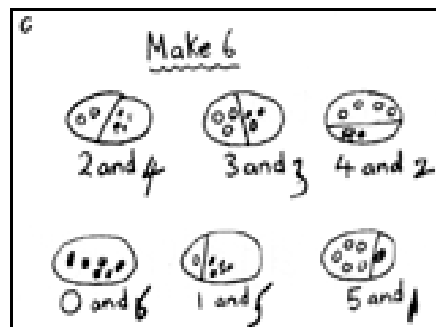


Appendix 1: Progression Through Calculations For Addition

- These standards are age-related expectations and therefore we expect the majority of children to achieve them.
- New learning is likely to be taught to groups rather than the whole class to acknowledge the different learning stages of the children.
- Children should understand that addition is commutative and therefore calculations can be rearranged, e.g. $4 + 13 = 17$ is the same as $13 + 4 = 17$.
- Ensure that children understand the $=$ sign means is the same as, not makes, and that children see calculations where the equals sign is in a different position, e.g. $3 + 2 = 5$ and $5 = 3 + 2$.
- Children should be encouraged to approximate before calculating and check whether their answer is reasonable.

Year R

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They should experience practical calculation opportunities using a wide variety of equipment, e.g. small world play, role play, counters, cubes etc. They develop ways of recording calculations using pictures, etc.



Children **who are ready** may record this as:

$$6 = 2 + 4 \quad 6 = 3 + 3 \quad 6 = 4 + 2 \quad 6 = 0 + 6 \quad 6 = 1 + 5 \quad 6 = 5 + 1$$

Children may be introduced to numberlines from zero on which to plot additions.

$$3 + 1 = 4$$



Year 1

Children will initially use practical equipment to combine groups of objects to find the total. They will move on to the use of number strings, number lines, Singapore Bars and Base 10 equipment to support their developing understanding of addition. They will record the calculations using their own drawings of the Base 10 equipment (as lines for the 10 rods and dots for the unit blocks; 'chips and peas') and on numberlines.

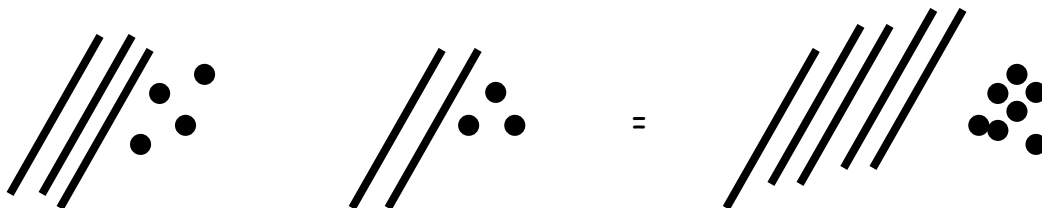
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Model of Base 10 equipment $11 + 5 = 16$

Year 2

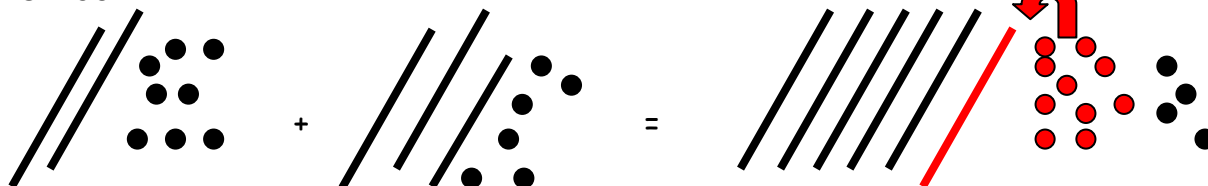
Children will continue to use the Base 10 equipment to support their calculations. They will record the calculations using their own drawings of the Base 10 equipment

e.g. $34 + 23 =$



$34 + 23 = 57$ They would add the tens first and then count on the units.

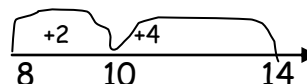
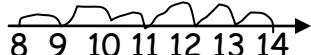
e.g. $28 + 36 =$



$28 + 36 = 64$

When the units total more than 10, children should be encouraged to exchange 10 ones for 1 ten. This is the start of children understanding 'carrying' in vertical addition.

Empty numberline addition will start from larger number and add on; written methods will include jumping to the next ten and then adding rest. E.g. $8 + 6 = 14$



Year 3

Children will build on their knowledge of using Base 10 equipment from Y2 and continue to use this to support with the transition into a vertical method.

Children should add the **least significant digits** first as preparation for the compact method.

TU	
67	
+ 24	
11	(7 + 4)
80	(60 + 20)
91	

HTU	
267	
+ 85	
12	(7 + 5)
140	(60 + 80)
200	
352	

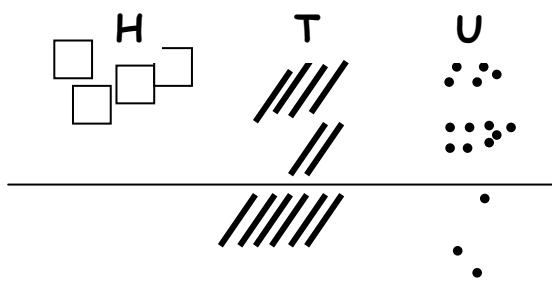
The Base 10 equipment should be used alongside to model the transition to the vertical method but this should not be recorded by the children once vertical process understood.

Year 4

Based on their experiences in Y3, children will then begin to carry below the line.

The best way to model this would be using Base 10 equipment to show how units would transfer to tens.

HTU	
625	
+ 48	
673	
1	



Teacher model

$$\begin{array}{r} 783 \\ + 42 \\ \hline 825 \\ 1 \end{array}$$

$$\begin{array}{r} 367 \\ + 85 \\ \hline 452 \\ 11 \end{array}$$

$$\begin{array}{r} 321 \\ + 7 \\ \hline + 48 \\ \hline 376 \\ 1 \end{array}$$

$$\begin{array}{r} £3.48 \\ + £0.78 \\ \hline £4.26 \\ 11 \end{array}$$

Using similar methods, children will:

- add several numbers with different numbers of digits;
- begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds; also when adding measures
- know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.

Year 5

Children should extend the carrying method to numbers with at least four digits.

$$\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \\ 11 \end{array}$$

$$\begin{array}{r} 3587 \\ + 675 \\ \hline 4262 \\ 111 \end{array}$$

$$\begin{array}{r} 3121 \\ + 37 \\ \hline + 148 \\ \hline 3306 \\ 11 \end{array}$$

$$\begin{array}{r} 3.20 \\ + 2.88 \\ \hline 6.08 \\ 1 \end{array}$$

Using similar methods, children will:

- add several numbers with different numbers of digits;
- begin to add two or more decimal fractions with up to three digits and the same number of decimal places;
- **know that decimal points should line up under each other**, particularly when adding or subtracting mixed amounts, e.g. 3.2 m + 280 cm.
- be able to identify errors e.g. in 4.7 + 3.11

$$\begin{array}{r} 4.7 \\ 3.11 + \end{array}$$

Year 6

Children should extend the carrying method to number with any number of digits. Place largest at top, smallest at bottom

$$\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ 111 \end{array}$$

$$\begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \\ 111 \end{array}$$

$$\begin{array}{r} 6432 \\ 4681 \\ 786 \\ 42 \\ + 3 \\ \hline 11944 \\ 121 \end{array}$$

$$\begin{array}{r}
 401.20 \\
 + 26.85 \\
 + \underline{0.71} \\
 \hline
 428.76 \\
 1
 \end{array}$$

Using similar methods, children will

- *add several numbers with different numbers of digits;*
- *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;*
- ***know that decimal points should line up under each other***, particularly when adding or subtracting mixed amounts, e.g. $401.2 + 26.85 + 0.71$.

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 1) they are not ready.
- 2) they are not confident.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.