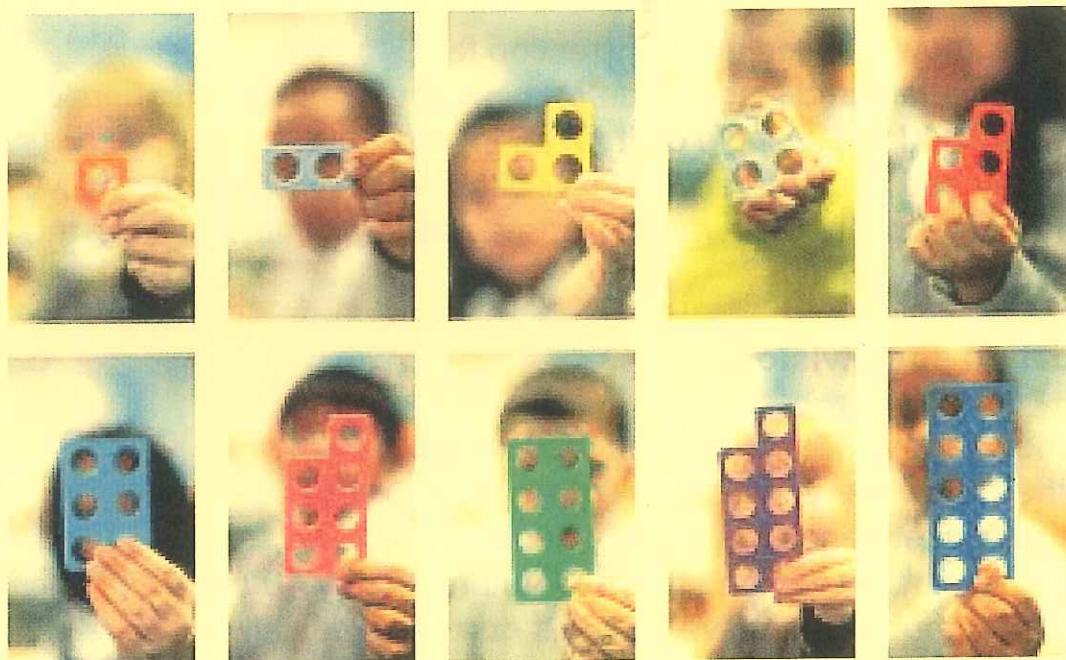


CALCULATIONS POLICY



OTTERHAM CP SCHOOL
2013

REASONS FOR USING WRITTEN METHODS

- To aid mental calculation by writing down some of the numbers and answers involved
- To make clear a mental procedure for the pupil
- To help communicate methods and solutions
- To provide a record of work to be done
- To aid calculation when the problem is too difficult to be done mentally
- To develop and refine a set of rules for calculations

WHEN ARE CHILDREN READY FOR WRITTEN CALCULATIONS?

Addition and subtraction

- Do they know addition and subtraction facts to 20?
- Do they understand place value and can they partition numbers?
- Can they add three single digit numbers mentally?
- Can they add and subtract any pair of two digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?

Multiplication and division

- Do they know the 2, 3, 4, 5 and 10 time table
- Do they know the result of multiplying by 0 and 1?
- Do they understand 0 as a place holder?
- Can they multiply two and three digit numbers by 10 and 100?
- Can they double and halve two digit numbers mentally?
- Can they use multiplication facts they know to derive mentally other multiplication facts that they do not know?
- Can they explain their mental strategies orally and record them using informal jottings?

The above lists are not exhaustive but are a guide for the teacher to judge when a child is ready to move from informal to formal methods of calculation.

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

ADDITION

Extend to decimals with up to 2 decimal places, including:

- sums with different numbers of digits;
- totals of more than two numbers.

e.g. $76.56 + 312.2 + 5.07 = 398.83$

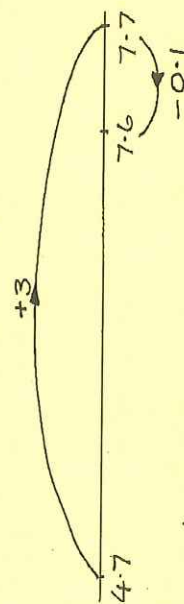
Use diagrams to illustrate adding fractions

$$\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$$

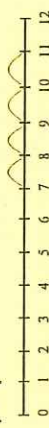
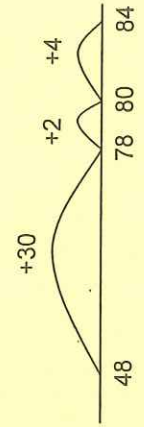


Use compensation by adding too much, and then compensating

$$\begin{aligned} 4.7 + 2.9 &= 4.7 + 3 - 0.1 \\ &= 7.7 - 0.1 \\ &= 7.6 \end{aligned}$$



ADDITION GUIDELINES

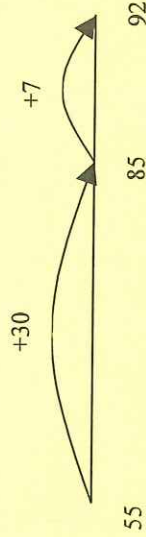
Year One	Year Two	Year Three
<u>+ = signs and missing numbers</u> Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'. $2 = 1 + 1$ $2 + 3 = 4 + 1$ $3 = 3$ $2 + 2 + 2 = 4 + 2$ Missing numbers need to be placed in all possible places. $3 + 4 = \square$ $3 + \square = 7$ $\square + 4 = 7$ $\square + \nabla = 7$ $\square = 3 + 4$ $7 = \square + 4$ $7 = 3 + \square$ $7 = \square + \nabla$ <u>The Number Line</u> Children use a numbered line to count on in ones. Children use number lines and practical resources to support calculation and teachers <i>demonstrate</i> the use of the number line. $7 + 4$ 	<u>+ = signs and missing numbers</u> Continue using a range of equations as in Year 1 but with appropriate, larger numbers. Extend to $14 + 5 = 10 + \square$ and $32 + \square + \square = 100$ $35 = 1 + \square + 5$ <u>Partition into tens and ones and recombine</u> $12 + 23 = 10 + 2 + 20 + 3$ $= 30 + 5$ $= 35$ <u>Count on in tens and ones</u> $23 + 12 = 23 + 10 + 2$ $= 33 + 2$ $= 35$  <u>The Empty Number Line: Partitioning and bridging through 10.</u> The steps in addition often bridge through a multiple of 10 e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5. $8 + 7 = 15$  <u>Add 9 or 11 by adding 10 and adjusting by 1</u> e.g. Add 9 by adding 10 and adjusting by 1 $35 + 9 = 44$ $+10$ 	<u>+ = signs and missing numbers</u> Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers. <u>Partition into tens and ones</u> - Partition both numbers and recombine. - Count on by partitioning the second number only e.g. $36 + 53 = 53 + 30 + 6$ $= 83 + 6$ $= 89$  <u>Add a near multiple of 10 to a two-digit number</u> Secure mental methods by using a number line to model the method. Continue as in Year 2 but with appropriate numbers e.g. $35 + 19$ is the same as $35 + 20 - 1$. Children need to be secure adding multiples of 10 to any two-digit number including those that are not multiples of 10. $48 + 36 = 84$  <u>pencil and paper procedures</u> $83 + 42 = 125$ <u>either</u> 1. Vertical expansion $\begin{array}{r} 83 \\ + 42 \\ \hline 125 \end{array}$ or 2. Horizontal expansion $\begin{array}{r} 80 + 3 \\ + 40 + 2 \\ \hline 120 + 5 = 125 \end{array}$

ADDITION GUIDELINES

Year Four

+ = signs and missing numbers
Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Partition into tens and ones and recombine
Either partition both numbers and recombine or partition the second number only e.g.
 $55 + 37 = 55 + 30 + 7$
 $= 85 + 7$
 $= 92$



Add the nearest multiple of 10, then adjust

Continue as in Year 2 and 3 but with appropriate numbers e.g. $63 + 29$ is the same as $63 + 30 - 1$

Pencil and paper procedures

$367 + 185 = 431$
either

or

$$\begin{array}{r} 367 \\ +185 \\ \hline 12 \\ 140 \\ 400 \\ 552 \end{array}$$

$$\begin{array}{r} 300 + 60 + 7 \\ 100 + 80 + 5 \\ 400 + 140 + 12 = 552 \end{array}$$

leading to

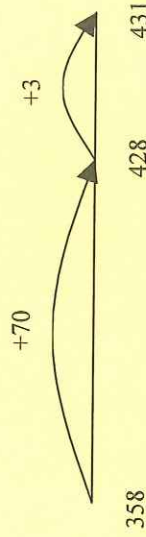
$$\begin{array}{r} 367 \\ +185 \\ \hline 552 \\ 11 \end{array}$$

Extend to decimals in the context of money.

Year Five

+ = signs and missing numbers
Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Partition into hundreds, tens and ones and recombine
Either partition both numbers and recombine or partition the second number only e.g.
 $358 + 73 = 358 + 70 + 3$
 $= 428 + 3$
 $= 431$



Add or subtract the nearest multiple of 10 or 100, then adjust

Continue as in Year 2, 3 and 4 but with appropriate numbers e.g. $458 + 79 =$ is the same as $458 + 80 - 1$

Pencil and paper procedures

Extend to numbers with at least four digits
 $3587 + 675 = 4262$

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

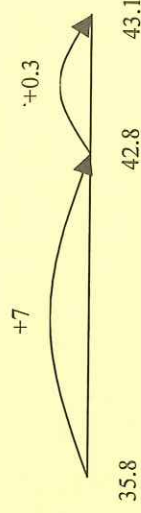
Revert to expanded methods if the children experience any difficulty.
Extend to up to two places of decimals (same number of decimals places) and adding several numbers (with different numbers of digits).

$$\begin{array}{r} 72.8 \\ +54.6 \\ \hline 127.4 \\ 1 \end{array}$$

Year Six

+ = signs and missing numbers
Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Partition into hundreds, tens, ones and decimal fractions and recombine
Either partition both numbers and recombine or partition the second number only e.g.
 $35.8 + 7.3 = 35.8 + 7 + 0.3$
 $= 42.8 + 0.3$
 $= 43.1$



Add the nearest multiple of 10, 100 or 1000, then adjust

Continue as in Year 2, 3, 4 and 5 but with appropriate numbers including extending to adding 0.9, 1.9, 2.9 etc

Pencil and paper procedures

Extend to numbers with any number of digits and decimals with 1, 2 and/or 3 decimal places.
 $13.86 + 9.481 = 23.341$

$$\begin{array}{r} 13.86 \\ + 9.481 \\ \hline 23.341 \\ 111 \end{array}$$

Revert to expanded methods if the children experience any difficulty.