

## Subtraction

### Stage 1:

#### **Recording and developing mental pictures**

Children are encouraged to develop a mental picture of the calculation in their heads. They experience practical activities using a variety of equipment and develop ways to record their findings including models and pictures.

Children will engage in a variety of counting songs and rhymes and practical activities. In practical activities and through discussion they will begin to use the vocabulary associated with subtraction.

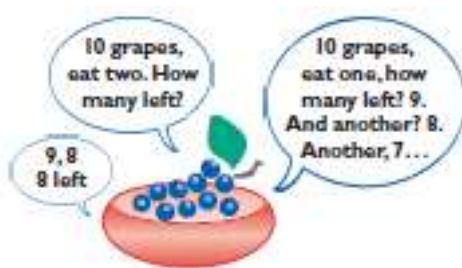
They will find one less than a given number.

They will begin to relate subtraction to 'taking away' using objects to count 'how many are left' after some have been taken away.

$$6 - 2 = 4$$

'Take two apples away. How many are left?'

Children will begin to count back from a given number.



The 'difference between' is introduced through practical situations and images.



## Stage 2:

### **Progression in the use of a number line**

-Subtracting on fingers using single digits.

- Understanding of counting back with a number track.



- Understanding of counting back with a numberline (supported by models and images).

Children should experience a range of representations of number lines and number tracks.

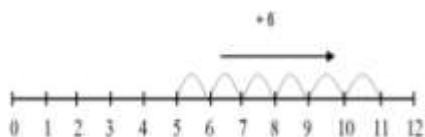
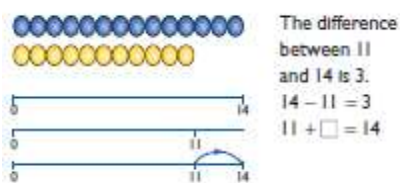
Use of bead string to count back

Use of a 100 grid to count back

Different orientations of the 100 square help children transfer their skills and understanding between similar representations.

### *Difference between*

• The number line should also be used to make comparisons between numbers, to show that  $6 - 3$  means the 'difference in value between 6 and 3' or the 'difference between 3 and 6' and how many jumps they are apart.



Counting on to find a small difference:

Introduce complementary addition to find differences (only use for small differences). The use of models is extremely important here to understand the idea of "difference". Count up from the smallest number to the largest to find the difference using resources, e.g. cubes, beads, number tracks/lines:

$$11 - 9 = 2$$


The difference between nine and eleven is two.

### Stage 3:

The empty number line as a representation of a mental strategy (this stage is a representation of a mental method not a formal written method)

*Counting back (when the context of the problem results in their being less)*

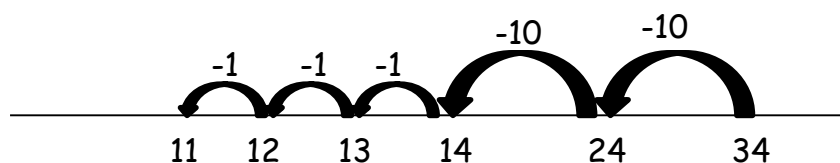
*Children should start on the right side of the number line and work towards the left when jumping.*

- Partitioning numbers and bridge through 10s.  
eg  $15 - 7 = 8$

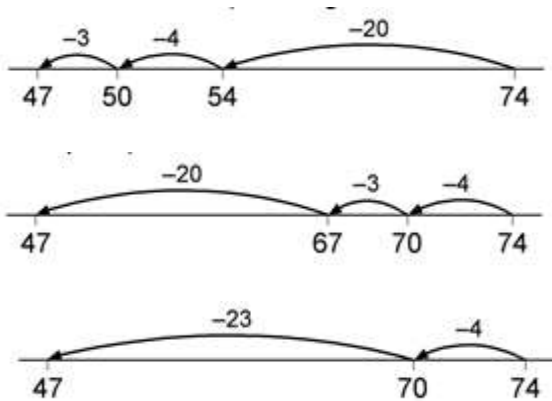


Children need to be able to subtract multiples of 10 and single digits and show this on an empty number line.

Then move to partitioning numbers into tens and ones.  
eg  $34 - 23 =$



As children become more efficient they will be able to use different sized jumps, use partitioning and bridging through 10.



Counting on (from the smaller number to the larger number to find the difference; useful for comparisons problems)

Count up from the smallest number to the largest to find the difference.

$$12 - 8 = 4$$

+1 +1 +1 +1



8 9 10 11 12

'The difference between 8 and 12 is 4.'

$$32 - 28 = 4$$

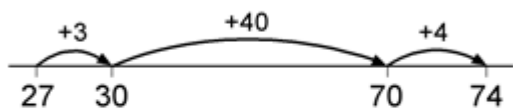
+1 +1 +1 +1



28 29 30 31 32

'The difference between 28 and 32 is 4.'

$$74 - 27 =$$



The 'jumps' should be added, either mentally or with jottings according to confidence, beginning with the largest number e.g.  $40 + 4 + 3$ .

#### Stage 4:

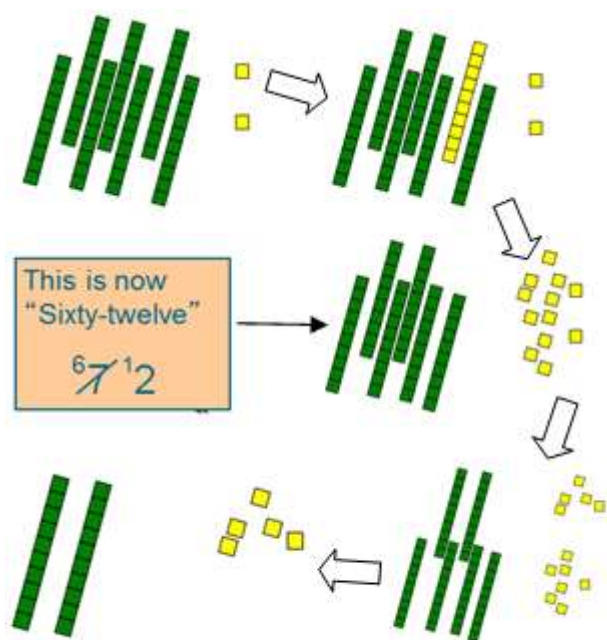
##### Practical equipment using exchange to 'take away'

- Children use practical apparatus to take away the smaller number from the larger. This should be used to model exchanging as in the example.

Teachers will start with straws, bundled into 10s and singularly. Children see 10 straws making one bundle and can be involved in bundling and unbundling.

This then progresses to the use of Dienes (or similar) where 10s are clearly ten ones but cannot be separated in the same way.

Once children are able to use these with understanding, they will progress to the use of place value cards and place value counters which are a further abstraction of the concept of number. Money should also be used (1ps, 10ps and £1) as place value equipment to help children develop their understanding of a range of representations.



$$72 - 47 = 25$$

Expanded written methods using vertical layout:

$$\begin{array}{r}
 81 - 57 = \\
 80 \quad 1 \rightarrow 70 \quad 11 \\
 \underline{50 \quad 7} \quad \underline{50 \quad 7} \\
 \quad \quad \underline{20 \quad 4} = 24
 \end{array}$$

This is a teaching stage

Stage 5: Making the link between the practical and columnar subtraction.

Diagram illustrating the transition from base ten blocks to a grid for the subtraction  $72 - 47$ . The left side shows base ten blocks (7 tens rods and 2 ones units). The middle shows a grid with the subtraction  $72 - 47$ . The right side shows base ten blocks (6 tens rods and 2 ones units) after removing 4 tens rods and 7 ones units.

Diagram illustrating the transition from base ten blocks to a grid for the subtraction  $72 - 47$ . The left side shows base ten blocks (7 tens rods and 2 ones units). The middle shows a grid with the subtraction  $72 - 47$ . The right side shows base ten blocks (6 tens rods and 12 ones units) after removing 4 tens rods and 7 ones units.

Diagram illustrating the transition from base ten blocks to a grid for the subtraction  $72 - 47$ . The left side shows base ten blocks (6 tens rods and 2 ones units). The right side shows a grid with the subtraction  $72 - 47$ .

Where the subtracted amount is removed

Diagram illustrating the transition from base ten blocks to a grid for the subtraction  $72 - 47$ . The left side shows base ten blocks (6 tens rods and 2 ones units). The right side shows a grid with the subtraction  $72 - 47$  and the result  $25$ .

And the answer is represented by what is remaining in the top row

## Stage 6:

### **Compact method**

Finally children complete the compact columnar subtraction as the most efficient form. Once children are confident with HTU - HTU, this should be extended to four digit subtract four digit calculations.

$$563 - 246 = 317$$

$$\begin{array}{r} 51 \\ \cancel{5}63 \\ \underline{246} \\ \underline{317} \end{array}$$

932 - 457 becomes

$$\begin{array}{r} \phantom{9}32 \\ - 457 \\ \hline \phantom{9}475 \end{array}$$

Answer: 475