Strategies your Child might Use for...
SUBTRACTION

Number Lines for Subtraction

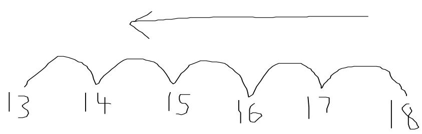
Number lines are just as useful in aiding simple subtraction where children are reminded that they are 'jumping' backwards as the numbers need to get smaller.
Children will continue to use the terms 'jumps', or 'counting back' or even 'bunny hops'; and will be encouraged to put their finger or an object on the start number and move backward the number of spaces for the number they are subtracting or taking away.
Number lines are frequently created in an outside environment (using chalk) where children will physically jump backwards to understand the calculation.
A common misconception in early development is 'jumping on the spot' whereby children do not move backward for their initial move.

Next Steps

Blank number lines for Subtraction

As children become more aware of the number system they are encouraged to create their own number line for a subtraction calculation. Rather than starting at zero, they will put the largest number at the start of their number line and jump backward the number to subtract before going back to 'fill in the gaps' to find the answer. Often children will be encouraged to work from the right of the page to the left of the page to show that they are moving backwards.

18 - 5



89 - 42

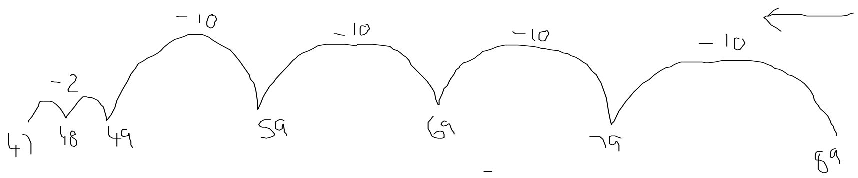
Next Steps

Blank number lines using Tens and Units

When children are more familiar with place value they will begin to recognise that jumping backward ten at a time is much more efficient than making ten individual jumps. As they become more confident they will be encouraged to create their own number line to subtract and will put their starting number first and make a 'big jump' to represent taking away a ten and 'little jumps' to show subtracting the units. These have sometimes been called kangaroo jumps in KS1 and children have referred to the them as 'Joey and Mel Jumps' (Joey, a baby kangaroo, would obviously make smaller jumps than his mum Mel!). This method requires children to have a sound knowledge of '10 less' and '1 less' than any given number.

A common misconception here is when children draw the number line correctly and fill in the tens numbers, but continue counting in tens rather than reverting to units. Another misconception is that children will construct the number line correctly, but add rather than subtract or even start subtracting the tens but then add the units.

89-42=



Subtracting by Partitioning

Once children understand the value of a number and are secure with addition methods using partitioning, we are able to progress to subtraction.

First Steps

Children will use Diene’s apparatus or other appropriate supporting equipment to physically take away different amounts. At this point, all 3 digits in the starting number are larger than the second number (for example 628 – 517). At this stage, children are not quite ready to deal with numbers that may cross boundaries or involve a decomposition method (“carrying” - see further on), so we do not give questions where units in the second number are greater than the first (for example 628 – 519).

Children are always encouraged to draw their understanding. For subtraction, children might draw the starting number of objects and colour in (rather than rub out for take away) the second number to find how much is left.

Next Steps

Children are able to recognise that they can subtract the tens and then the ones.
34 – 21 become 30 subtract 20 then 4 take 1. This may be done mentally or written in a simple number sentence. Children then progress to performing the same method, but with HUNDREDS tens and ones. For example 345 – 124 = 300 – 100

40 – 20

5 – 4

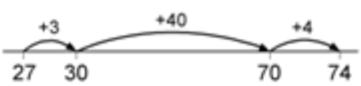
Children often spend a long time consolidating this level of understanding before they are ready to move on.

Further Steps: Decomposition

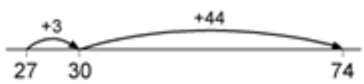
It is only when children truly understand the worth of a number and the value of its place or position that children can then progress to tackling a question where some digits pose a problem because they cannot be subtracted simply. This is called decomposition. So although 628 – 519 is possible, because the 9 is more than the 8 it gives our mathematicians a problem as they can no longer just ‘take it away’. Something needs to be done to the tens! To understand a new concept we go back to more familiar ground: practical apparatus like Deine’s. Children will understand that they need to subtract 9 ones, but can only take 8. They will also understand by now that a tens rod is made up of 10 units. Children physically break up a rod of ten into pieces (or decompose it) so that they are then able to take away that remaining unit. They will then be able to ‘see’ that they now have fewer tens, and some units left over.

<u>Counting Up in order to ‘Subtract’ or ‘Take Away’</u>

The mental method of counting up from the smaller to the larger number can be recorded using either number lines or vertical columns. The number of rows (or steps) can be reduced by combining steps. As subtraction becomes more challenging for children, like with two-digit numbers, this requires children to have developed the ability to work out the answer to a calculation such as 30 + ? = 74 mentally.



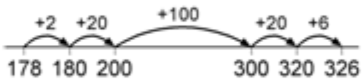

```
  74
- 27
   3  → 30
  40  → 70
   4  → 74
  47
```




```
  74
- 27
   3  → 30
  44  → 74
  47
```

With three-digit numbers, the number of steps can again be reduced, provided that children are able to work out answers to calculations such as 178 + ? = 200 and 200 + ? = 326 mentally.

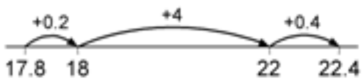
The most compact form of recording remains reasonably efficient.



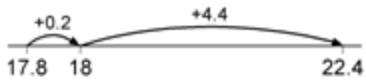

```
 326
-178
   2  → 180
  20  → 200
 100  → 300
  26  → 326
 148
```


```
 326
-178
  22   → 200
 126   → 326
 148
```

The method can be used with decimals where no more than three columns are required. However, it becomes less efficient when more than three columns are needed.




```
 22.4
-17.8
  0.2  → 18
  4.0  → 22
  0.4  → 22.4
  4.6
```




```
 22.4
-17.8
  0.2  → 18
  4.4  → 22.4
  4.6
```

This counting-up method can be a useful alternative for children who find the more standard written methods explained next in this booklet challenging.

Expanded Column Layout for Subtraction

Partitioning the numbers into 'tens' and 'ones' and writing one under the other mirrors the column method, where 'units' are placed under 'units' and tens under tens.
This does not link directly to mental methods of counting back or up but is similar to the partitioning method for addition. It also relies on secure mental skills.
The expanded method leads children to the more compact method so that they understand its structure and efficiency.
Partitioned numbers are then written under one another:

Example: 74 - 27

```
  70 + 4        60   14           6 14
- 20 + 7        70 + 4            7  4
               - 20 + 7          - 2  7
                 40 + 7            4  7
```

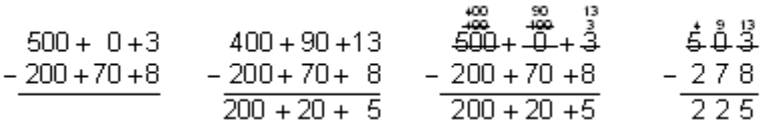
Example: 741 - 367

```
  700 + 40 + 1        600   130   11        6 13 11
- 300 + 60 + 7        700 + 40 +  1         7  4  1
                    - 300 + 60 +  7       - 3  6  7
                      300 + 70 +  4         3  7  4
```

The amount of time that is spent teaching and practising the expanded method will depend on how secure the children are in their recall of number facts and with partitioning: some children will need plenty of time to further consolidate their understanding of the maths involved, others will understand quickly and be ready to move onto more formal written methods.

However, as the level of difficulty increases with numbers of greater size and complexity, the skills and knowledge that the children are expected to be able to apply is greater too! Eventually, to the extent of the example below...

Example: 503 – 278, dealing with zeros when adjusting



Here 0 acts as a place holder for the 'tens'. The adjustment has to be done in two stages. First the 500 + 0 is partitioned into 400 + 100 and then the 100 + 3 is partitioned into 90 + 13.