

## Progression for Addition

### Written methods for addition of whole numbers

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. Children are entitled to be taught and to acquire secure mental methods of calculation and one efficient written method of calculation for addition which they know they can rely on when mental methods are not appropriate.

### To add efficiently, children need to be able to:

Understand addition as combining sets to find a total

recall all addition pairs to  $9 + 9$  and complements in 10

add mentally a series of one-digit numbers, such as  $5 + 8 + 4$

add multiples of 10 (such as  $60 + 70$ ) or of 100 (such as  $600 + 700$ ) using the related addition fact,  $6 + 7$ , and their knowledge of place value

partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways e.g.

$352$  into  $300 + 50 + 2$  or  $300 + 40 + 12$  or  $200 + 150 + 2$

**Note:** It is important that children's mental methods of calculation are practiced and secured alongside their learning and use of an efficient written method for addition. Mental methods may be supported by jottings. **These jottings are part of the calculating process and must not be erased or written in a different place to the calculation.**

#### Level 1

Counts, orders and adds numbers when solving problems involving up to 10 objects.

#### Level 2

Uses mental recall of addition facts to 10.

Uses mental calculation strategies for addition to solve problems involving money and measures.

Uses the knowledge that subtraction is the inverse of addition.

#### Level 3

Uses mental recall of addition facts to 20 in solving problems involving larger numbers.

Adds numbers with two digits mentally.

Adds numbers with three digits using written methods.

#### Level 4

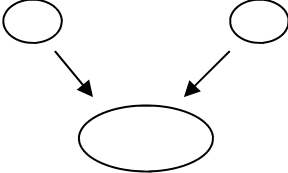
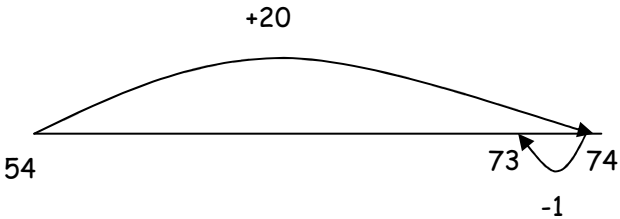
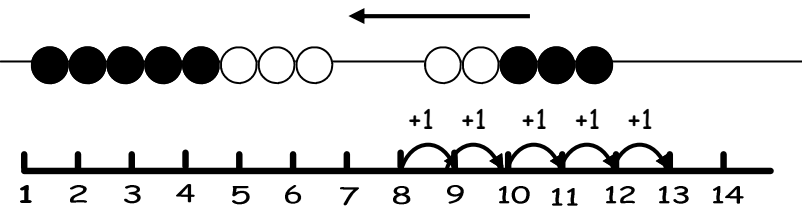
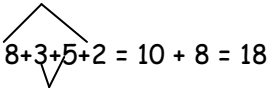
In solving number problems, uses a range of mental methods of addition with the four operations.

Uses efficient written methods of addition.

Uses decimals to two decimal places.

#### Level 5

Adds negative numbers in contexts.

Stage	Progression for Addition
1	<p><b>DEVELOPING UNDERSTANDING</b></p> <ul style="list-style-type: none"> <li>Understand addition as combining sets to make a total, initially counting all items in the set then moving on to counting on from the larger number. Develop and support understanding through images such as:</li> </ul>  <ul style="list-style-type: none"> <li>Interpret situations as addition calculations and explain reasoning. For example, answer questions such as: <ul style="list-style-type: none"> <li><i>Lisa has 5 pens and Tim has 2 pens. How many pens do they have altogether?</i></li> </ul> </li> </ul>
2	<p><b>DEVELOPING MENTAL CALCULATION</b></p> <ul style="list-style-type: none"> <li>Derive and recall addition facts including those for each number to 20</li> </ul> <p>NB: Children should develop and use a 'toolbox' of mental calculation strategies from which they can choose the most efficient strategy to solve a calculation depending on the numbers involved in it.</p> <p><b>SPECIAL CASE STRATEGIES</b></p> <ul style="list-style-type: none"> <li><b>Compensation</b> (adding nearest multiple of 10, 100 etc and adjusting) <p>54+19</p>  </li> <li><b>Near doubles</b> (adding numbers relatively close to each other in value) <p>12+13 = 12+ (12+1) = 24+1 = 25</p> <p>1.5 + 1.6 = Double 1.5 plus 0.1</p> </li> <li><b>Re-ordering</b> (use knowledge that addition can be done in any order) e.g. simplify the calculation by putting largest number first.... <p>8+5</p>  <p>..look for pairs of numbers that total 10 etc</p>  </li> </ul>

FS/  
Y1Y1-  
Y6

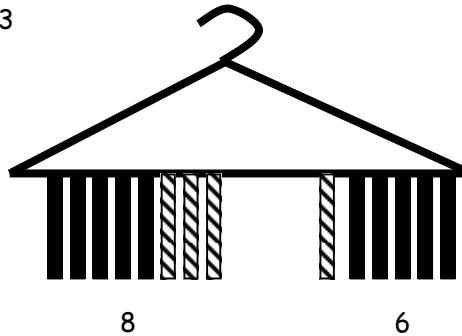
**GENERAL STRATEGY**

**Partitioning:**

Use counting and developing recall of number facts to add a pair of numbers mentally by...

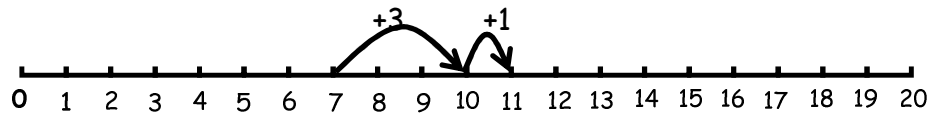
- **Partitioning numbers into '5 and a bit'**

$$8 + 6 = 5 + 5 + 3 + 1 = 13$$



- **Partitioning numbers to enable bridging through 10....**

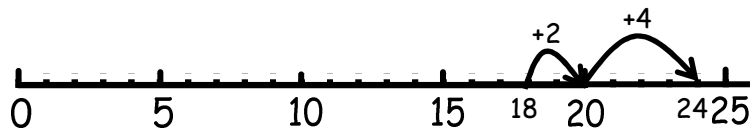
$$7 + 4 = 11$$



2

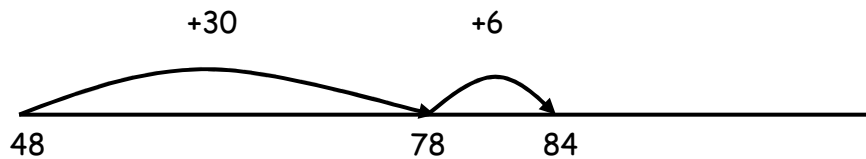
- **...progressing to bridging through 20**

$$18 + 6 = 24$$



- **Partitioning two digit numbers into their component parts**

$$48 + 36 = 84$$



or

$$\begin{aligned} 48 + 36 &= (40 + 30 + 8 + 6) \\ &= 70 + 14 \\ &= 84 \end{aligned}$$

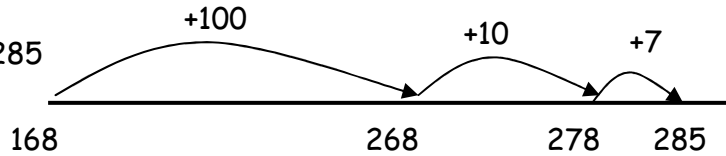
$$\begin{aligned} 48 + 36 &= 48 + (30 + 6) \\ &= 78 + 6 \\ &= 84 \end{aligned}$$

**WRITTEN METHODS:**

Children should be encouraged to select an appropriate calculation method, be it mental or written, depending on the numbers involved in the calculation. To develop this skill children should be taught to ask themselves 'Can I do this mentally?' Therefore, it is important that children's mental methods of calculation are practised and secured alongside their learning and development towards a compact written method.

**USING THE NUMBER LINE AS A WRITTEN METHOD FOR LARGER NUMBERS**

$168 + 117 = 285$



3

**EXPANDED WRITTEN METHOD:**

This leads children to the more compact written method developing an understanding of its structure and efficiency. Two and three digit addition:

Write the numbers in columns - start with adding the units, then the tens etc.

a.

76
+ 47
-----
13
110
-----
123

Numbers are still added up mentally

168
+ 117
-----
15
70
200
-----
285

The amount of time that should be spent teaching and practising this expanded method will depend on how secure the children are in their recall of number facts and with partitioning.

**COMPACT METHOD:**

*NB: For some children the number line will still be the most efficient and reliable calculation method.*

The method doesn't change but the recording is reduced. Only the children who can calculate independently and accurately with the expanded method should be introduced to the compact method. 'Carry' digits are recorded below the line.

4

- No 'Carrying'

$$\begin{array}{r} 42 \\ + 23 \\ \hline 65 \end{array}$$

and

$$\begin{array}{r} 415 \\ + 224 \\ \hline 639 \end{array}$$

- One 'Carry' - extra digit in the answer

$$\begin{array}{r} 82 \\ + 27 \\ \hline 109 \\ 1 \end{array}$$

- One 'carry' - ones to tens

$$\begin{array}{r} 159 \\ + 34 \\ \hline 193 \\ \hline 1 \end{array}$$

- One 'carry' -tens to hundreds

$$\begin{array}{r} 541 \\ + 293 \\ \hline 834 \\ \hline 1 \end{array}$$

- Two 'Carries' - 'ones to tens' and 'tens to hundreds'

$$\begin{array}{r} 376 \\ + 485 \\ \hline 861 \\ \hline 11 \end{array}$$

- Use method to begin to add 2 or more 3 digit sums of money or measures, with or without adjustments, and the same number of decimal places.

$$\begin{array}{r} \pounds 4.21 \\ \pounds 3.87 \\ \hline \pounds 8.08 \\ \hline 1 \end{array}$$

***NB:For children displaying a lack of understanding of recording at Stage 4, return to the expanded method of recording at Stage 3.***

- Extend method to numbers with at least four digits.

$$\begin{array}{r} 1587 \\ + 475 \\ \hline 2062 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 3587 \\ + 1675 \\ \hline 5262 \\ \hline 111 \end{array}$$

- Use the compact method extending to numbers with any number of digits.
- Use the compact method to add two or more decimal fractions with up to 4 digits and either 1 or 2 decimal places.

4

Y4

Y5

Y6