St John's Calculation Policy

Parent's Guide

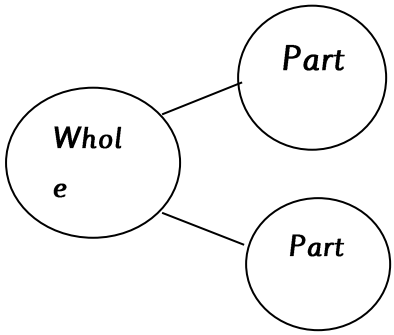
If what you remember as maths is pages of sums you may sometimes feel confused when your child's maths book contains writing, pictures, diagrams, jottings or blank number lines and not many 'formal calculations'. Certainly younger children, up to Year 3, will record calculations in a variety of ways that do not necessarily look like the kind of 'sums' you remember.

We know that school wide guidance, such as this, can ensure consistency of approach, enabling children to progress stage by stage through models and representations they recognise from previous teaching, allowing for deeper conceptual understanding and fluency. As children move between concrete and pictorial and abstract, teachers will be presenting strategies and equipment appropriate to children's level of understanding.

Progression in addition and subtraction

Addition and subtraction are connected.

Part	Part
Whole	



Addition names the whole in terms of the parts and **subtraction** names a missing part of the whole.

Year Two

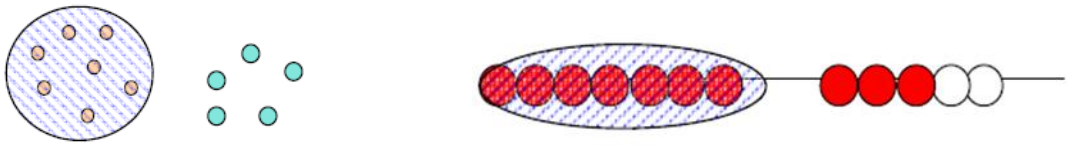
Addition

Combining two sets (augmentation)

This stage is essential in starting children to calculate rather than counting

Where one quantity is increased by some amount. Count on from the total of the first set, e.g. put 3 in your head and count on 2. Always start with the largest number.

Counters: Beadstrings:



Start with 7, then count on 8, 9, 10, 11, 12

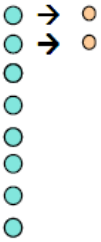
Subtraction

Finding the difference (comparison model)

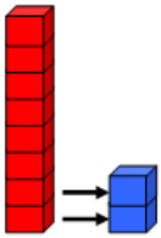
Two quantities are compared to find the difference.

8 – 2 = 6

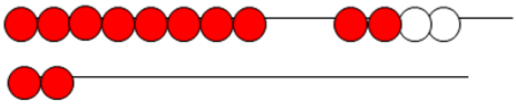
Counters:



Multilink Towers:



Beadstrings:



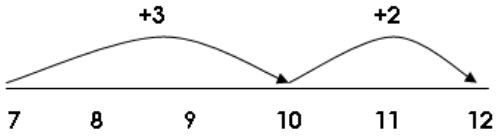
Make a set of 8 and a set of 2. Then count the gap.

Bridging through 10s

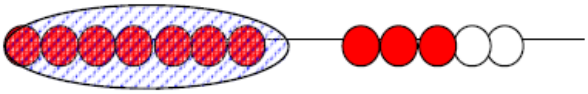
This stage encourages children to become more efficient and begin to employ known facts.

7 + 5 is decomposed / partitioned into 7 + 3 + 2.
Children are asked 'how many more to the next multiple of 10?' (children should identify how their number bonds are being applied) and then 'if we have used 3 of the 5 to get to 10, how many more do we need to add on?

Number line

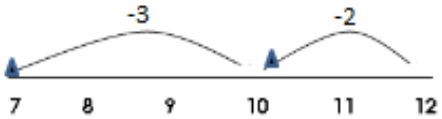


Beadstring



12 – 7 is decomposed / partitioned in 12 – 2 – 5.
Children are asked 'from 12 how many to the last/previous multiple of 10?' and then 'if we have used 2 of the 7 we need to subtract, how many more do we need to count back?

Number Line:



Subtraction also includes Counting up or 'Shop keepers' method

12 – 7 becomes 7 + 3 + 2.
Starting from 7 'How many more to the next multiple of 10?' 'How many more to get to 12?'.

Compensation model (adding 9 and 11) (optional)

This model of calculation encourages efficiency and application of known facts (how to add ten)

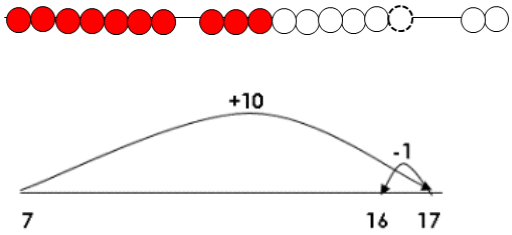
7 + 9

Children find 7, then add on 10 and

18 – 9

Children find 18, then subtract 10 and then

then adjust by removing 1.



adjust by adding 1.

Working with larger numbers
Tens and ones + tens and ones

Children transition onto Base 10 equipment and understand the abstract nature of the single 'tens' sticks and 'hundreds' blocks

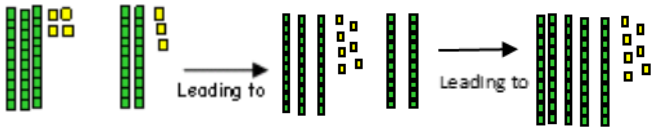
Partitioning (Aggregation model)

34 + 23 = 57

Children create the two sets with Base 10 equipment and then combine; ones with ones, tens with tens.

Partitioning (Augmentation model)

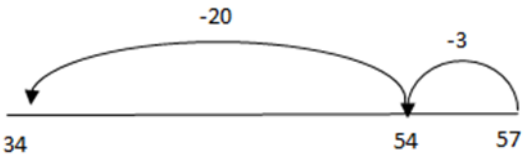
Encourage the children to begin counting from the first set of ones and tens, avoiding counting from 1. Beginning with the ones in preparation for formal columnar method.



Take away (Separation model)

57 – 23 = 34

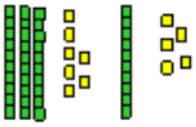
Children remove the lower quantity from the larger set, starting with the ones and then the tens in preparation for formal decomposition.



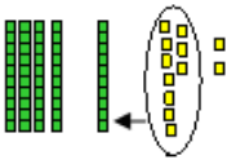
Bridging with larger numbers (Towards the end of Year 2

Once secure in partitioning for addition, children begin to explore exchanging. What happens if the ones are greater than 10? Introduce the term 'exchange'. Using the Base 10 equipment, children exchange ten ones for a single tens rod, which is equivalent to crossing the tens boundary on the bead string or number line.

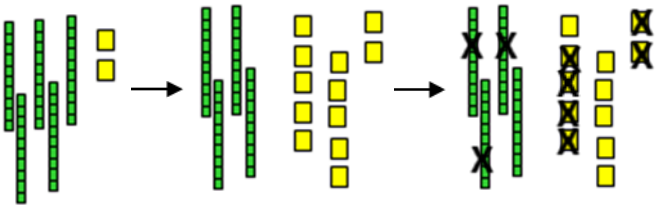
37 + 15 = 52



Discuss counting on from the larger number irrespective of the order of the calculation.



52 – 37 = 15



Progression in Multiplication and Division

Multiplication and division are connected.
Both express the relationship between a number of equal parts and the whole.

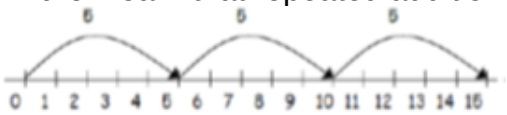
Part	Part	Part	Part
Whole			

Multiplication

Repeated addition (repeated aggregation)

3 times 5 is 5 + 5 + 5 = 15 or 5 lots of 3 or 5 x 3

Children learn that repeated addition can be shown on a number line.

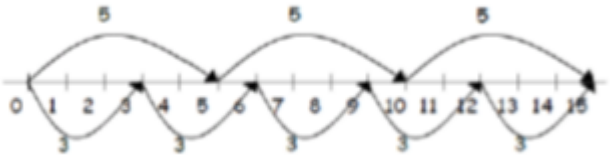


Commutativity

Children learn that 3 x 5 has the same total as 5 x 3.
This can also be shown on the number line.

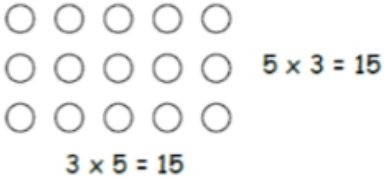
3 x 5 = 15

5 x 3 = 15



Arrays

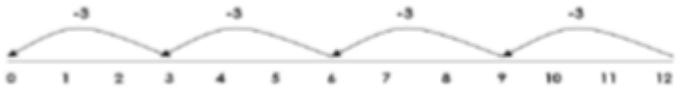
Children learn to model a multiplication calculation using an array. This model supports their understanding of **commutativity** and the development of the grid in a written method. It also supports the finding of factors of a number.



Division

Repeated subtraction using a bead string or number line

12 ÷ 3 = 4

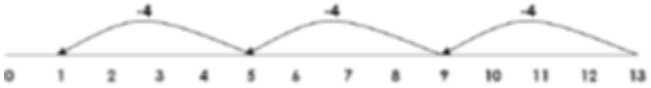


The bead string helps children with interpreting division calculations, recognising that 12 ÷ 3 can be seen as 'how many 3s make 12?'

Grouping involving remainders

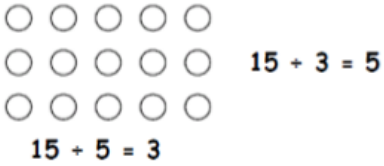
Children move onto calculations involving remainders.

13 ÷ 4 = 3 r1



*Children learn that division is **not** commutative and link this to subtraction.*

Children learn to model a division calculation using an array. This model supports their understanding of the development of partitioning and the 'bus stop method' in a written method. This model also connects division to **finding fractions** of discrete quantities.



Inverse operations

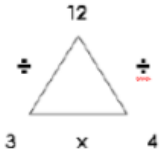
Trios can be used to model the 4 related multiplication and division facts. Children learn to state the 4 related facts.

3 x 4 = 12

4 x 3 = 12

12 ÷ 3 = 4

12 ÷ 4 = 3

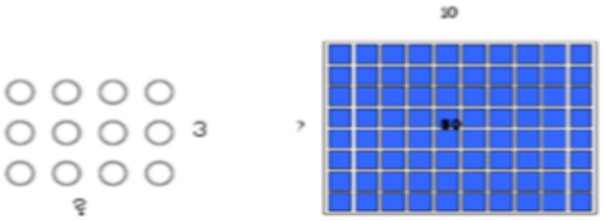


Children use symbols to represent unknown numbers and complete equations using inverse operations. They use this strategy to calculate the missing numbers in calculations.

□ x 5 = 20 3 x Δ = 18 O x □ = 32

24 ÷ 2 = □ 15 ÷ O = 3 Δ ÷ 10 = 8

This can also be supported using arrays: e.g. 3 X ? = 12



What you can do as parents:

- Have a look at the strategies we use in order to help with homework ina way the children are familiar with;
- Rehearse number facts often and thoroughly. These are the basis of most calculations and need to be learnt in order to be built on. It does take time, patience and practice at home but it leads to quicker calculating and the confidence of recognising something familiar;
- Practise couting forwards and backwards to 100 from any number, children need to develop counting on as a strategy so don't always start at one;
- Learn number bonds to ten, twenty or one hundred;
- Rehearse multiplication facts – counting forwards and backwards in steps of two, three, four, five and ten from any mulitple.

- Play number based games like cards, board games and dominoes because these support children’s developing subitising skills.