



St Werburgh's and St
Columba's Catholic
Primary School

Progression in
Mental and Written
Calculations

ADDITION

Children are taught to understand addition as combining two sets and counting on.

A progression from R to Y6

$$2 + 3 =$$



Add

Working practically or drawing a picture helps children to visualise the problem.

At a party, I eat 5 cakes and my friend eats 3.

How many cakes did we eat **altogether**?



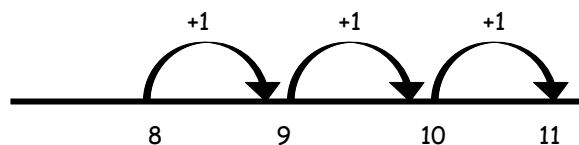
7 people are on the bus. 4 more get on at the next stop. How many people are on the bus now?



Children are encouraged to progress towards using dots or marks.

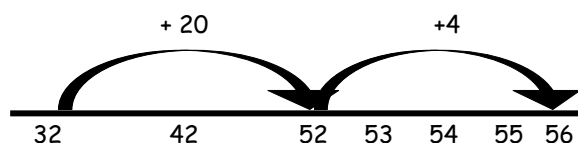
Counting forwards

$8 + 3$

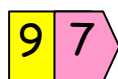
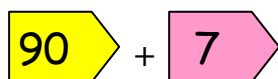
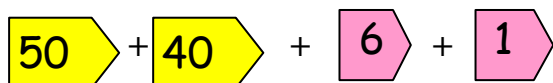


Hundred Square with counters-
moving the counter down the
tens and across the units.

What is $32 + 24$?



$56 + 41 =$



Children can count up using an empty number line. This is a really good way for them to record the steps they have taken.

They are encouraged to use the most efficient method to solve a given calculation, therefore you may see children putting the largest number first or partitioning a number into tens and ones

An expanded approach is introduced when children are secure with the mental calculation methods.

Initially children will add the most significant digit first (i.e. working from left to right).

$$56 + 22$$

$$\begin{array}{r} 56 \\ + 22 \\ \hline 70 \\ 8 \\ \hline 78 \end{array}$$

$$366 + 172$$

$$\begin{array}{r} 366 \\ + 172 \\ \hline 400 \\ 130 \\ 130}8 \\ \hline 538 \end{array}$$

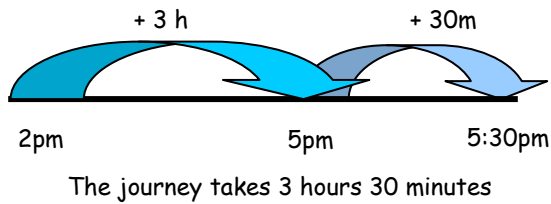
$$\begin{array}{r} 546 \\ + 487 \\ \hline 13 \\ 120 \\ 120}900 \\ \hline 1033 \end{array}$$

Children progress to working from the least significant digit first, i.e. units, but still need to read the numbers as $6 + 7$, $40 + 80$, $500 + 400$, to secure full understanding of the approach used.

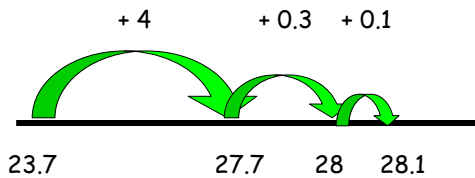
Children progress to working from the least significant digit first, i.e. units, but still need to read the numbers as $6 + 7$, $40 + 80$, $500 + 400$, to secure full understanding of the approach used.

$$\begin{array}{r}
 546 \\
 +487 \\
 \hline
 1033 \\
 \hline
 \end{array}$$

The train leaves at 2 o'clock in the afternoon and arrives at 5:30pm. How long is the journey?



$$23.7 + 4.4$$



The compact method is used when children are confidently using the expanded approach.

Children are encouraged to use a blank number line to solve money, time, decimal and other calculations.

SUBTRACTION

Children are taught to understand subtraction as taking away (counting back) and finding the difference (counting up)

A progression from R to Y6

$$5 - 2 =$$

I had five balloons. Two burst.
How many did I have left?



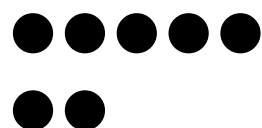
Take away

A teddy bear costs £5 and a doll costs £2. How much more does the bear cost?



Find the difference

Lisa has 5 felt tip pens and Tim has 2. How many more does Lisa have?

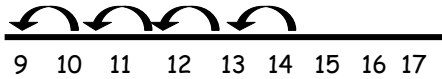


Drawing a picture helps children to visualise the problem.

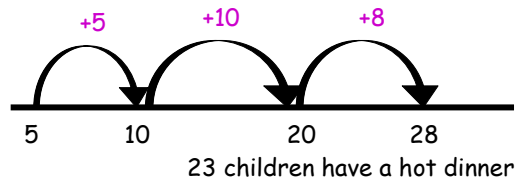
Children are encouraged to progress towards using dots or marks.

The baker makes 14 loaves and sells 8.
How many has he left?

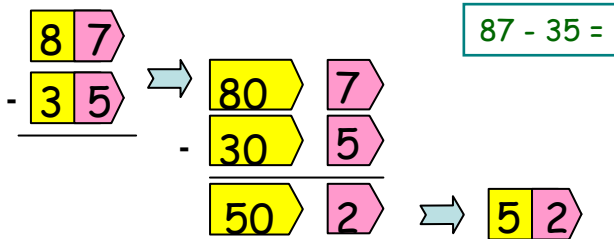
$$14 - 8$$



There are 28 children in the class, 5 have sandwiches for lunch. How many have a hot dinner?
 $28 - 5 = 23$



$$5 + 10 + 8$$



$$563 - 248$$

$$\begin{array}{l} 500 \text{ and } 60 \text{ and } 3 \\ -200 \text{ and } 40 \text{ and } 8 \end{array}$$

Exchange 60 into 50 and 10

$$\begin{array}{l} 500 \text{ and } 50 \text{ and } 13 \\ -200 \text{ and } 40 \text{ and } 8 \\ \hline 300 \text{ and } 10 \text{ and } 5 \end{array}$$

Children can count up or back using a number line. This is a really good way for them to record the steps they have taken.

Children are encouraged to use the most efficient method to solve a given calculation, therefore you may see children using a blank number line to solve money, time, decimal and appropriate calculations.

This expanded approach is introduced when children are secure with the mental calculation methods.


This is used to develop a more compact method. The word 'and' is used to show what the numbers are partitioned into and is preferred to '+' so as not to confuse addition with subtraction.

643 - 358

600 and **40** and **3** Exchange 40 into 30 and 10
-300 and 50 and 8

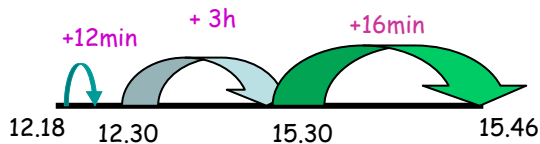
600 and **30** and 13 Exchange 600 into 500 and 100
-300 and 50 and 8

500 and 130 and 13
-300 and 50 and 8
200 and 80 and 5

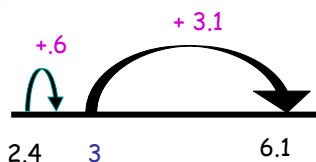

$$\begin{array}{r} 5 \quad 1 \quad 3 \quad 1 \\ \cancel{6} \quad \cancel{4} \quad \cancel{3} \\ - 358 \\ \hline 285 \end{array}$$

The train leaves at 12.18 and arrives at 15.46.
How long is the journey?

The journey takes 3h 28min



6.1 - 2.4



$$3.1 + 0.6 = 3.7$$

Numbers are 'exchanged' to enable the children to complete the process.

The compact method hides the understanding and can confuse children - 'I know I need to cross out but which numbers?' They may not reach this stage until they are in KS3.

MULTIPLICATION

Children are taught to understand multiplication as repeated addition.

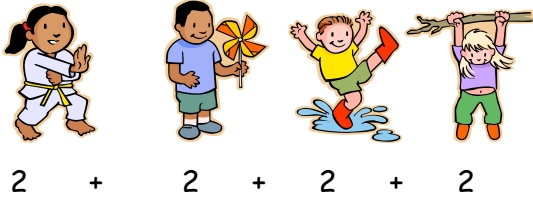
A progression from R to Y6

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

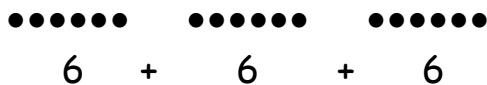
$$2 \times 4$$

Each child has two feet. How many feet do four children have?



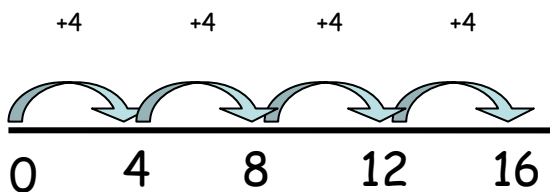
$$6 \times 3$$

There are 6 eggs in a box. How many eggs in 3 boxes?

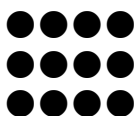


$$4 \times 4$$

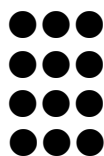
There are 4 cats. Each cat has 4 kittens. How many kittens are there altogether?



$$4 \times 3$$



$$3 \times 4$$



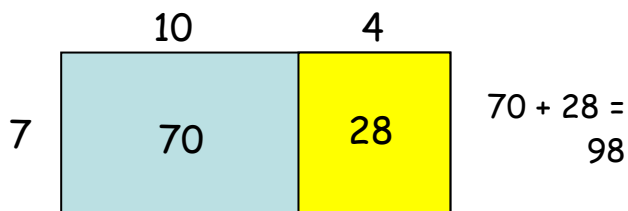
Children are introduced to multiplication by counting on and back in equal steps of ones, twos, fives and tens

Working practically or drawing a picture helps children to visualise the problem.

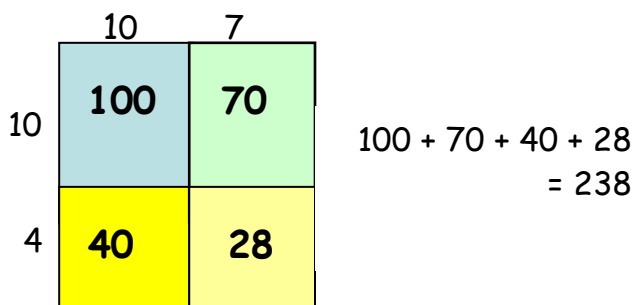
Dots or tally marks are often drawn in groups. This shows 3 groups of 6.

Children can count on in equal steps using an empty number line. This shows 4 jumps of 4.

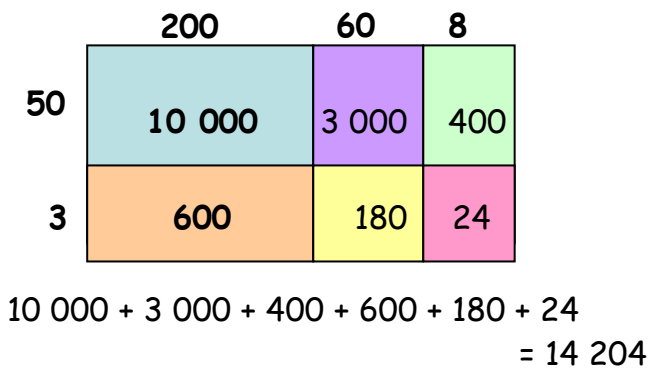
Drawing an array (3 rows of 4 or 4 rows of 3) gives children an image of the answer. It also helps to develop the understanding that 4×3 has the same



17×14



268×53



Condensed Method

value as 3×4 .

Children progress to the grid method. When calculating 14×7 , 14 is partitioned into 10 and 4, and each of these is multiplied by 7. The two answers are then added together.

This method is also used with larger numbers. Again partition the numbers and multiply each part. Add the numbers together.

Children will need a secure recall of 'times tables' facts to successfully use the grid method of multiplication.

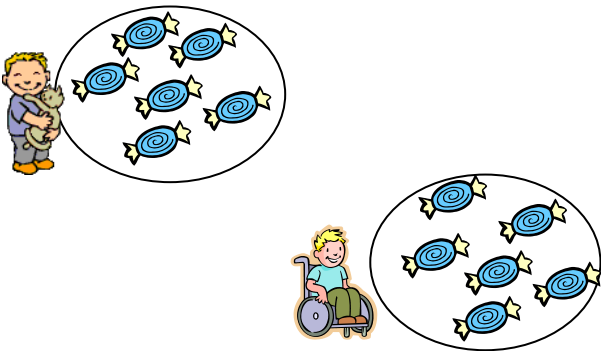
DIVISION

Children are taught to understand division as sharing, grouping and chunking.

A progression from R to Y6

There are 12 sweets and 2 children. They share the sweets equally, how many sweets does each child have?

Sharing between two



Each child has 6 sweets

Grouping in threes

There are 12 sweets and each party bag needs three sweets. How many party bags can be made?



There are 4 party bags

Sharing is a skill children come to school with. 'One for me one for you' is repeated subtraction of one.

Working practically or drawing a picture helps children to visualise the problem.

In this example children 'share' the 12 sweets between the two children until there are none left.

Children progress to removing 'groups' of a number. In this example children put 'groups of three sweets' into the party bags until they have no sweets left.

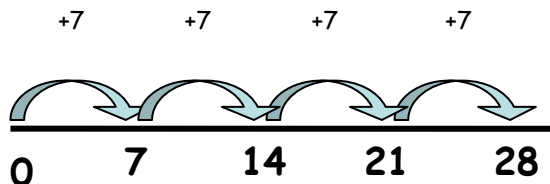
$$12 \div 4 =$$

4 apples are packed in a basket.
How many baskets can you fill with
12 apples?



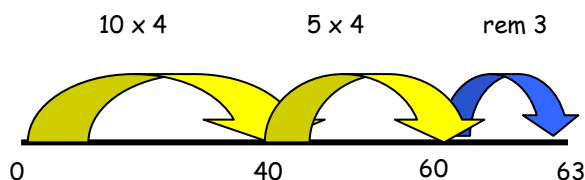
$$28 \div 7 =$$

A chew bar costs 7p. How many
can I buy with 28p?



63 children need to be seated in
groups of 4. How many tables will
be needed to seat all the children?

$$63 \div 4 = 15 \text{ r } 3$$



16 tables will be needed to seat all
the children, one will only have 3
seats.

Dots or tally marks are
often drawn in groups. This
shows 3 groups of 4.

Children can count on in equal
steps using an empty number
line to work out how many
groups of 7 there are in 28.
This shows you need 4 jumps
of 7 to reach 28.

When numbers get bigger, it
is inefficient to do lots of
small jumps on a number line.
Children begin to jump in
'chunks' of the number they
are dividing by, in this
example 'chunks of 4' are
used. A jump of 10 groups of
4 takes you to 40. Then you
need another 5 groups of 4
to reach 60, leaving a
remainder of 3.

$$63 \div 4 = 15 \text{ r } 3$$

$$\begin{array}{r} 4 \overline{) 63} \\ \underline{40} \\ 23 \\ \underline{20} \\ 3 \end{array}$$

10×4
 5×4

$$412 \div 7 = 58 \text{ r } 6$$

$$\begin{array}{r} 7 \overline{) 412} \\ - 350 \\ \underline{62} \\ - 56 \\ \underline{6} \end{array}$$

50×7
 8×7

Things I know about 7:

$$7 \times 1 = 7 \quad \therefore 7 \times 10 = 70$$

$$7 \times 2 = 14 \quad \therefore 7 \times 20 = 140$$

$$7 \times 5 = 35 \quad \therefore 7 \times 50 = 350$$

Bus Stop Method

Children progress to this method which is known as 'chunking'. The chunks of 4 are subtracted (10 groups of 4, then 5 groups of 4) until no more chunks of 4 remain. This example shows 15 groups of 4 and a remainder of 3.

This method is also used with larger numbers. Children need to have a secure knowledge of 'tables' facts and be able to derive associated facts.

In this calculation children might start by generating facts they know about 7. It is important that children try not to write out the whole table but just significant ones.