Progression in Written Calculations

The aim of this agreement is to ensure consistency and progression throughout the school in written methods of calculation and reflects a whole school agreement. It contains the key pencil and paper procedures that will be taught throughout the school. Our aim is that most children follow this progression successfully and with understanding. Other methods may be introduced for more able pupils to investigate and explore.

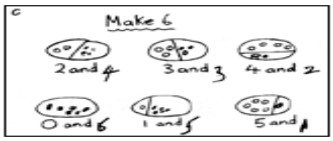
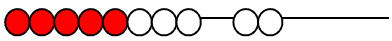
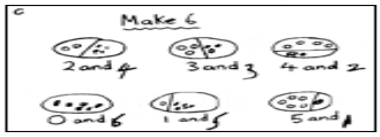
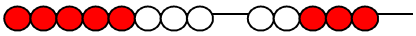
The aim for the school is that by the end of Y6, children will have been taught and be secure with a compact method for each operation. The children will have acquired their understanding through a wide range of models, representations, skills based developments and then embedded the knowledge through real life problems and contexts. Children will be encouraged to look at a calculation/problem/ investigation and then decide which calculation will best solve the problem. They will then select the most efficient method. The long-term aim is for children to be able to select the most efficient method of their choice (whether this be mental, written) that is appropriate for a given task.

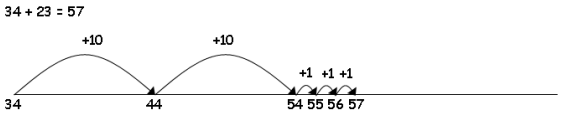
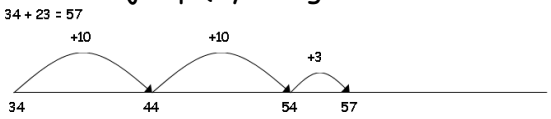
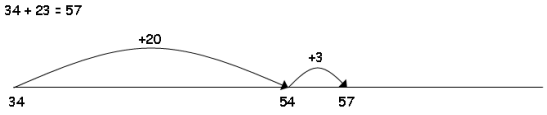
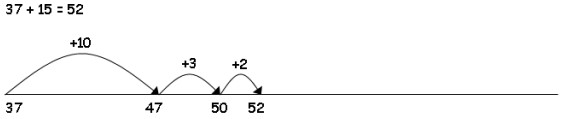
Children should be guided towards increased efficiency and less dependence on informal jottings. Countries that are most successful at teaching number, avoid the premature teaching of standard written methods in order not to jeopardise the development of mental strategies.

Key points:

Children should be encouraged to:	Points for teachers:
Ask themselves, 'Can I do this calculation mentally?'	Refer to accompanying documents: Detailed Progression (Appendix 1) Progressive success criteria (Appendix 2 -5)
Approximate first	Continue to develop a range of mental strategies
Choose an efficient method appropriate for the numbers	Use appropriate numbers for child's ability
Apply knowledge of known facts	Present calculations in real life/problem solving contexts
Check results of calculations using the inverse	Make links between 4 operations
	Encourage children to share and discuss their methods
	Encourage a deeper conceptual understanding
	Use clear representations to support learning

Addition

Stage A	Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.  Bead strings or bead bars can be used to illustrate addition  8+2=10 They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.
Stage B	They develop ways of recording calculations using pictures  Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.  8+5=13 They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline. Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones. **Using symbols to stand for unknown numbers to complete equations using inverse operations and the + and = sign including bonds up to 10 and 20** 4 + 6 = ☐ 7+ ☐ = 3 12 + ☐ = 20

Stage C	Children will continue to use pictorial representation alongside beginning to use 'empty number lines' themselves starting with either number and counting on. ✓ First counting on in tens and ones.  ✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).  ✓ Followed by adding the tens in one jump and the units in one jump.  ✓ Bridging through ten can help children become more efficient.  Commutativity Children should know that 3 + 5 has the same answer as 5 + 3. This can also be shown on the number line.
Stage D	Children will move on from number lines and begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies. 67 + 24 = 91 60 7 20 4 80 + 11 = 91 Extend to… Adding the least significant digits first

	67 + 24 11 (7 + 4) 80 (60 + 20) 91 267 + 85 12 (7 + 5) 140 (60 + 80) 200 352 Leading to formal written methods for column addition with up to 3 digits and exchanging below the line. 625 + 48 = 673 (1) 783 + 42 = 825 (1) 367 + 85 = 452 (11)
Stage E	Children should extend the exchanging method to numbers with at least four digits. 587 + 475 = 1062 (11) 3587 + 675 = 4262 (111) Using similar methods, children will: ✓ add several numbers with different numbers of digits; ✓ begin to add two or more four-digit sums of money, with or without adjustment from the pence to the pounds; ✓ know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.
Stage F	Children should extend the carrying method to numbers with more than 4 digits. 30684 + 45883 = 79567 70394 + 58 192 = 128586 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.

Stage G	Children should extend the exchanging method to number with any number of digits and use these to solve multi-step word problems. $\begin{array}{r} 7648 \\ +\ 1486 \\ \hline 9134 \\ 1\ 1\ 1 \end{array}$ $\begin{array}{r} 6584 \\ +\ 5848 \\ \hline 12432 \\ 1\ 1\ 1 \end{array}$ $\begin{array}{r} 42 \\ 6432 \\ 786 \\ 3 \\ +\ 4681 \\ \hline 11944 \\ 1\ 2\ 1 \end{array}$ 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:

they are not ready.

they are not confident.

Children should be encouraged to approximate their answers before calculating.

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