subtraction. They work with numbers up to 20.

When they have done this practically (lots of times) the children will start to write number sentences to show what they have done:



4 + 8 = 12



12 - 3 = 9

By the end of Year 2, children should understand that they can add numbers in any order and get the same answer. This is called **commutativity**. They cannot do this with subtraction.

There is also an expectation that children can work out **related number facts**. For example, if children know the following:

4 + 8 = 12

They should also be able to work out these related number facts:

8 + 4 = 12 *or* 12 = 8 + 4
12 - 8 = 4 *or* 4 = 12 - 8
12 - 4 = 8 *or* 8 = 12 - 4

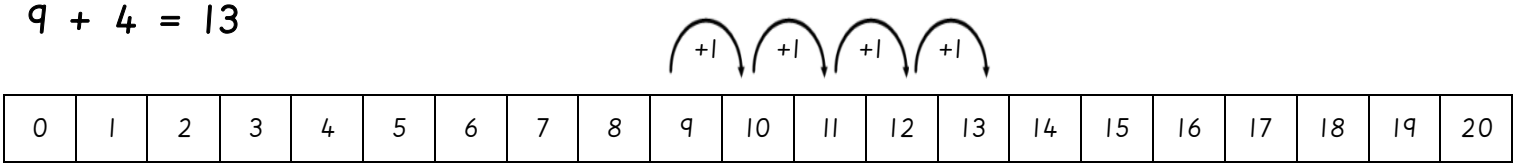
We support children's understanding of this through lots of practical work using objects. Once confident, we move children on to working out missing number problems, again using objects to support their understanding.

Number tracks and lines:

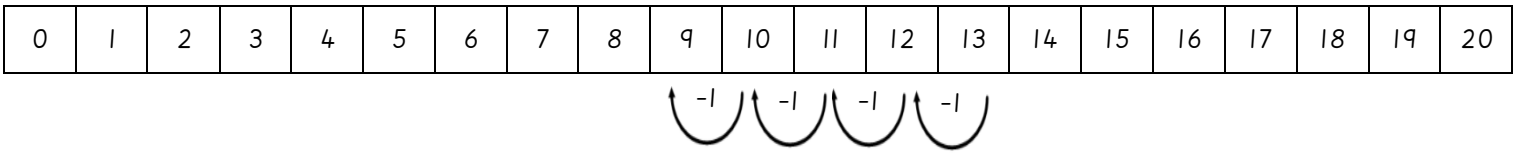
When children demonstrate that they can add and subtract using objects, we move them onto **number tracks** and **number lines**.

Children 'draw' a calculation on the number track or number line

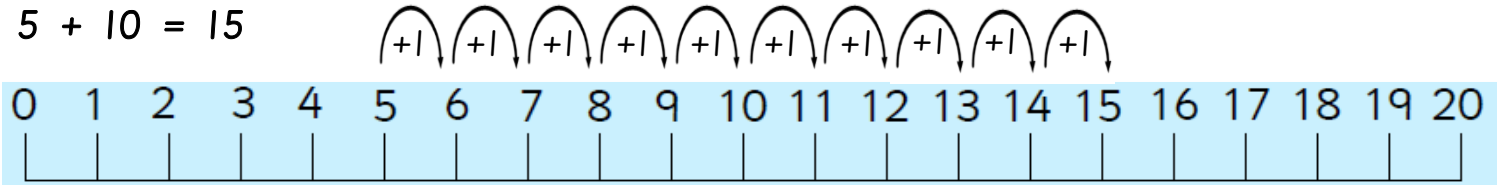
9 + 4 = 13



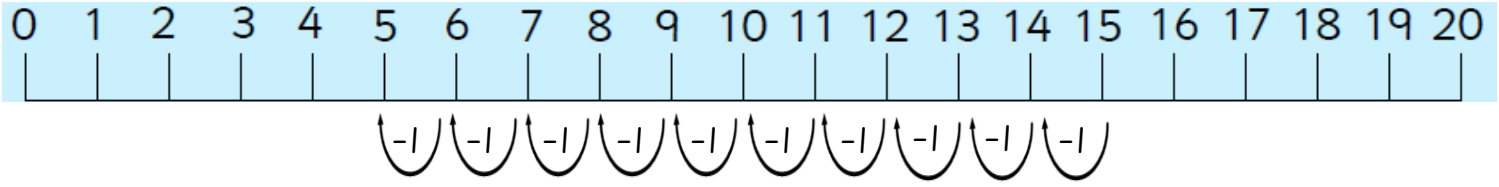
13 - 4 = 9



5 + 10 = 15



15 - 10 = 5

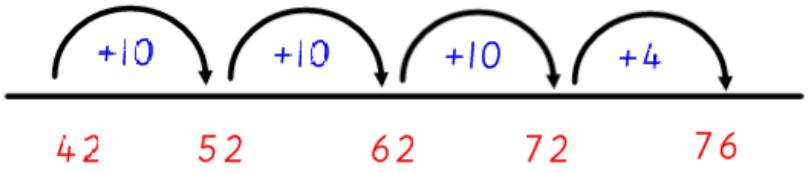


As children gain confidence in using number lines and number tracks, we encourage them to draw their own.

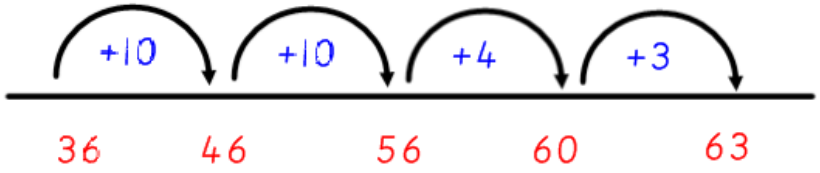
We expect children in Year 2 to be able to draw **blank number lines** and calculate in **larger jumps**, using their knowledge of **number bonds** and **adding/subtracting tens** to help them.

Children in Year 2 should be calculating working with numbers up to 100.

42 + 34 = 76

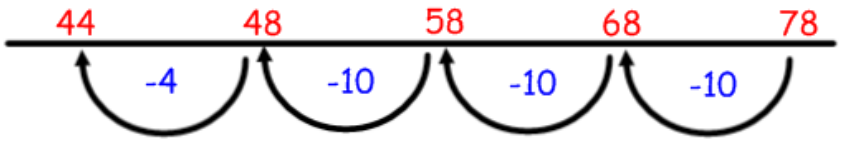


36 + 27 = 63

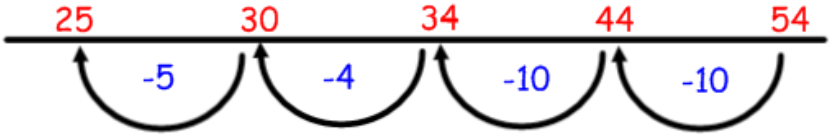


The 7 from the 27 has been **partitioned** (split) into 4 + 3 so that you can 'jump' to the next multiple of 10 and then add on the rest.

78 - 34 = 44



54 - 29 = 25

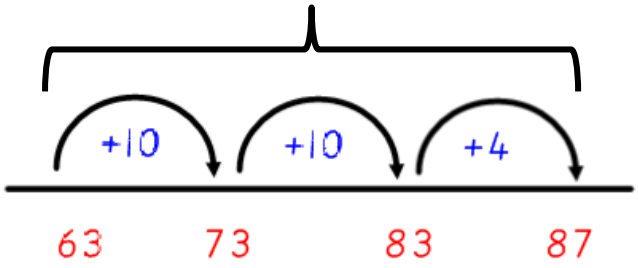


The 9 from the 29 has been **partitioned** (split) into 4 + 5 so that you can 'jump' to the next multiple of 10 and then add on the rest.

In Year 2, children need to understand that they can calculate the answer to a subtraction problem by **finding the difference**. We encourage them to calculate this on a number line. Finding the difference is a particularly useful strategy when children are asked to compare totals in a graph or table.

87 - 63 = 24

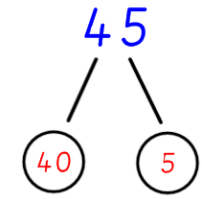
This is the difference between the two numbers.



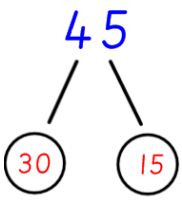
Partitioning

When children leave Year 1, they should be able to confidently add and subtract numbers up to 20. As they move into Year 2, children must start to calculate with number up to **100**. To do this, children need to understand what each digit represents in a **2 digit** number. We call this **place value**. Prior to starting any addition or subtraction work, we ensure that children understand the value of each digit in a 2 digit number and can **partition** (split) numbers in different ways. This is similar to **number bond** work that the children will have done in Year 1.

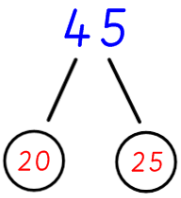
Children do a lot of work with **Base Ten** equipment to help them understand **tens** and **ones**.



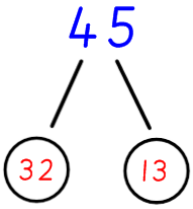
tens	ones
4	5

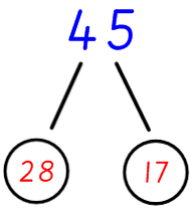


tens	ones
3	15



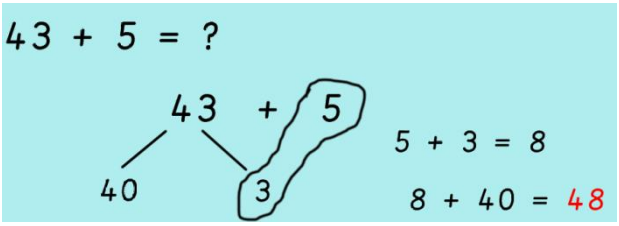
tens	ones
2	25





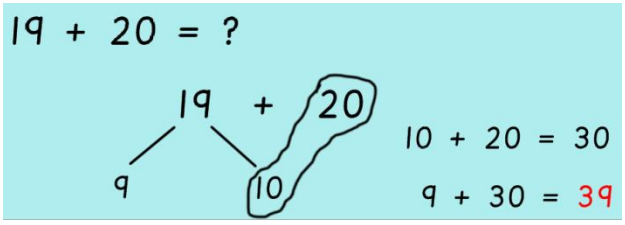
Once children in Year 2 have a good understanding of place value and can partition 2 digit numbers in different ways, they can use these skills to help them add and subtract.

Adding a **2 digit** number to a **1 digit number**



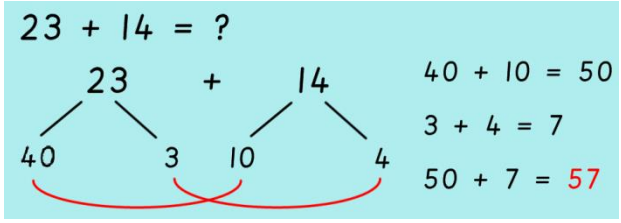
Step 1: Partition the 2 digit number
Step 2: Group the ones
Step 3: Add the ones together
Step 4: Add on the tens

Adding a **2 digit** number to a **multiple of 10** (a number that is in the 10x table)



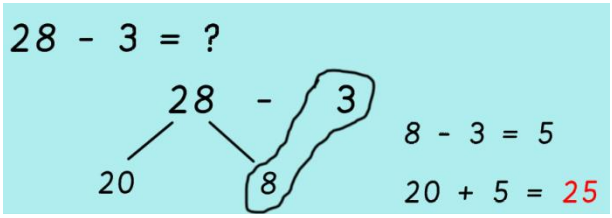
Step 1: Partition the 2 digit number that is **not** a multiple of 10,
Step 2: Group the tens
Step 3: Add the tens together
Step 4: Add on the ones

Adding a **2 digit** number to a **2 digit** number



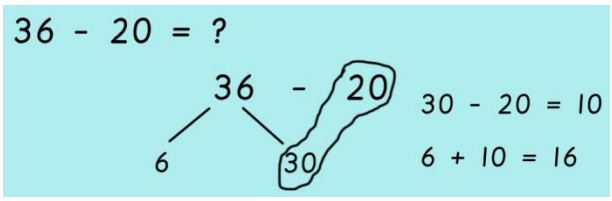
Step 1: Partition the 2 digit numbers
Step 2: Group the tens
Step 3: Group the ones
Step 4: Add the tens
Step 5: Add the ones
Step 6: Add the total of the tens and ones together

Subtracting a **1 digit** number from a **2 digit number**



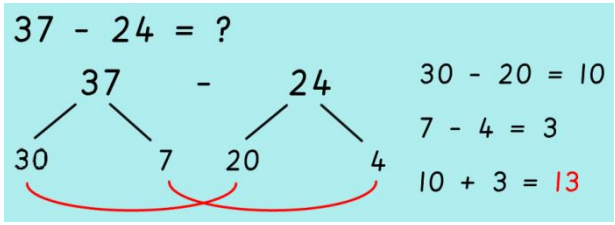
Step 1: Partition the 2 digit number
Step 2: Group the ones
Step 3: Subtract the ones
Step 4: Add the tens back on

Subtracting a **2 digit** number from a **multiple of 10** (a number that is in the 10x table)



Step 1: Partition the 2 digit number that is **not** a multiple of 10,
Step 2: Group the tens
Step 3: Subtract the tens
Step 4: Add the ones back on

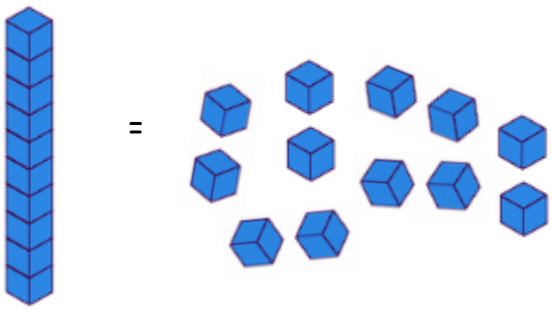
Subtracting a **2 digit** number from a **2 digit** number



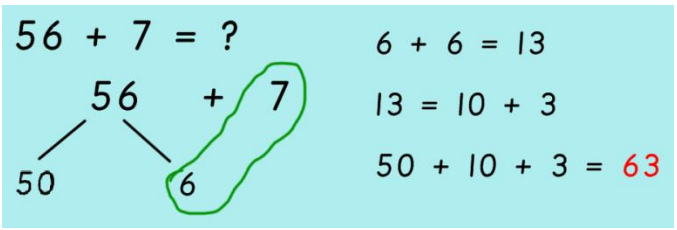
Step 1: Partition the 2 digit numbers
Step 2: Group the tens
Step 3: Group the ones
Step 4: Subtract the tens
Step 5: Subtract the ones
Step 6: Add the total of the tens and ones together

Sometimes, children are required to **exchange** tens and ones in order to complete a calculation. They have lots of practise doing this practically, using Base Ten equipment, before moving on to written jottings.

Children need to understand that **ten ones have the same value as one ten** and vice versa.

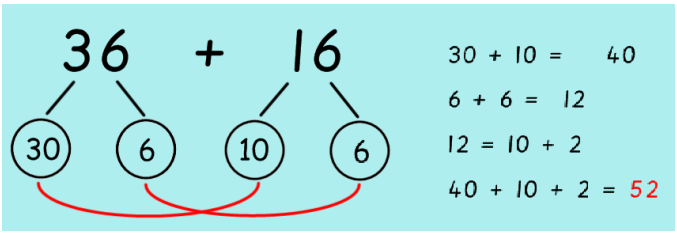


Adding a **2 digit** number to a **1 digit number** (with exchanging/regrouping)



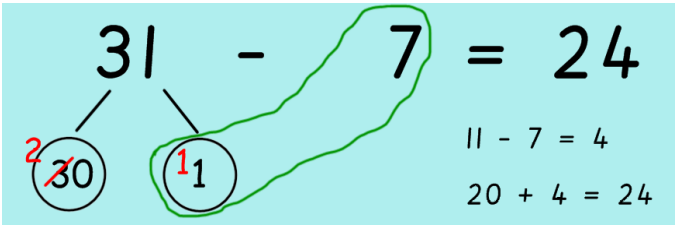
Step 1: Partition the 2 digit number
Step 2: Group the ones
Step 3: Add the ones together
Step 4: Partition the new 2 digit number
Step 5: Add the partitioned number to the tens

Adding a **2 digit** number to a **2 digit** number (with exchanging/regrouping)



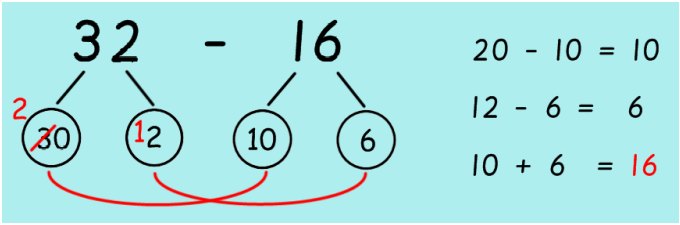
Step 1: Partition the 2 digit numbers
Step 2: Group the tens
Step 3: Group the ones
Step 4: Add the tens
Step 5: Add the ones
Step 6: Partition the new 2 digit number
Step 7: Add the partitioned number to the tens.

Subtracting a **1 digit** number from a **2 digit number** (with exchanging/regrouping)



Step 1: Partition the 2 digit numbers
Step 2: Group the ones
Step 3: **Borrow** one ten and **exchange** it for ten ones
Step 4: Add the exchanged ten to the ones
Step 5: Subtract the ones
Step 6: Add the tens back on

Subtracting a **2 digit** number from a **2 digit** number (with exchanging/regrouping)



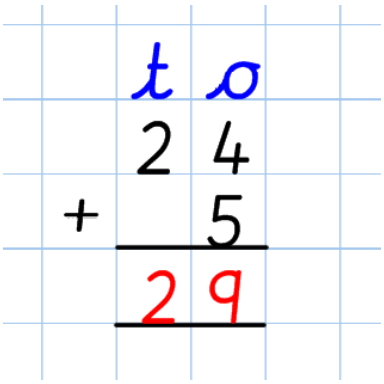
Step 1: Partition the 2 digit numbers
Step 2: Group the tens
Step 3: Group the ones
Step 4: **Borrow** one ten and **exchange** it for ten ones
Step 5: Add the exchanged ten to the ones
Step 6: Subtract the tens
Step 7: Subtract the ones
Step 8: Add the totals together

Column method

Once children have demonstrated a secure understanding of how to use partitioning to solve addition and subtraction problems, we introduce them to **column method**. It is not a requirement that children use this method to calculate in Year 2, however it does prepare them for formal written methods in KS2.

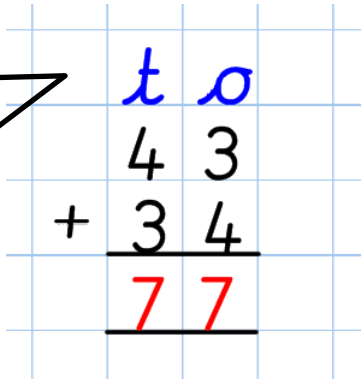
Column method is always taught alongside the use of Base Ten equipment. This allows children to understand where **borrowed** and **exchanged** tens and ones come from.

Addition



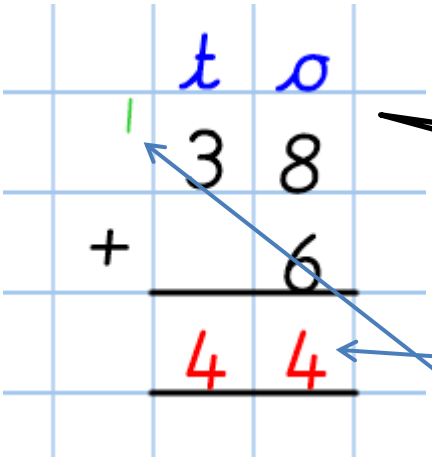
When using column method, always start in the ones column.

4 ones + 5 ones = 9 ones
2 tens + 0 tens = 2 tens
2 tens + 9 ones = 29



When using column method, always start in the ones column.

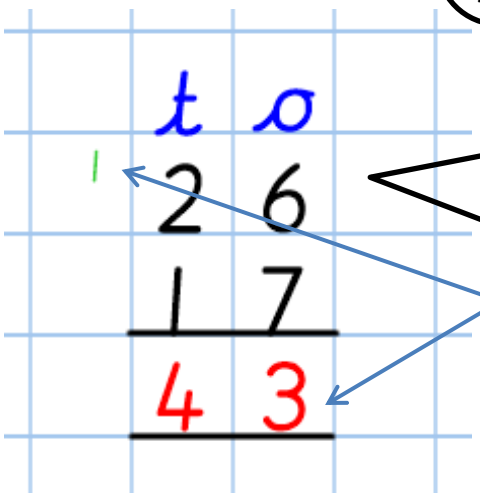
3 ones + 4 ones = 7 ones
4 tens + 3 tens = 7 tens
7 tens + 7 ones = 77



When using column method, always start in the ones column.

8 ones + 6 ones = 14 ones
Keep the 4 ones **in the ones column.**
Exchange the ten ones **for** one ten.

3 tens + 1 exchanged ten = 4 tens
4 tens + 4 ones = 44

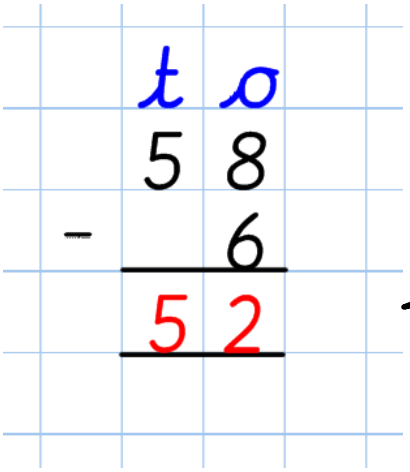


When using column method, always start in the ones column.

6 ones + 7 ones = 13 ones
Keep the 3 ones **in the ones column.**
Exchange the ten ones **for** one ten.

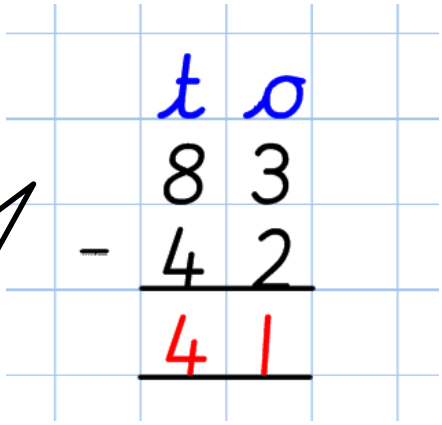
2 tens + 1 ten + 1 exchanged ten = 4 tens
4 tens + 3 ones = 43

Subtraction



When using column method, always start in the ones column.

8 ones - 6 ones = 2 ones
5 tens - 0 tens = 5 tens
5 tens + 2 ones = 52



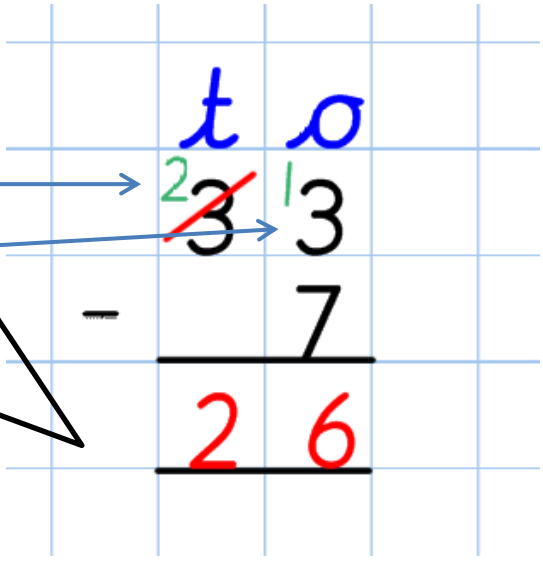
When using column method, always start in the ones column.

3 ones - 2 ones = 1 one
8 tens - 4 tens = 4 tens
4 tens + 1 one = 41

When using column method, always start in the ones column.

3 ones - 7 ones will leave us with a negative number.
Borrow 1 ten **from the tens column.**
Exchange the one ten **for** ten ones **and add this to the ones column.**

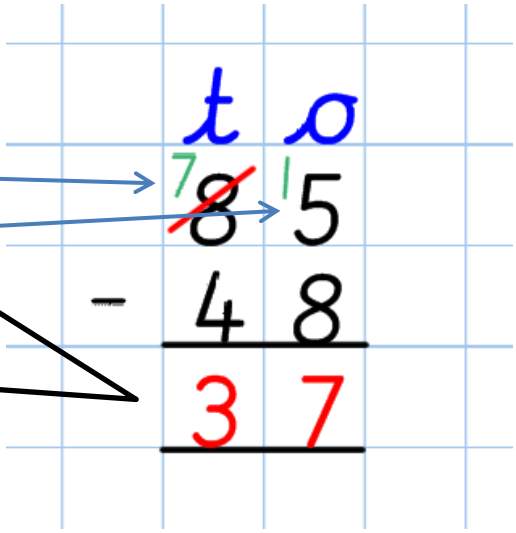
13 ones - 7 ones = 6 ones
2 tens - 0 tens = 2 tens
2 tens + 6 ones = 26



When using column method, always start in the ones column.

5 ones - 8 ones will leave us with a negative number.
Borrow 1 ten **from the tens column.**
Exchange the one ten **for** ten ones **and add this to the ones column.**

15 ones - 8 ones = 7 ones
7 tens - 4 tens = 3 tens
3 tens + 7 ones = 37

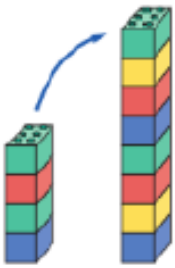


Multiplication and Division

Doubling and Halving

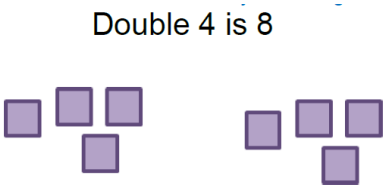
Children are taught that doubling is **multiplying by 2** (x2) and halving is **dividing/ sharing into 2 equal groups** (÷2).

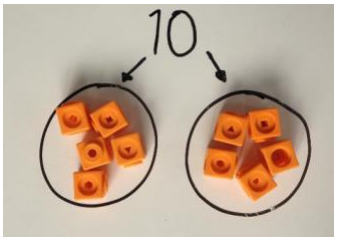
A range of practical equipment is used to help children double and halve numbers. They also draw pictures to help them.

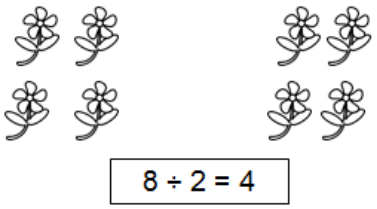


double 4 is 8

$4 \times 2 = 8$

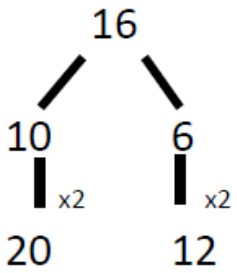




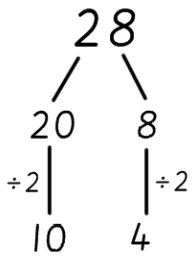


Once children can confidently show doubling and halving using objects or pictures, they start to use **partitioning** to help them work with larger numbers. We encourage the children to use diagrams to show their thinking.

What is double 16?



What is half of 28?



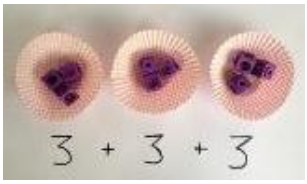
By the end of Year 2, children should be able to **quickly recall** halving facts up to **20 + 20** and the corresponding division facts.

Multiplication

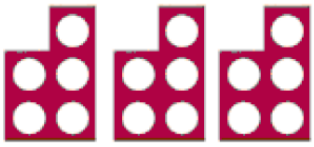
Multiplication is repeated addition.
We teach children that **x** means **groups of/lots of/sets of**.

Children begin by using objects. They arrange objects in groups to help them understand the concept of multiplication.

2 + 2 + 2 + 2 + 2 = 10
5 lots of 2 is 10
5 x 2 = 10

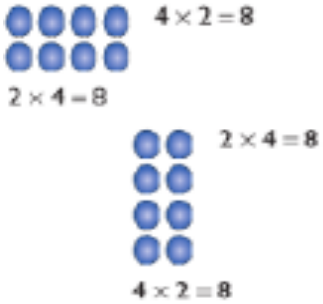


3 + 3 + 3 = 9
3 groups of 3 is 9
3 x 3 = 9



5 + 5 + 5 = 15
3 sets of 5 is 15
3 x 5 = 15

They also arrange objects in **arrays** (rows and columns) to help them understand that multiplication is **commutative** (can be done in any order and the answer will remain the same).

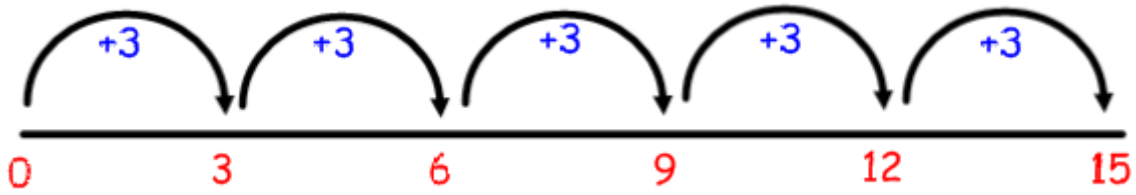


4 rows of 5 counters
4 x 5 = 20

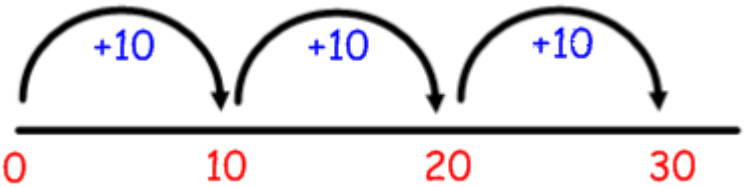
5 columns of 4 counters
5 x 4 = 20

Once children are secure with grouping objects to multiply, they start to use **blank number lines**.

5 x 3 = 5



10 x 3 = 30



As children's confidence grows, we introduce **word problems** which require children to multiply.

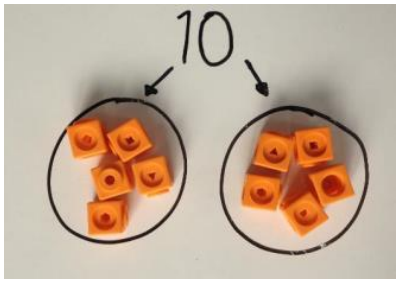
By the end of Year 1, children should be able to **confidently count in groups of 2, 5 and 10**.
By the end of Year 2, children should **know** their **2, 3, 5 and 10 times table**. When asked, they should be able to **quickly recall** any of these times tables.

Division

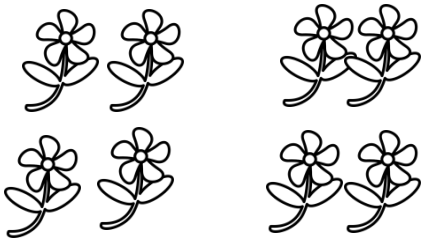
Division is repeated subtraction.
We teach children that ÷ means **shared into equal groups/ divided into equal groups of.**

Sharing

Children begin in Year 1 by **sharing** objects. They learn that sharing into two groups is the same as **halving** and **÷ 2.**



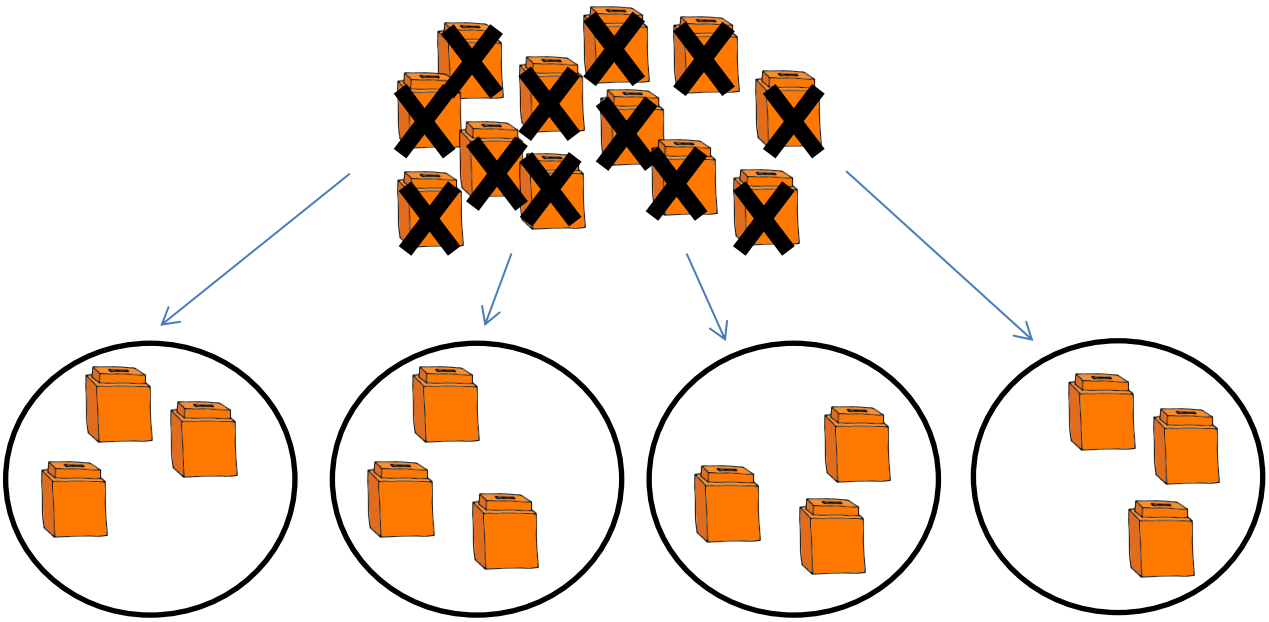
10 shared into 2 equal groups is 5
Half of 10 is 5
10 ÷ 2 = 5



8 ÷ 2 = 4

Children are encouraged to use **drawings** to help them.

Share 12 cubes between 4 children. How many do they get each?



Each child gets **4 cubes.**

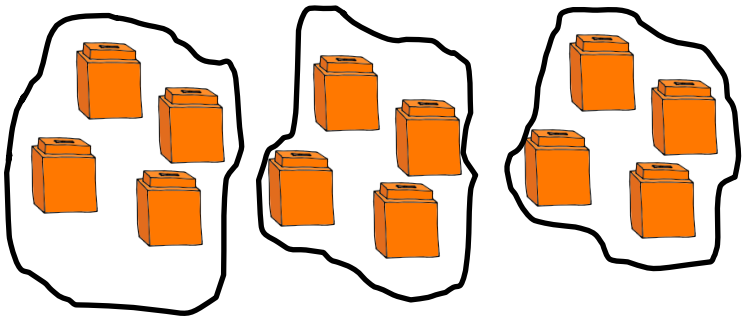
12 shared into 4 equal groups

Grouping

Once children understand division as sharing, they move on to division as **grouping**.

They begin to understand division as **dividing into groups of**. Children start with a total number of objects and practically move them into groups. They also draw pictures to help them group objects.

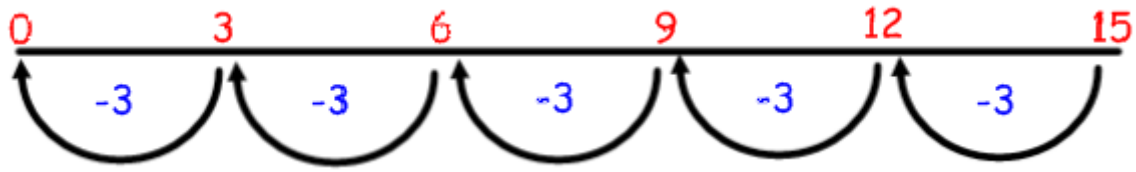
12 ÷ 3 =
12 divided into groups of 3
How many groups of 4 are there in 12?



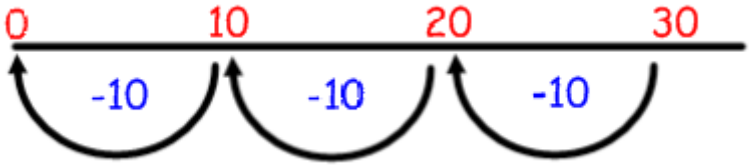
There are **3 groups of 4** in 12
12 ÷ 3 = 4

Once children are secure with using objects and drawings, they start to use **blank number lines**. They show division as **repeated subtraction**

15 ÷ 3 = 5



30 ÷ 10 = 3



From a very early stage, children are encouraged to spot the **relationship** between multiplication and division. They are **inverse** which means that one can undo the other.

Children learn that they can create calculation families

5 x 2 = 10 **10 ÷ 2 = 5**
2 x 5 = 10 **10 ÷ 5 = 2**

As children's confidence grows, we introduce **word problems** which require children to divide.

By the end of Year 1, children should be able to **quickly recall** division facts linked to the 2, 5 and 10 times table.

By the end of Year 2, children should be able to **quickly recall** division facts linked to the 2, 3, 5 and 10 times table.