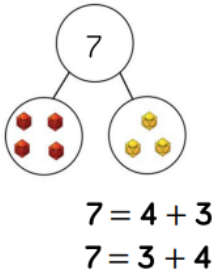
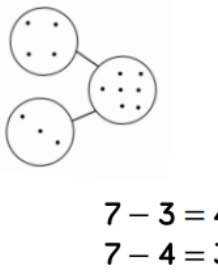
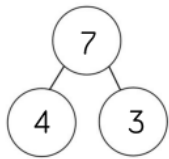
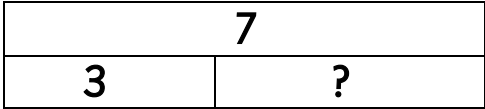
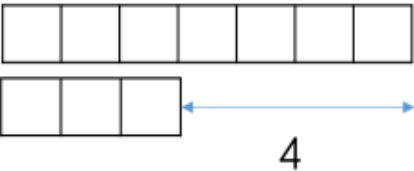


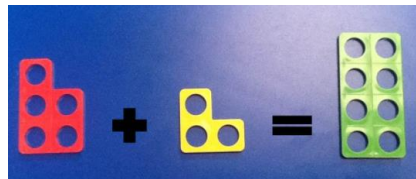
This document shows the different ways we teach calculation at Barnett Wood. Please use the link below to see the progression of skills document. This will show you at which stage the skills are taught.

<https://primariesite-prod-sorted.s3.amazonaws.com/barnett-wood-infant-school/UploadedDocument/cb319a2b-585d-4dd7-bac4-41a14522f5e4/maths-progression-of-skills.pdf>

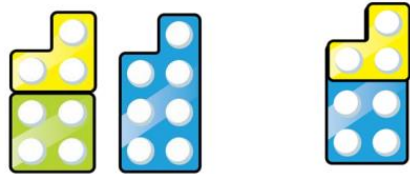
Concrete, pictorial and abstract representations used for addition and Subtraction

Part-whole	
    $7 = 4 + 3$ $7 = 3 + 4$ $7 - 3 = 4$ $7 - 4 = 3$	This part-whole model supports partitioning and recombining of numbers. It is often referred to as the cherry part-whole model. A part-whole model can be used to partition a number into tens and ones. (Or Hundreds, tens and ones) When the parts are full and the whole is empty, children combine the parts to find out the whole amount. If one part is empty, children subtract the other part from the whole to find the missing part.
  Lilly has 7 apples and she gives three away. How many apples does she have left?  $7 - 3 = 4$	This part-whole is called a bar model and can be used to represent a calculation and help children solve calculation problems. For example, a subtraction problem or finding a difference between two numbers.

Number shapes (e.g. Numicon)



$$5 + 3 = 8$$



$$7 = 4 + 3 \quad 7 = 3 + 4 \quad 7 - 3 = 4$$

Number shapes are useful to support children to subitise (recognise amounts by pattern), to recombine amounts and calculate number bonds.

When adding children can see how parts come together to make a whole amount.

When subtracting, children can overlay number shapes and subitise the part left. This encourages mental calculation.

Cubes and bricks



$$2 + 5$$



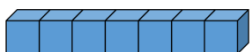
$$7 = 4 + 3$$



$$7 = 3 + 4$$



$$7 - 3 = 4$$



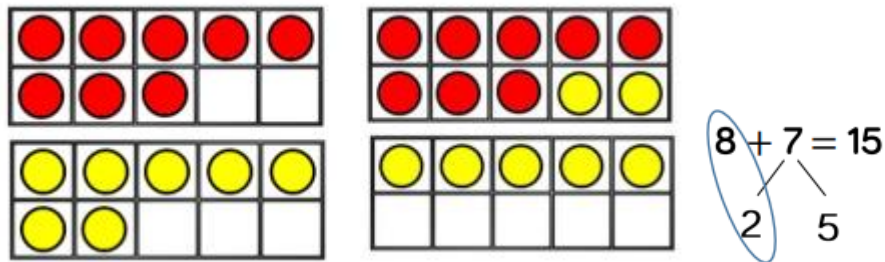
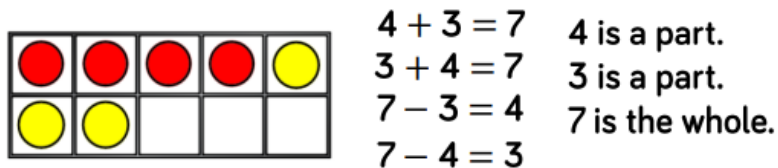
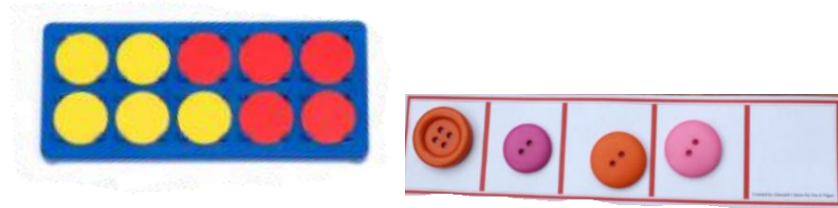
$$7 - 3 = 4$$

Cubes can be used to support the addition and subtraction of smaller numbers.

Children can physically combine the parts to add or remove a part from a whole to find the remaining part or difference.

Cubes are also used in geometry and pattern making.

Ten and five frames



The frames can support children in understanding the structure of addition and subtraction and the relationship between the parts.

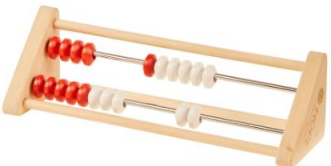
When adding or subtracting to totals greater than ten, children are supported in seeing how to partition a single digit number usefully to make the next ten and then see how many more.

Bead strings and Rekenrek



$$10 + 3 = 13$$

$$13 - 4 = 9$$



How many more to make 10 or 20?

Different size bead strings (10, 20, 50 or 100 beads) support children at different stages of progression in addition and subtraction.

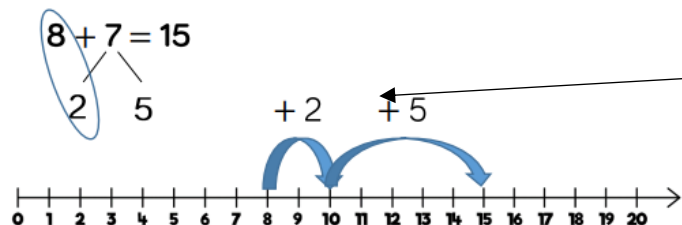
Rekenreks are used to develop subitising and to calculate

Labelled number lines/tracks

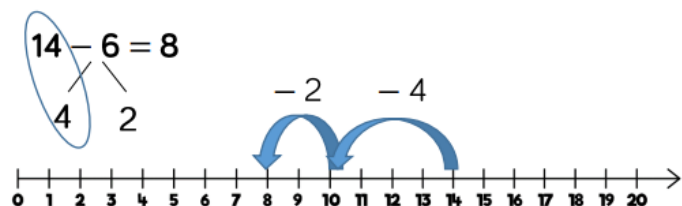
$$5 + 3 = 8$$



$$8 + 7 = 15$$



$$14 - 6 = 8$$



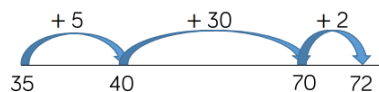
Number lines and tracks support children in understanding how amounts get greater or less, when calculating.

Children will start by counting on and back in ones.

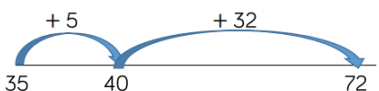
Once mastered, they can then add numbers by splitting a digit into useful parts in order to jump to the nearest ten and add or subtract the remaining part.

Blank number lines

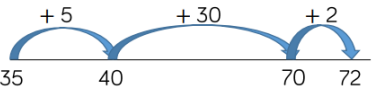
$$35 + 37 = 72$$



$$35 + 37 = 72$$



$$72 - 35 = 37$$

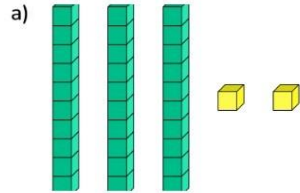


Blank number lines provide children with a structure to add and subtract numbers in smaller parts. It helps develop mental calculation once mastered.

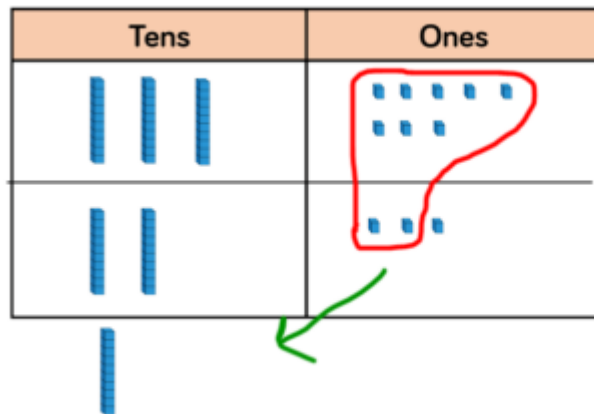
Children can add by jumping to the nearest 10 and then adding the rest of the number either as one amount or adding the tens and ones separately.

The same method can be used for subtraction but jumping back from the largest amount.

Base ten (Dienes) Addition



Initially, base ten equipment can be used to represent number. They are also used to calculate



$$\begin{array}{r} 38 \\ + 23 \\ \hline 61 \\ 1 \end{array}$$

Base ten equipment can support children's understanding of column addition and subtraction.

It is important that the written method is used alongside the practical manipulatives or drawings so that children can see the relationship between the written method and the model.

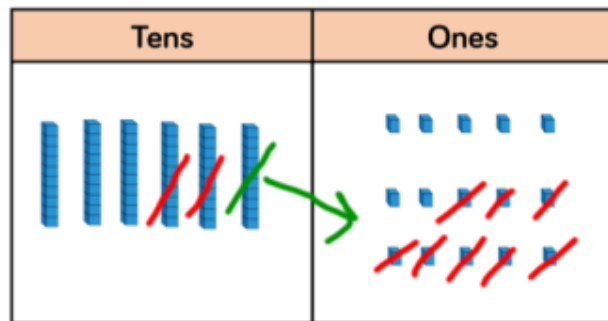
Children should start by calculating amounts that do not require exchanging and then moving on to exchanging.

When adding always start with the smallest place value column.

Children are encouraged to think about how many ones there are altogether.

Can they exchange ten ones for one ten? If so they can show this new ten in the tens column. They then count the amount of ones left in the ones column and write the number in the total position. Then they add all of the tens including the new exchanged ten to find the total.

Base ten (Dienes) Subtraction



$$\begin{array}{r} 5 \cancel{1} 65 \\ - 28 \\ \hline 37 \end{array}$$

Again it is important that children write out their calculations alongside using or drawing base 10. This is so they can see the clear links between the written method and the model.

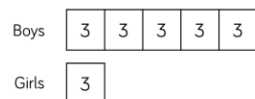
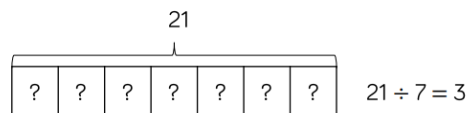
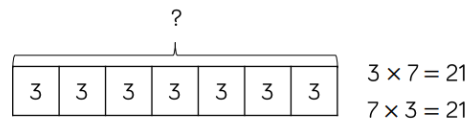
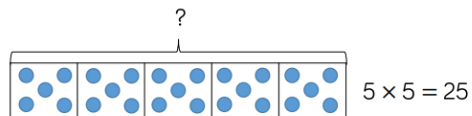
Children should first subtract without the need to exchange before moving on to subtraction with exchange.

Children make **just** the minuend (total amount that will be subtracted from) and then physically subtract the subtrahend (the amount to be subtracted)

Children start with the smallest place value column. When there are not enough ones/ tens/ hundreds to subtract in a column, children need to move to the column to the left and exchange e.g. exchange one ten for ten ones. They can then subtract the correct amount.

Concrete, pictorial and abstract representations used in all year groups for multiplication and division

Bar Model



Children use the single bar model to represent multiplication and repeated addition. They could use counters, cubes or draw dots within the bar model to support calculation before moving on to placing digits into the bar model to represent the multiplication.

Division can be represented by showing the total of the bar model and then dividing the bar model into equal groups. This is also used for finding fractions of amounts.

A multiple bar model is used for comparing groups and solving scaling problems. For example, there are 3 dogs in the pet show. There are five times more cats than dogs. How many cats are there?

Number shapes (e.g. Numicom)



$$5 \times 4 = 20$$

$$4 \times 5 = 20$$

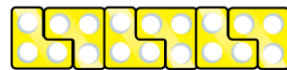


$$5 \times 4 = 20$$

$$4 \times 5 = 20$$



$$18 \div 3 = 6$$



Number shapes support understanding of multiplication as repeated addition.

Children build multiplications in a row using the number shapes. When using odd numbers, encourage children to interlock the shapes so there are no gaps in the row. Using the tens and appropriate other number shapes over the top of the row to check the total.

Using number shapes can support understanding of number patterns such as odd $\times$ odd = even, odd $\times$ even = odd, even $\times$ even = even.

Number shapes can support children's understanding of division as grouping. They make the number they are dividing and then place the number shape they are dividing by over the top of the number being divided to find how many groups of the number there are. e.g. There are 6 groups of 3 in 18.

Bead strings



$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

$$15 \div 3 = 5$$



$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

$$15 \div 5 = 3$$



$$4 \times 5 = 20$$

$$5 \times 4 = 20$$

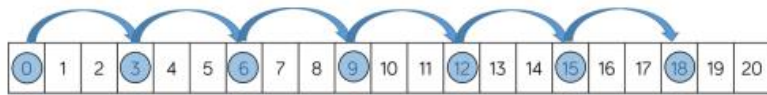
$$20 \div 4 = 5$$

Bead strings to 100 can support children's understanding of multiplication as repeated addition. They build the multiplication using beads. The colour of the beads supports children to see how many groups.

Children can also use the bead string to count forwards and backwards in multiples, moving the beads as they count.

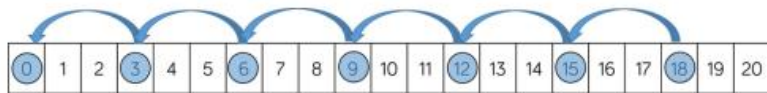
When dividing, children build the number they are dividing and then group the beads into the number they are dividing by. They then count how many groups they have made to find the answer.

Number tracks



$$6 \times 3 = 18$$

$$3 \times 6 = 18$$



$$18 \div 3 = 6$$

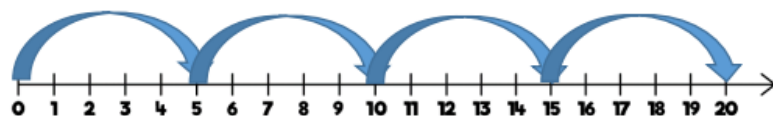
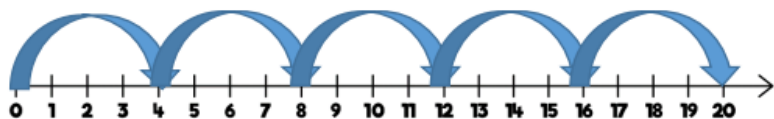
Number tracks support the counting in multiples, forwards and backwards.

When multiplying, children place a counter on zero to start and then count on to find the product of the numbers.

When dividing, children place a counter on the number they are dividing and then count back in jumps of the number they are dividing by until they reach zero. They record how many jumps in order to find the answer.

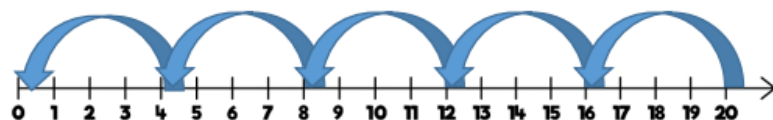
Number tracks are useful for smaller multiples.

Labelled number lines



$$4 \times 5 = 20$$

$$5 \times 4 = 20$$

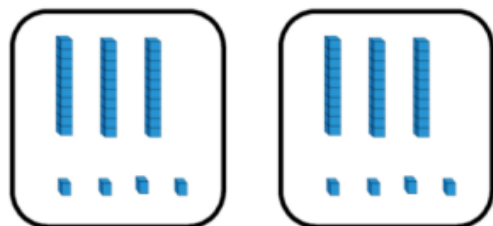


$$20 \div 4 = 5$$

These work in a similar way to number tracks.

Again less useful for larger multiples.

Base ten (Dienes)



$$68 \div 2 = 34$$

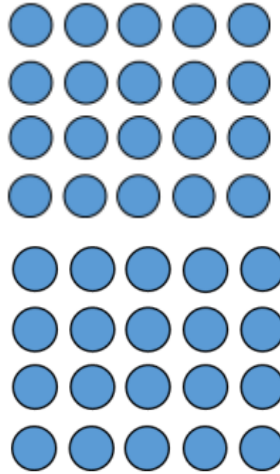
Using Base 10 or Dienes supports children's understanding of division.

It can be an effective way to move children from representing numbers as ones towards representing them as tens and ones in order to divide.

Children can share the Base 10/ Dienes between different groups.

When sharing, the children start with the larger place value (in this case tens) and then the ones. If there are not enough ones to share they can exchange tens for ones.

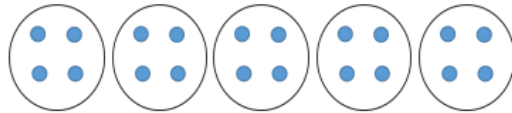
Counters or cubes



$$5 + 5 + 5 + 5 = 20$$

$$4 \times 5 = 20$$

$$5 \times 4 = 20$$



$$20 \div 5 = 4$$

Children use cubes or counters to make arrays when multiplying. They make equal rows and columns and count the total.

When dividing they start with the whole amount to be divided and make equal groups of the amount they are dividing by.