Connaught Junior School
Progression in Maths

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Introduction

This document is designed to give you a little more information about how Maths is taught at Connaught Junior School and how you can help support your child.

We appreciate that some of the maths that your child is learning today at Connaught (and all primary schools across the country), they are learning in a way which seems unfamiliar to you and, in so many ways, appears very different to how you were taught.

The aim of this booklet is to help you understand where your children are coming from in maths and how you can best help them in this vital area of learning.

The big difference today is that the emphasis is on thinking and mental work rather than rote learning of methods. The hope is that in this way, children can understand why and how a method works rather than simply knowing a method for getting an answer.

The good news is that all the old methods that you remember from your school days will be taught to your child, but only at a stage when they are able to understand not just what to do but why they are doing it. From your child's point of view this must be the best way: a blind ability to follow a method without knowing why it works will not help them in the long term.

What that means for all of us who learnt our maths through methods, is that we have to do a little extra work unpicking what we know to see the principles and concepts that lie behind it. That way we can start to help our children in a positive and supportive way in their maths learning. We hope that this information will help in that process.

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How we teach calculations

We are working towards building up a progression of skills in the children so that by the time your child is in upper Key Stage 2 (Year 6), they should be asking themselves a number of important questions whenever they are faced by a maths related problem…

What is the problem about – which operations (+, -, x or ÷) will I need?

Can I do this in my head?

Can I do it in my head but with the help of some drawings or jottings?

Do I *need* to use a written method?

Do I *need* to use a calculator?

What is a reasonable estimation of the likely answer?

And then, having completed the calculation…
Is my answer a reasonable or sensible one?

The aim is to give all children an armoury of strategies that they can use to decipher the meaning and needs of a question and then the confidence to know how best to tackle that question. A written method may not be the best way!

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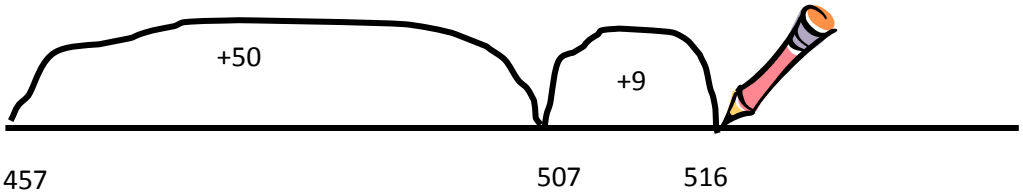
Progression in Addition
Add, plus, total, sum

Use of number lines

Please note that the use of the number line continues right through the school – it is not just an infants' tool! An "empty number line" (ie you put in the numbers that you need) can be used for more complicated calculations such as 457 + 59, provided that the child has a good understanding of number and can "partition" ie see 59 as 50 + 9 (see below):



Partitioning and recombining

As the calculations get more complicated and the use of mental maths on its own or number lines become less efficient, so the children progress to more formal written methods.

These rely on an understanding of place value and the ability to partition. ie knowing that the digit 4 in 46 actually has a value of 40 or 4 tens etc, meaning that 46 is made up of 40 + 6

A calculation can then be completed as follows:

My sunflower is 47cm tall. It grows another 39cm. How tall is it now?

46 + 39

Tens		*Units*		
40	+	6		
30	+	9		
70	+	15	=	85

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Expanded written method with exchange
There is then a natural progression to start to talk about "exchange" where, for example, 10 units are exchanged as 1 ten and shown in the tens column:

There are 467 girls and 529 boys in the secondary school. How many children all together?
467 + 529

Hundreds		*Tens*		*Units*		
400	+	60	+	7		
500	+	20	+	9		
900	+	90	+	*6*	=	996
		10				

Compact written methods with exchange
Once children are confident with the expanded written method, then they are ready for the more traditional compact method of addition: there is nothing to be gained – except confusion - by teaching this method until children have a real and secure understanding of place value and of the concept of exchange. This is generally in upper Key Stage 2.

6,874 Woking supporters were at the Final and 3,837 Redbridge fans. How many fans were there in total?
6,874 + 3,837

	6	8	7	4 +
	3	8	3	7
1	0	7	1	1
	1	1	1	

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Progression in Subtraction

Subtract, less, minus, take away, find the difference

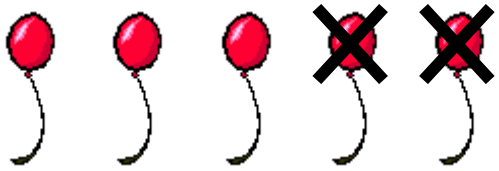
Number bonds

Again, simple subtraction can follow an understanding of number and ordinal number and basic number bonds to 10 and beyond. If I know 3 + 7 is 10, the next step of understanding is that if I take 3 away from 10, I will be left with 7.

Practical and Graphic methods

Children will start by using objects as soon as they can reliably count and identify the order of number. For example,

I have 5 balloons but 2 burst. How many have I got left?



5 take away 2… there are 3 left

Working independently the children will then start to show the calculation by drawing or using dots or a tally – it shows that they can visualise the calculation: the first step to a mental calculation.

This will then progress to the use of the number line

Counting back and counting on, using the number line and mentally

As with addition, once the children are confident with place value and partitioning, they can then start to use the empty number line efficiently (mental calculations will also develop).

Counting back:

I cut 27cm from a ribbon measuring 84cm. How much is left?

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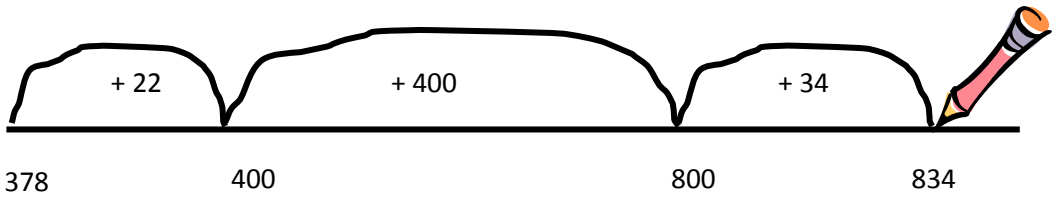
84 – 27 = 57

Counting on:
Sometimes it is easier to count on (it is a more natural direction for us!) from the smaller number to the larger number to find the difference between them.
The library lends 378 of its 834 books. How many are left on the shelves?
The calculation is 834 – 378 or finding the difference between 378 and 834…



22 + 400 + 34 = 456
So, 834 – 378 = 456

Expanded written method with decomposition and exchange
The first written method introduced is an expanded one to help the children understand what is happening. It is at this stage that the children need to start exchanging tens for ten units or hundreds for 10 tens. Traditionally we have may said “borrowed” but this gives a false impression that we will give it back! Today we use the term “exchange”.
There are 754 children in the hall and 286 leave. How many children are still in the hall?
754 - 286

	Hundreds		*Tens*		*Units*		
	700	+	50	+	4	-	
	200	+	80	+	6		
=	700	+	40	+	14		10 is exchanged from the tens column to the units
	200	+	80	+	6		

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=	600	+	140	+	14		100 is exchanged from the hundreds column to the tens
	200	+	80	+	6		
	400	+	60	+	8	=	468

754 – 286 = 468

Compact written methods with decomposition and exchange
Once children are confident with what they are doing, then it is possible to compact the method to the more traditional written method with which parents may be more familiar. Again, without an understanding of why they are doing this, the method can be very confusing indeed!
There are 4,347 ants in the ant hill but 2,879 leave to collect food. How many ants are left in the ant hill?

3	*~~4~~*	*12*	*~~3~~*	*13*	*~~4~~*	*1*	7	-	*in this case an exchange has been required*
	2		8		7		9		*from the tens, hundreds and thousands*
	1		4		6		8		

4,347 – 2,879 = 1,468

Progression in multiplication
Multiply, times, lots of

Learning times tables is a great advantage in almost all areas of maths but particularly multiplication. Again, learning by rote before the child is able to understand what the times table means is *not* as valuable.

Repeated addition with graphic methods
Children are introduced to multiplication first as repeated addition. As in every case this will start with the use of physical objects and then move to pictures and other graphic methods.
For example:

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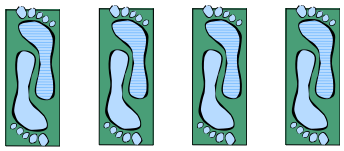
Each child has two feet. How many feet do four children have?
2 x 4



2 + 2 + 2 + 2 = 8

Arrays and number lines
An array is a way of showing data in a regular rectangular form of columns and rows so, for example it can help with 3 x 4:

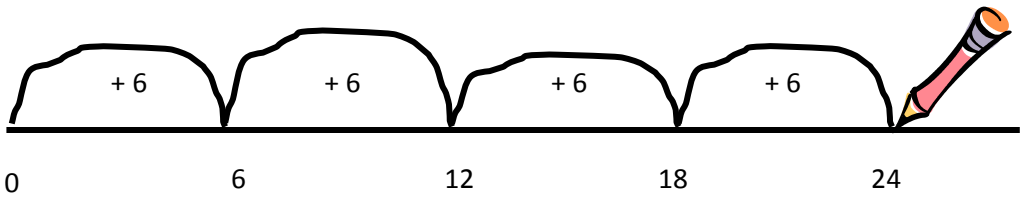
●●●
●●●
●●●
●●●

or

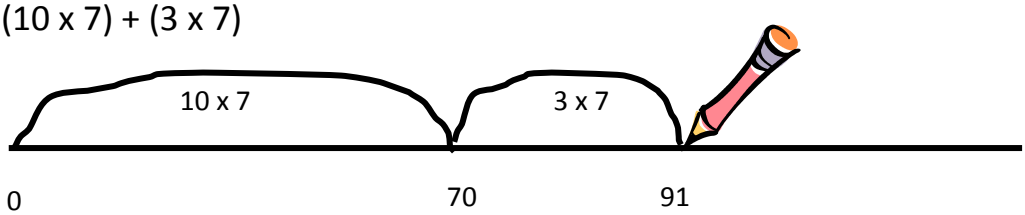
●●●●
●●●●
●●●●

This also helps children to understand that 3 x 4 is the same as 4 x 3.

The use of the number line is for repeated addition:
There are 4 cats. Each cat has 6 kittens. How many cats are there altogether?



4 x 6 = 24
This can be developed for larger numbers by using known facts:
There are 13 biscuits in a packet. How many biscuits in 7 packets?
13 x 7
= (10 x 7) + (3 x 7)



13 x 7 = 91

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Grid method with partitioning

The more advanced use of the number line leads naturally to the grid method – the first written method we teach for multiplication. This is dependent on a secure understanding of place value and partitioning.

A block is 193cm high. How high would 6 blocks be if they were placed on top of each other?

193 x 6

×	100	90	3	
6	*600 +*	*540 +*	*18 =*	*1,158*

This method can be used for numbers of any size provided the child is confident in partitioning:

Eg 34 x 27

×	30	4		
20	*600 +*	*80*	=	*680*
7	*210 +*	*28*	=	*238*
				918

Expanded written method

This method takes the grid method and starts to put it in to a vertical structure as an introduction to the conventional compact method. Again, it depends on a secure understanding of place value and partitioning:

A block is 193cm high. How high would 6 blocks be if they were placed on top of each other?

193 x 6

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1	9	3	x
		6	
	1	8	(3 x 6)
5	4	0	(90 x 6)
6	0	0	(100 x 6)
1, 1	5	8	

Compact written method for "long multiplication"

The final step is the introduction of the compact method for long multiplication. It is essential that children understand place value before tackling this method as they need to understand the need to place a 0 in the units column when multiplying by tens in order to "hold the place", to be a placeholder…

There are 52 weeks in a year. How many weeks in 27 years?

52 x 27

	5	2	x	
	2	7		
3	6	4		(52 x 7)
	1			
1	0	4	0	(52 x 20)
1	4	0	4	
	1			

The 0 must be placed in the units column as a place holder because we are now multiplying tens.

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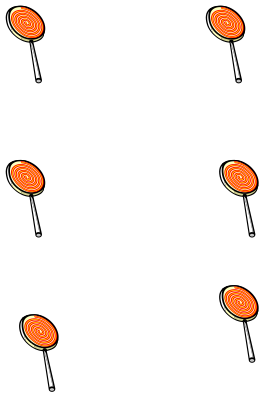
Progression in division
Divide, share, split, group

Division is seen as the hardest operation – but it shouldn't be! It is the inverse to multiplication. A good grasp of times tables, understanding not just reciting, will really help!

Sharing and grouping using graphic methods
Children start by sharing and grouping. Again, practical objects and then images are the way in.
There are 6 lollies to be shared between 2 children. How many lollies will each child get?

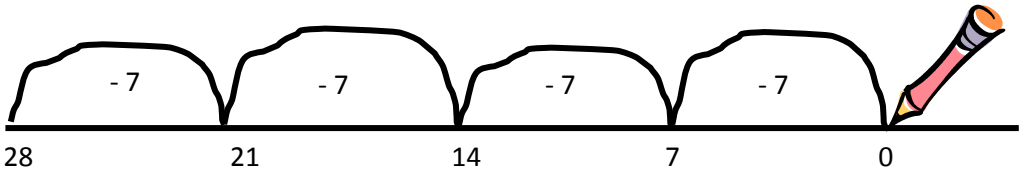
Sharing: one for you, one for me… until all of them are gone



There are six lollies, how many children can have 2 each?

Grouping: in twos…

Repeated subtraction and number lines
Number lines can be used for repeated subtraction:
A lolly costs 7p. How many can I buy with 28p?



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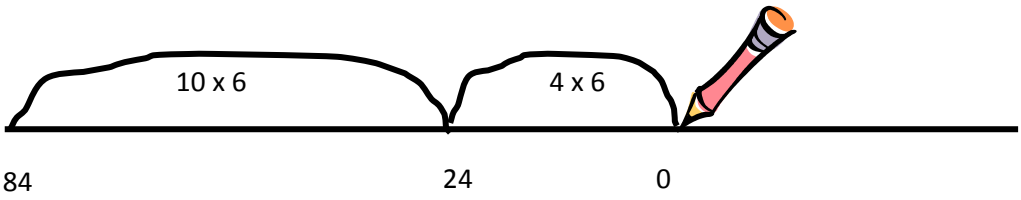
4 jumps of 7, so 28 ÷ 7 = 4
This can also work where there are remainders.

This can be further developed by using larger "chunks" of the divisor, for example:
I need 6 pins to put up a picture. How many pictures can I put up with 84 pins?



It is easier to use a chunk of ten 6s than repeatedly subtract individual sixes.
So, 84 ÷ 6 = 14

Repeated subtraction and "chunking"
This is simply repeated subtraction of "chunks" of the divisor to make the calculation as simple as possible. The chunks need to be sensible amounts eg a multiple of 10…
I have 200 chairs to arrange in to rows of 6. How many rows will I have?

200	200		200	
- 6	- 60	(10 x 6)	- 180	(30 x 6)
194	140		20	
- 6	- 60	(10 x 6)	- 18	(3 x 6)
188	80		2	
- 6	- 60	(10 x 6)		33 r 2
…	20			

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- 6	- 18	(3 x 6)
20	2	
- 6		33 r2
14		
- 6		
8		
- 6		
2		
33 r 2		

So 33 full rows and 2 chairs left over.
The more confident the understanding, the larger the “chunks” and the more efficient the method.

Short division (“the bus shelter”)
The final progression is to short division using the bus shelter method. This may start in an extended form:
I have 200 chairs to arrange in to rows of 6. How many rows will I have?

	3	3	r 2	
6) 2	0	0		
- 1	8	0		30 x 6
	2	0		
	- 1	8		3 x 6
		2		r 2

Once this concept is clear, it is possible to move to the short form of division:

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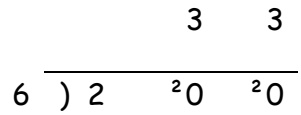

ALWAYS, ALWAYS try to estimate first and check that the answer makes sense, in **EVERY** calculation…

There are so many positive ways to help your child with maths at home – just as important as reading with them every day!

The first big thing that everyone can do is to BE POSITIVE…
If you tell your child that you could never do maths, you give them the excuse to stop trying so please keep positive – a *can do* attitude!

Make maths fun – not lists of calculations and an expectation that they will want or be able to use the methods that you remember from school…

Use the internet… there are great interactive games out there for children of all ages and also games for the PC, Nintendo, Playstation etc. All children have log-ins for Mathletics that they can use from home. The BBC has some great games and activities. There are also free apps that you can download onto your phone for your child to play in the car or the supermarket!

Make maths practical. Shopping, cooking, DIY… it all needs maths so try to involve the children in those activities too: the measuring, counting out, paying, working out the change and so on.

Show your child maths in everyday activities. Play a game of adding the numbers on number plates whilst in the car. The level can alter to hit the level that your child is working at – too easy and they will be bored, too hard and they will not want to play!

Work with them on telling the time. This can be very hard, but such an important skill, analogue and digital, 12 hour and 24 hour clocks.

We hope that you have found this information useful!