

USEFUL WEBSITES

Expanded addition:

http://www.wmnet.org.uk/custom/files_uploaded/uploaded_resources/850/addexpand.swf

Decomposition expanded:

http://www.wmnet.org.uk/custom/files_uploaded/uploaded_resources/851/decompexpandv2.swf

Further help with addition and subtraction:

<http://www.bbc.co.uk/schools/ks2bitesize/maths/>

<http://www.bbc.co.uk/skillswise/numbers/wholenumbers/>

Broom Barns Community Primary School



Strategies Taught
in School
for
Addition
and
Subtraction

Information for Parents



Strategies for Addition and Subtraction

The aim of the Primary framework for mathematics is that by the end of Key Stage 2, the great majority of children should be able to use an efficient written method for each operation with confidence and understanding.

We want the children to know that they have a reliable written method to which they can turn when the need arises.

In setting out these aims, the intention is that schools adopt greater consistency in their approach to calculations.

(Primary Framework of literacy & mathematics Primary National Strategy 2006)

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence.

$$\begin{array}{r} 1) \quad 4 \quad 2 \quad 9 \\ - \quad 1 \quad 0 \quad 9 \\ \hline 3 \quad 2 \quad 0 \end{array}$$

$$\begin{array}{r} 4) \quad 3 \quad 6 \quad 5 \quad 2 \\ - \quad 2 \quad 5 \quad 1 \quad 1 \\ \hline 1 \quad 1 \quad 4 \quad 1 \end{array}$$

$$\begin{array}{r} 2) \quad 5 \quad 7 \quad 7 \\ - \quad 2 \quad 3 \quad 4 \\ \hline 3 \quad 4 \quad 3 \end{array}$$

$$\begin{array}{r} 5) \quad \quad 5 \quad 12 \quad 1 \\ \quad 7 \quad \cancel{6} \quad \cancel{3} \quad 2 \\ - \quad 4 \quad 1 \quad 9 \quad 6 \\ \hline 3 \quad 4 \quad 3 \quad 6 \end{array}$$

$$\begin{array}{r} 3) \quad 2 \quad 1 \\ \quad \cancel{3} \quad 8 \quad 7 \\ \quad 2 \quad 9 \quad 4 \\ \hline 9 \quad 3 \end{array}$$

$$\begin{array}{r} 6) \quad 3 \quad 1 \\ \quad \cancel{4} \quad 2 \quad 9 \quad 8 \\ - \quad 3 \quad 6 \quad 5 \quad 4 \\ \hline 6 \quad 4 \quad 4 \end{array}$$

Stage 3: Expanded Layout, Leading to Column Method

- Partitioning the numbers into tens and ones and writing one under the other mirrors the column method, where ones are placed under ones and tens under tens.
- This does not link directly to mental methods of counting back or up but parallels 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. The amount of time that should be spent teaching and practicing the expanded method will depend on how secure the children are in their recall of number facts and with partitioning.

Addition

To add successfully, children need to be able to:

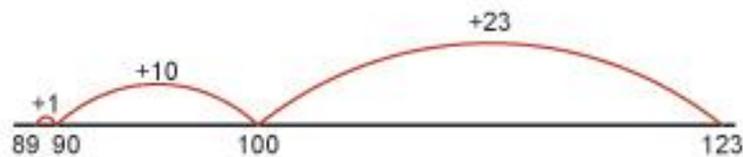
- Recall all addition pairs to $9 + 9$ and complements to 10:
- Add mentally a series of one-digit numbers, such as $5 + 8 + 4$;
- Add multiples of 10 (such as $60 + 70$) or 100 (such as $600 + 700$) using related addition fact, $6 + 7$, and their knowledge of place value;
- Partition two-digit and three-digit numbers into 100, 10 and 1 in different ways.

Note: It is important that children's mental methods of calculation are practiced and secured alongside their learning and use of efficient written method of addition.

Stage 1 : The empty Number Line

- The mental methods that lead to column addition generally involve partitioning, e.g. adding the tens and ones separately, often starting with the tens. Children need to be able to partition numbers in ways other than into tens and ones to help them make multiples of ten by adding on steps.
- The empty number line helps to record the steps on the way to calculating the total.

Adding on a Number Line



Stage 2: Partitioning

- The next stage is to record mental methods using partitioning. Add the tens and then the ones to form partial sums and then add these partial sums.
- Partitioning both numbers into tens and ones mirrors the column method where ones are placed under ones and tens under tens. This also links to mental methods.

Examples;

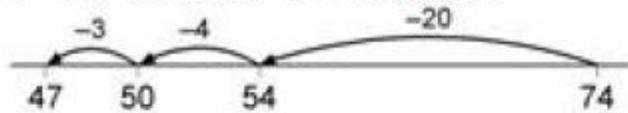
$$35 - 23 = 12$$

$$(30 - 20 = 10) + (5 - 3 = 2)$$

$$10 + 2 = 12$$

Taking away on a number line example

$74 - 27 = 47$ worked by counting back:



The steps may be recorded in a different order:



Stage 2: Partitioning

- The next stage is to record mental methods using partitioning. Add the tens and then the ones to form partial sums and then add these partial sums.
- Partitioning both numbers into tens and ones mirrors the column method where ones are placed under ones and tens under tens. This also links to mental methods.

Example :

$$67 + 24 =$$

$$60 + 20 = 80$$

$$7 + 4 = 11$$

$$80 + 11 = 91$$

Examples

$$215 + 370 = 585$$

$$200 + 300 = 500$$

$$10 + 70 = 80$$

$$5 + 0 = 5$$

$$500 + 80 + 5 = 588$$

$$387 + 294 = 681$$

$$300 + 200 = 500$$

$$80 + 90 = 170$$

$$7 + 4 = 11$$

$$500 + 170 + 11 = 681$$

Stage 1 : Using the Empty Number Line

- The empty number line helps to record or explain the steps in mental subtraction. A calculation like $74 - 27$ can be recorded by counting back 27 from 74 to reach 47. The empty number line is also a useful way of modeling processes such as bridging through a multiple of ten.
- The steps can also be recorded by counting up from the smaller to the larger number to find the difference, for example by counting up from 27 to 74 in steps totalling 47.
- With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations such as $57-12$, $86-77$ or $43-28$.

Subtraction

To subtract successfully, children need to be able to:

- Recall all addition and subtraction facts to 20;
- Subtract multiples of 10 (such as $160 - 70$) using the related subtraction fact, $16 - 7$, and their knowledge of place value;
- Partition two-digit and three-digit numbers into multiples of one hundred, ten, and one in different ways (e.g. partition 74 into $70 = 4$ or $60 + 14$).

Stage 3: Expanded Methods in Columns

- Move on to a layout showing the addition of the tens to the tens and the ones to the ones separately. To find the partial sums either the tens or the ones can be added first, and the total of the partial sums can be found by adding them in any order. As children gain confidence, ask them to start by adding the ones digits first always.
- The addition of the tens in the calculation $47 + 76$ is described in the words 'forty plus seventy equals one hundred and ten', stressing the link to the related fact 'four plus seven equals eleven'.
- The expanded method leads children to the more compact method so that they understand its structure and efficiency. The amount of time that should be spent teaching and practicing the expanded method will depend on how secure the children are in their recall of number facts and in their understanding of the place value.

Stage 4 : Column Method

- In this method, recording is reduced further. Carry digits are recorded below the line, using the words 'carry them' or 'carry one hundred', not 'carry one'.
- Later, extend to adding three two-digit numbers, two three-digit numbers and numbers with different number digits.

$$\begin{array}{r}
 4 \quad 6 \quad 3 \\
 + \quad 2 \quad 8 \quad 5 \\
 \hline
 6 \quad 0 \quad 0 \\
 1 \quad 4 \quad 0 \\
 \quad 8 \\
 \hline
 7 \quad 4 \quad 8
 \end{array}$$

$$\begin{array}{r}
 4 \quad 3 \quad 6 \\
 + \quad 5 \quad 8 \quad 2 \\
 \hline
 9 \quad 0 \quad 0 \\
 1 \quad 1 \quad 0 \\
 \quad 8 \\
 \hline
 1 \quad 0 \quad 1 \quad 8
 \end{array}$$

Examples

$$\begin{array}{r}
 \quad 6 \quad 3 \quad 9 \\
 + \quad 4 \quad 8 \quad 2 \\
 \hline
 1 \quad 1 \quad 2 \quad 1 \\
 \quad \cancel{1} \quad \quad \cancel{1}
 \end{array}$$

$$\begin{array}{r}
 \quad 9 \quad 0 \quad 8 \\
 + \quad 6 \quad 9 \quad 7 \\
 \hline
 1 \quad 6 \quad 0 \quad 5 \\
 \quad \cancel{1} \quad \quad \cancel{1}
 \end{array}$$