

Teaching calculations: Recording methods for mental strategies in FS2 to Year 3

Aims and Rationale

The National Numeracy Strategy provides a structured and systematic approach to teaching mathematics (NB the renewed framework will be available from Sept 2006). There is considerable emphasis on the teaching of mental calculation contained within the NNS, providing a variety of strategies that can be used to teach each of the four number operations. Schools need to discuss and decide which strategies best match the needs of their pupils as there needs to be a consistent approach to teaching the four operations ensuring continuity and progression across the school.

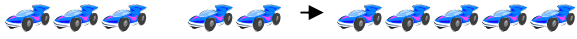

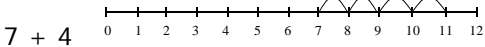
This guidance is produced to help schools to make these decisions and consider the recording to support the mental strategies. This guidance supplements the Key Stage 2 'Calculation policy, written methods' (available from pnewson@swindon.gov.uk and on Swindon LA portal on the SWGfL). By making these decisions collectively, about recording methods from FS2 to Year 6, schools are able to align the methods taught in each year group and thereby support continuity and progression.

Recording methods for mental strategies in FS2 to Year 3


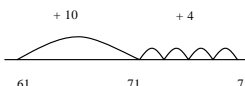
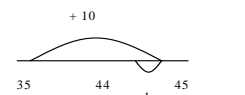
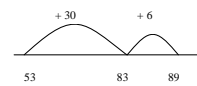
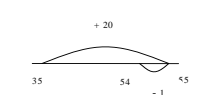
The current NNS framework sets out the progression of recording as illustrated in the diagram below. The variety of recording methods increases as the children progress but as can be seen from the diagram one recording method is intended to build up the child's repertoire of recording methods. For example, drawing number lines should not be seen as an exclusive Year 1 method as this strategy needs to be used by Year 6 children.

Foundation	Year 1	Year 2	Year 3
DRAWING PICTURES AND MARKS			
	USING SIGNS AND SYMBOLS		
	DRAWING NUMBER LINES		
		USING INFORMAL JOTTINGS	
			EXPLAINING IN WORDS

RECORDING ADDITION

Foundation	Year 1
<p>Drawing pictures and marks</p> <p>There are 3 cars in the garage. 2 more arrive. How many are there now?</p> 	<p>Drawing pictures and marks</p> <p>Lisa has 5 lollies and Tim has 2 lollies. How many lollies do they have altogether?</p>  <p>Using materials to add up</p>
<p>Signs and symbols</p> <p><i>(Number sentences modelled by adults)</i></p>	<p>Signs and symbols</p> $3 + 2 = \square$ $\square = 3 + 2$ $3 + \square = 5$ $5 = \square + 2$ $\square + 2 = 5$ $5 = 3 + \square$ $\square + \square = 5$ $5 = \square + \square$
<p>Number lines</p> <p><i>(Prepared number tracks and lines used)</i></p>	<p>Number lines (numbered)</p>  <p>$7 + 4$</p> <p>Recording by - drawing jumps on prepared lines - constructing own lines</p>
<p>Informal jottings</p> <p>Drawing adding pictures</p>	<p>Informal jottings</p> <p><i>(Teachers model jottings appropriate for larger numbers)</i></p>
<p>Verbal counting on and back</p> <p>Counting real objects</p> <p>Begin to count on</p> <p>Use of simple number lines</p> <p>Use of practical materials for counting</p> <p>Drawing adding pictures</p>	<p>Use of 100 squares to see</p> <p>Counting on keeping biggest number in head</p>

RECORDING ADDITION


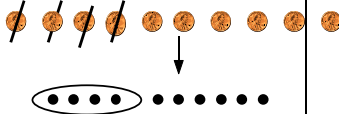
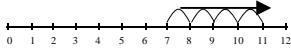
Year 2	Year 3
<p>Drawing pictures and marks There are 7 people on the bus. 8 more get on. How many people are on the bus.</p> 	<p>Drawing pictures and marks As Year 2 Numbers are often too large for pictures to be efficient but pictures/diagrams will continue to be used where appropriate</p>
<p>Signs and symbols</p> $\begin{array}{l} 5 + \square = \square \\ \square + \square = 9 \\ \square + \square = 9 \\ + = 9 \end{array}$ <p>Adding three numbers $1 + \square + 5 = 17$ Extend to $14 + 5 = 10 + \square$</p>	<p>Signs and symbols</p> $\begin{array}{l} 13 + 6 = \square \\ 13 + \square = 19 \\ + 6 = \square \\ + = 19 \end{array}$ $\begin{array}{l} \square = 13 + \square \\ 19 = \square + 6 \\ 19 = 13 + \square \\ 19 = \square + \square \end{array}$ <p>Adding three or more numbers $14 + \square + 6 = 37$ Extend to $21 + 6 = \square + 10$</p>
<p>Number lines (partition empty)</p>  <p>$61 + 14$ (partition)</p>  <p>$35 + 9$ add 9 by adjusting</p>	<p>Number lines (numbered)</p>  <p>$+ 36$ (partition)</p>  <p>$+ 19$ add 19 by adjusting</p>
<p>Informal jottings ones and recombine</p> $\begin{array}{l} 23 + 12 = \\ 23 + 10 = 33 \\ 33 + 2 = 35 \\ \begin{array}{r} 10 \\ 3 + 8 + 7 = 10 + 8 \\ = 18 \end{array} \end{array}$ <p>Pairs totalling 10</p>	<p>Informal jottings</p> $\begin{array}{l} 42 + 27 = \\ 42 + 20 = 62 \\ 62 + 7 = 69 \\ \begin{array}{r} 10 \quad 20 \\ 4 + 8 + 16 + 2 = 20 + 10 \\ = 30 \end{array} \end{array}$ <p>Pairs totalling 10 or 20</p>
<p>Explaining in words <i>(Explaining methods and reasoning orally)</i></p>	<p>Explaining in words</p> <p>$23 + 17$ I added 17 and 3 to get 20, then 20</p>

Partition the 2nd number and add


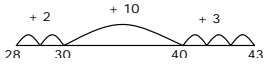
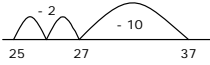
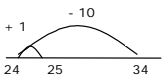
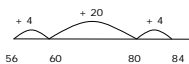
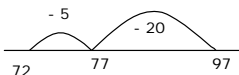
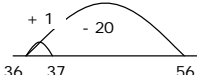
Partition the 2nd number and add

NB
 This is a preferred method for partitioning as this will also work for subtraction. Schools need to decide which method they wish to use

RECORDING SUBTRACTION


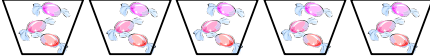
Foundation	Year 1
<p>Drawing pictures and marks We made 6 cakes. We ate 2 of them. How</p> 	<p>Drawing pictures and marks Sam spent 4p. What was his change from 10p?</p> 
<p>Signs and symbols</p> <p><i>(Number sentences modelled by adults)</i></p>	<p>Signs and symbols</p> $5 - 2 = \square \quad \square = 5 - \square$ $5 - \square = 3 \quad 3 = 5 - \square$ $\square - 2 = \square \quad 3 = 5 - \square$ $\square - \square = \square \quad 3 = \square - \square$ <p>Reciting number bonds</p>
<p>Number lines</p> <p><i>(Prepared number tracks and lines used)</i></p>	<p>Number lines (numbered)</p> <p>Counting back ←</p> <p>11 - 7</p> <p style="text-align: center;">7</p> <p>counting on</p> <p>The difference between 7 and 11</p>  <p>11</p> <p>Recording by - drawing jumps on prepared lines - constructing own lines</p> <p>Finding the difference using cubes / materials / toys etc</p>
<p>Informal jottings</p>	<p>Informal jottings</p> <p><i>(Teachers model jottings appropriate for larger numbers)</i></p>
<p>Finding one less than (numbers to 10)</p> <p>Picture / story representations of sums</p> <p>Relate less than to take away</p> <p>Use of stimulating / appropriate</p>	<p>Use of appropriate number lines / 100 squares to count back</p> <p>Counting back in head from given number</p> <p>Using fingers to take some away</p>

RECORDING SUBTRACTION

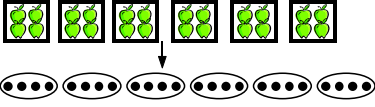

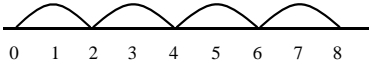
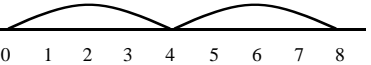
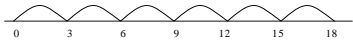
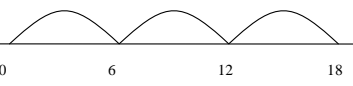
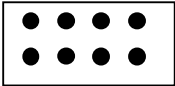
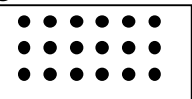
Year 2	Year 3
<p>Drawing pictures and marks</p> <p>There were 17 bean bags in a bucket. Luke took 9.</p> 	<p>Drawing pictures and marks</p> <p>As Year 2 Numbers are often too large for pictures to be efficient but pictures/diagrams will continue to be used where appropriate</p>
<p>Signs and symbols</p> $9 - 4 = \square$ $9 - \square = 5$ $\square - 4 = 5$ $\square - \square = 5$ $\square = 9 - 4$ $5 = \square - 4$ $5 = 9 - \square$ $5 = \square - \square$ <p>Extend to $14 + 5 = 20 - \square$</p>	<p>Signs and symbols</p> $19 - 6 = \square$ $19 - \square = 13$ $\square - 6 = 13$ $\square - \square = 13$ $\square = 19 - 6$ $13 = \square - 6$ $13 = 19 - \square$ $13 = \square - \square$ <p>Extend to $21 + 6 = 30 - \square$</p>
<p>Number lines (partly numbered - empty)</p> <p>43-28 count on</p>  <p>37 - 12 partition</p>  <p>34 - 9 subtract 9</p> 	<p>Number lines</p> <p>84 - 56 count on</p>  <p>97 - 25 partition</p>  <p>56 - 19 subtract 19</p> 
<p>Informal jottings</p> $37 - 12 =$ $37 - 10 = 27$ $27 - 2 = 25$ <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>Partition the 2nd number and subtract</p> </div>	<p>Informal jottings</p> $97 - 25 =$ $97 - 20 = 77$ $77 - 5 = 72$ <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>Partition the 2nd number and subtract</p> </div>
<p>Explaining in words <i>(Explaining methods and reasoning orally)</i></p>	<p>Explaining in words</p> <p>50 - 29 I did 50 take away 30 then added 1.</p>

NB
This is a preferred method for partitioning as this will also work for addition. Schools need to decide which method they wish to use

RECORDING MULTIPLICATION



Foundation	Year 1
<p>Drawing pictures and marks</p> <p>How many wheels do we need to make three lego cars?</p> 	<p>Drawing pictures and marks</p> <p>There are 3 sweets in one bag. How many sweets are there in 5 bags?</p> 
<p>Signs and symbols</p>	<p>Signs and symbols</p>
<p>Number lines</p>	<p>Number lines (numbered)</p> <p><i>(Recording on a number line modelled by the teacher when solving problems)</i></p>
<p>Informal jottings</p>	<p>Informal jottings</p>
<p>Pairs of socks in 2s</p> <p>Counting in 2s and 10s</p>	<p>Sorting objects into groups to count</p> <p>Investigating natural multiples by grouping, arranging and sorting</p> <p>Eg Eggs in a box Corners on squares Fingers and gloves</p> <p>Counting in 2s, 5s and 10s</p>

RECORDING MULTIPLICATION

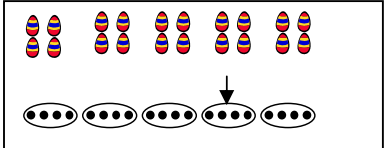

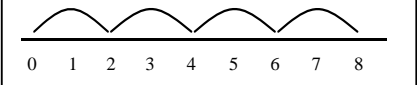
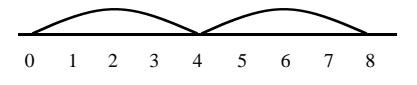
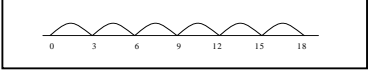
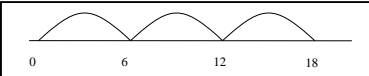
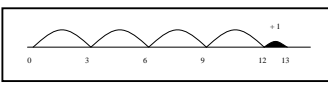
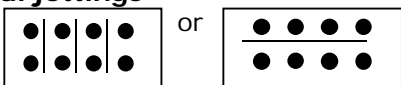
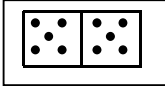
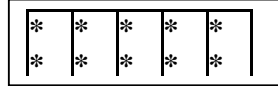
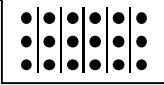
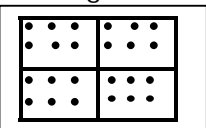
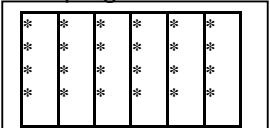
Year 2	Year 3
<p>Drawing pictures and marks There are 4 apples in one box. How many apples in 6 boxes?</p> 	<p>Drawing pictures and marks A spider has 8 legs. How many legs do 4 spiders have?</p> 
<p>Signs and symbols</p> $\square \times 2 = \square$ $6 \times \square = 12$ $\square \times 2 = 12$ $\square \times \square = 12$ $\square = 2 \times 6$ $12 = \square \times 6$ $12 = 2 \times \square$ $12 = \square \times \square$ <p>Extend to $4 \times 5 = 10 \times \square$</p>	<p>Signs and symbols</p> $6 \times 5 = \square$ $6 \times \square = 30$ $\square \times 5 = 30$ $\square \times \square = 30$ $\square = 5 \times 6$ $30 = \square \times 6$ $30 = 5 \times \square$ $30 = \square \times \square$ <p>Extend to $4 \times 3 = \square \times 2$</p>
<p>Number lines (numbered then empty)</p> <p>2×4</p>  <p>4×2</p>  <p>Recording by - drawing jumps on prepared line - constructing own lines</p>	<p>Number lines</p> <p>3×6</p>  <p>6×3</p> 
<p>Informal jottings</p> <p>Arrays 2×4 or 4×2</p>  <p>Repeated addition</p> $2 \times 4 = 2 + 2 + 2 + 2$ <p>Doubling by partitioning</p> $15 \times 2 = 30$ <p><u>Partition</u></p> $\begin{array}{r} 10 \\ + \quad 5 \\ \hline 20 \end{array} + \begin{array}{r} 5 \\ + 10 \\ \hline 15 \end{array} = 30$	<p>Informal jottings</p> <p>Arrays 3×6 or 6×3</p>  <p>Repeated addition</p> $3 \times 6 = 3 + 3 + 3 + 3 + 3 + 3$

RECORDING DIVISION

DIVISION

FOUNDATION	Year 1
<p>Drawing pictures and marks Grouping How many pairs of socks are there in the 'laundrette'?</p> 	<p>Drawing pictures and marks 12 children get into teams of 4 to play a game. How many teams are there?</p> 
<p>Signs and symbols</p>	<p>Signs and symbols</p>
<p>Number lines</p>	<p>Number lines (numbered)</p> <p><i>(Recording on a number line modelled by the teacher when solving problems)</i></p>
<p>Informal jottings</p>	<p>Informal jottings</p>
<p>Sharing objects and grouping objects</p>	<p>Sharing objects and grouping objects</p>

RECORDING DIVISION

Year 2	Year 3
<p>Drawing pictures and marks 4 eggs fit in a box. How many boxes would you need to pack 20 eggs?</p> 	<p>Drawing pictures and marks 8 children can travel in a minibus. How minibuses would you need to take 29 children to a football match?</p> 
<p>Signs and symbols</p> $12 \div 2 = \square$ $12 \div \square = 6$ $\square \div 2 = 6$ $\square \div \square = 6$ <p>Extend to $15 - 10 = 10 \div \square$</p> $\square = 12 \div 2$ $6 = \square \div 2$ $6 = 12 \div \square$ $6 = \square \div \square$	<p>Signs and symbols</p> $30 \div 5 = \square$ $30 \div \square = 6$ $\square \div 5 = 6$ $\square \div \square = 6$ <p>Extend to $20 - 11 = \square \div 5$</p> $\square = 30 \div 5$ $6 = \square \div 5$ $6 = 30 \div \square$ $6 = \square \div \square$
<p>Number lines (numbered empty)</p> <p>$8 \div 2$</p>  <p>$8 \div 4$</p>  <p>Recording by - drawing jumps on prepared lines - constructing own lines</p>	<p>Number lines</p> <p>$18 \div 3$</p>  <p>$18 \div 6$</p>  <p>Remainders $13 \div 3$</p> 
<p>Informal jottings</p> <p>Arrays $8 \div 2$</p>  <p>Sharing $10 \div 2$</p>  <p>Grouping $10 \div 2$</p>  <p>Understand division as sharing and grouping</p>	<p>Informal jottings</p> <p>Arrays $18 \div 3$</p>  <p>Sharing $24 \div 4$</p>  <p>Grouping $24 \div 4$</p>  <p>Understand division as sharing and grouping</p>

Thanks to

- Tregoze Primary School
- Gorse Hill Infant School