

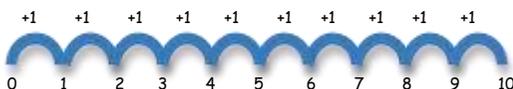
In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them. Children will also be encouraged to check their work using the inverse or a different method. They can represent and explain how to solve problems involving the operations, with increasing independence.

Rec

Teachers should model addition using a range of practical resources using numbers 0 - 20, linked to the terms topic as appropriate.



When counting on, the link with calculating must be explicit:



0 add 1 equals 1, 1 add 1 equals 2, 2 add 1 equals 3... / I more than ... (to 20)

Children should also experience counting in tens, five and twos. Starting and finishing at different numbers is important as this will help them with addition calculations as they

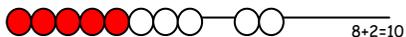
First, children should 'count all' to combine two groups of objects. When this is secure, they will begin to count on. For example, when one group of objects is hidden. Then they will move on to full number sentences. Children should understand the = symbol as 'the same as', balances, equals.



3 add then 3 + 3 = 6 (teacher modelling) equals 6

Begin to relate the addition of doubles to counting on as well as showing the inverse e.g. 6 - 3 = 3

Bead strings or bead bars should be used to model addition.



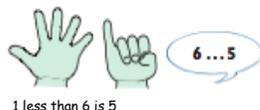
As well as discrete objects, children should use number tracks, progressing to number lines when understanding is secure. Using a number track: 4 red counters add 2 black counters



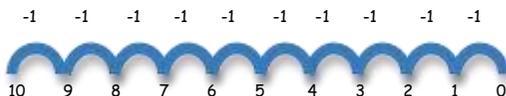
Children should be encouraged to develop a mental picture of a number-line to help with calculation.

They develop ways of recording calculations using pictorial representations. ** see opposite

Teachers should model subtraction using a range of practical resources. Begin to relate subtraction to taking away and counting how many are left.



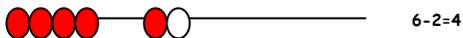
When counting back, the link with calculating must be explicit:



10 subtract 1 equals 9 / 1 less than 10 / 10 take away 1 equals 9

Children should also experience counting in tens, five and twos. Starting and finishing at different numbers is important as this will help them with subtraction calculations as they progress.

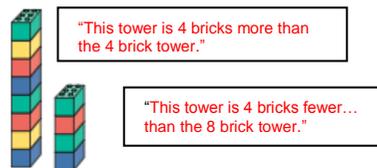
Bead strings or bead bars can be used to illustrate subtraction:



Children should use a range of manipulatives, including counters and bead strings to support calculation. Physical jumping on a number track, will support progression to number lines when understanding is secure.

Children should be encouraged to imagine a number-line to help with calculation. They develop ways of recording calculations using pictorial representations. ** see opposite

Children should be introduced to the language of subtraction as the difference in a range of practical situations, including



using daily routines as a context for learning. For example, comparing the blocks to see how many packed lunches/ school dinners there are on a given day.

Children will experience equal groups of objects.

They will count in 2s and 10s and begin to count in 5s. They should be provided with practical opportunities and visual images eg: counting pairs of socks or counting in tens to find out how many fingers five children would have.



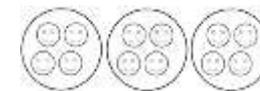
Children should be introduced to the language of doubling in context. E.g. throwing dice, They will work on practical problem solving activities involving equal sets or groups.



'Three hands of 5 fingers is the same as 15 fingers'.

5 + 5 + 5 = 15

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.



Children should experience halving in context e.g. halving apples, sandwiches etc. and have opportunities to practice finding halves of numbers to 10 in practical activities.

Children should have opportunities to explore division by sharing objects out equally 'One for you, one for me...' but also encourage to begin giving out in twos etc...

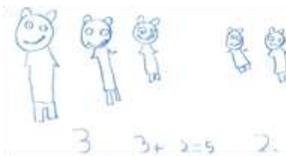
**Children need opportunities to mark make in a variety of contexts - e.g. recording their score in a game, writing prices on labels for the shop... Provide a range of different sized papers and card, white boards, post-its, self-adhesive labels and clipboards etc. to encourage mark making. Ask questions like, 'Can you put something on paper to show me your score...?'

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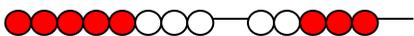
Y1



Children should be encouraged to show pictorial recordings of their calculations including number sentences.



Bead strings or bead bars should be used to illustrate addition including bridging through ten by counting on 2 then counting on 3. e.g. $8 + 5 = 8 + 2 + 3$.



The children should use number tracks and number lines marked out in jumps of one and practical resources to support calculation. They may begin to use number lines marked out in jumps of five and ten.

Teachers will need to model the use of the number line. Children will then begin to use number lines, counting on in ones, to support their own calculations. **The link between the bead bar and number line must be made explicit.** Use to begin to illustrate that addition can be done in any order and to recognise that more than two numbers can be added.



Hand items is 10
Hand legs is 10
 $9 + 1 = 10$



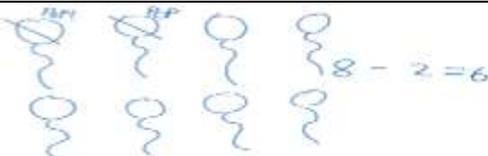
$8 + 2 + 3 = 13$

Numicon can also be used to model bridging through ten by counting on 2 then counting on 3.

Numicon software should also be used during teacher led whole class and guided groups. Children should also have access to this independently both on the interactive whiteboard and on class computers and laptops

Children must have access to a range of counters and resources such as to solve addition calculations with 1 and 2-digit numbers. It is important that children are able to explore a range of resources and be encouraged to consider and reason which is most appropriate for a given calculation.

Vocabulary: see 'Mathematical vocabulary' booklet (2000) p. 12



There were 8 balloons, 2 popped. How many were left?

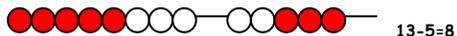
Children need practical activities of 'taking away', that is finding how many are left from a collection of objects when some are removed.

Children also need practical activities of 'finding the difference', which involves making a comparison between the numbers in two groups of objects



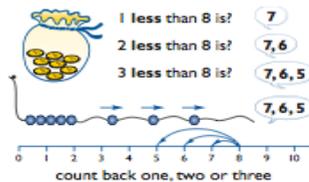
The bead bar and the number line should also be used to show that $8 - 5$ means the 'difference between 8 and 5' or 'the difference between 5 and 8' and how many jumps they are apart.

Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3, then counting back 2. Use the language of 'more than', 'less than' and 'difference between', together.



Begin to show how to add or subtract 9 by adding or subtraction 10 and adjusting by 1. Refer to as 'over jumping 10'.
Visualising $10 = 9 + 1$ $9 = 10 - 1$

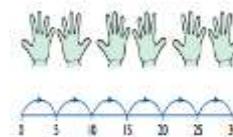
Children should then begin to use number lines to support their own calculations, counting back in ones.



Children will experience equal groups of objects.

They will count in 2s and 10s and 5's.

They will work on practical problem solving activities involving equal sets or groups.



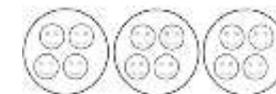
Children should experience doubling numbers in a range of contexts, including discrete objects and continuous measures. E.g. 'Explain how to cut a piece of ribbon for the big doll that is twice as long as the ribbon for the small doll.'



double 4 is 8
 $4 \times 2 = 8$



$2 + 2 = 4$ $4 - 2 = 2$
double 2 is 4 half of 4 is 2



Children should experience halving numbers in a range of contexts. (discrete objects, shapes and quantities) e.g. How might I share this cake equally between 2 people? 4 people?. Folding shapes to find halves, quarters etc. Find half of these muffins...



half of 8 is 4
 $8 \div 2 = 4$



$4 - 2 = 2$
half of 4 is 2



$2 + 2 = 4$
double 2 is 4

Children should experience finding, recognising & naming one half as one of two equal parts and one quarter as one of four equal parts.

They should begin to understand multiplication as repeated addition and as an array in context e.g. eggs in a box and cakes in a tin.
e.g. $5 \times 2 = 5$ multiplied by 2 = 5 '2 times' = $5 + 5$

Make connections between arrays, number patterns and counting in 2's, 5's, 10's.

Children will need to be introduced to the language of 'rows' and 'columns'.



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Y2

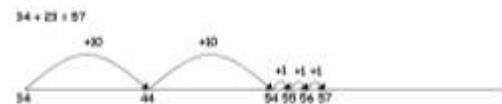
Children should use number lines that are marked out in jumps of one and ten and begin to choose and use number lines which would be most appropriate for a given calculation.

Children will begin to use 'empty number lines' themselves starting with the larger number and counting on, keeping the first number whole.

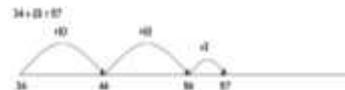
Numicon and Base Ten can be used to support this. It is important that the visual image of these resources is related to the number line. Encourage children to use the language of partitioning and bridging when explaining their strategies.

Counting on.

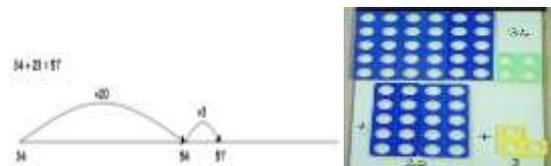
First counting on in tens and ones.



Then helping children to become more efficient by adding the units in one jump (by using the known fact $4 + 3 = 7$).



Followed by adding the tens in one jump and the units in one jump.



Bridging through ten can help children become more efficient.



Compensation

Children should be taught compensation, for example, when adding 9, it is easier to add 10 then subtract 1, modelling on a bead bar and number lines.

$37 + 9 = ??$ $37 + 10 = 47$ $47 - 1 = 46$

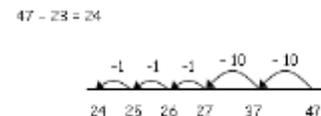
Missing number problems.

Children should understand complementary addition, for example, solving word problems, such as 'you need 10 marbles, but you only have 6, how many more do you need?' Model on bead bar and number line... 'how to find the

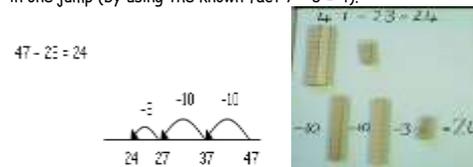
Children will use bead strings and numbered number lines to support calculations. They should begin to use empty number lines. When subtracting, children should be taught to only partition the second number.

Counting back:

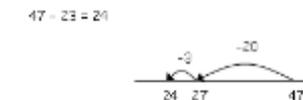
First counting back in tens and ones.



Then helping children to become more efficient by subtracting the units in one jump (by using the known fact $7 - 3 = 4$).

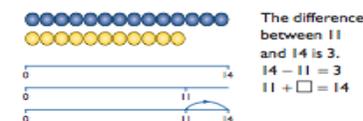


Subtracting the tens in one jump and the units in one jump.



Counting on:

It is important that children experience finding the difference between 2 numbers by counting on. The difference ITP is a good visual image.



It is important that this is modelled using two bead strings, or two Numicon plates as shown in the picture above, moving onto numbered number lines. Children should experience finding the difference in a range of contexts including height e.g. growth of two seedlings.

Compensation When subtracting 9, it is easier to subtract 10

then add 1, (model on a bead bar)
 $37 - 9 = ??$ → $37 - 10 = 27$ → $27 + 1 = 28$

Children will develop their understanding of multiplication and use jottings to support calculation:



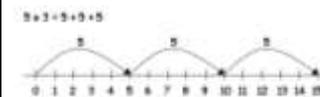
Repeated addition

5 times 3 is $5 + 5 + 5 = 15$ or 3 lots of 5 or 5×3

Repeated addition can be shown easily on a bead bar:



and on a number line:



Children should know that 3×5 has the same answer as 5×3 . This can also be shown on the number line.



Arrays

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method. Children will need to be taught the language of 'rows' and 'columns'. Explore using objects eg PE cones, doty paper,



Teach the language of 'rows' and 'columns'. The multiplication ITP is a good visual image. They should explore them in the environment.

Scaling.

Children should have experience of scaling. Exploring concepts in a range of contexts such as 'This is twice as long as/ half as long as/ 3 times as tall as.

Children will develop their understanding of division and use jottings to support calculation. They should make the link between counting in equal steps and grouping.

Sharing

6 sweets shared between 2 people, how many do they each get?



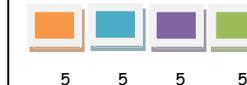
Relate fractions to the sharing aspect of division and model the recording. E.g. $8 \div 2 =$ half of 8.

Grouping

There are 6 sweets, how many people can have 2 sweets each?



Crisps come in packs of 5, I have 20 children and each needs a packet. How many packs do I need to buy? $20 \div 5 = 4$



Children should be encouraged to use their known multiplication facts to work out division calculations.

The bead bar will help children with interpreting calculations such as $12 \div 3 =$ as 'How many 3's equal 12?'

They should also begin to link division to an array.

Children should be able to solve calculations using symbols to stand for unknown numbers and complete equations using inverse operations.

$\square \div 2 = 4$ $20 \div \triangle$ $\square \div \triangle = 4$

Scaling down

e.g. Sam ran 6km on Saturday. On Sunday he ran half as far. How far did he run on Sunday?

In order to encourage children to work mentally, calculations should always be presented horizontally so children can make decisions about how to tackle them. Children will also be encouraged to check their work using the inverse or a different method. They can represent and explain how to solve problems involving the operations, with increasing independence.

missing number' e.g. $10 = 6 + \underline{\quad}$
Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems.

Vocabulary: see Mathematical vocabulary booklet (2000) p. 16

Vocabulary: see
'Mathematical
vocabulary' booklet
(2000) p. 12

