



Calculation Policy

Numeracy across the curriculum is a focus of Litcham School. This document provides an overview of strategies used to teach calculations. These methods will be continued to be used in all mathematics classrooms to support the learning of pupils and need to be remembered and employed by all staff when doing calculations.

These strategies show a progression for each of the four operations. Pupils may come into your class with differing levels of mathematical ability and therefore could be using the full variety of methods. Each teacher needs to make sure that they are allowing each pupil to use the method that they feel confident with so that we are not confusing them but instead are furthering their mathematical development. **It is important to realise that, ultimately, the aim is for pupils to use the most efficient method of calculations. However, this is a journey with many steps, at which any one pupil could be at a different place along that journey at any point in time.**

At primary school pupils are taught mental calculations through activities and only move to written calculations at a later stage. This is a process where they move through jottings and onto formally trying to put pen/pencil to paper. It is important that children do not abandon jottings and mental methods once pencil and paper procedures are introduced. Therefore children will always be encouraged to look at a calculation/problem and then decide which is the best method to choose - pictures, mental calculation with or without jottings, structured recording or a calculator. They will do this by always asking themselves:

'Can I do this in my head?'

'Can I do this in my head using drawings or jottings?'

'Do I need to use a pencil and paper procedure?'

'Do I need a calculator?'

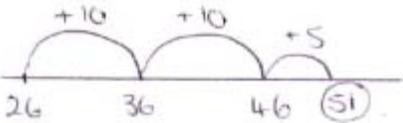
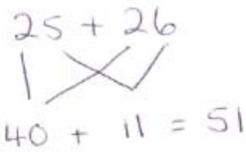
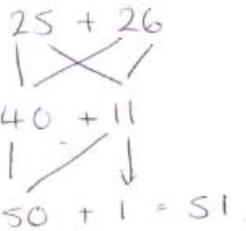
Written calculations then follow these rules;

- they **MUST** represent a mental method (examples to follow).
- all calculations must be transparent (pupils and teachers must be able to clearly see and understand mistakes).
- all questions **MUST** be written horizontally so that pupils can choose which method they use. (If calculations are written vertically then pupils feel they have to use the column method - a method they may be aware of but not competent at using).
- pupils **SHOULD** be encouraged to use a calculator where necessary and **SHOULD** use them as a tool to check whether their calculations are correct. (**NEVER** say "I'm sure you are clever enough to do it without a calculator" as this makes pupils feel they are stupid when they are asked to use them).

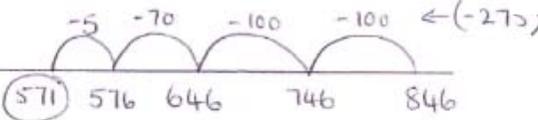
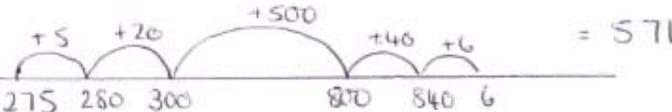
If calculators are available please put them out on the desk and do not wait for pupils to ask for one. Again, pupils may not ask to borrow a calculator for fear that they will look stupid if they have to use one. Openly use one yourself in front of the class.

It is important to make sure that pupils write down the calculation they have put in the calculator.

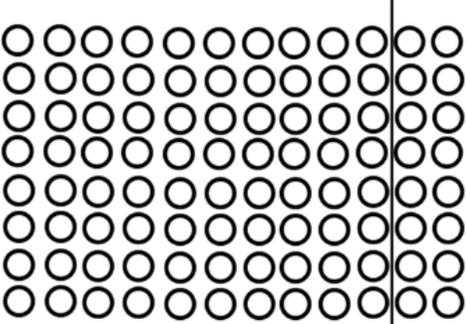
Addition

Stage 1	Stage 2	Stage 3	Stage 4														
<ul style="list-style-type: none"> • Practical activities and discussions • Finding one more than a number from 1 to 10 • Using vocabulary associated with addition. • Begin to use the + and = signs to record mental calculations • Know by heart all numbers bonds to 10 • Use knowledge to know that addition can be done in any order to do mental calculations more efficiently • Adding three single digit numbers mentally 	<p>Use a number line to make jottings, then informal jottings</p> <p>To calculate $25 + 26$, pupils may choose to start either with 25 or 26; Many choose to start with the bigger of the two numbers</p>  <p>Here the pupil has started at 26 and taken two jumps of 10 and then one jump of 5 and reached 51. This pupil can clearly partition 25 and could move on to be encouraged to jump on 20 and then 5. (Some pupils may jump in twos or even ones and may need to be encouraged to jump in 10's).</p> <p>This method can also be used for working with decimals</p>	<p>Use partitioning to reflect mental methods</p>  <p>OR</p>  <p>Here the pupil has worked with the tens and the units separately to find their answer</p> <p>A similar method could be</p> $\begin{array}{r} 20 + 5 \\ + 20 + 6 \\ \hline = 40 + 11 = 51 \end{array}$	<p>Column Method</p> <p>Pupils may have seen this method previously; however we advise that pupils should not use this method until they are competent and confident in using partitioning. It has been proven that a pupil needs to be a competent level 5 to fully understand this method.</p> <p>e.g.</p> <table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>HTU</td></tr> <tr><td>263</td></tr> <tr><td>+ 245</td></tr> <tr><td>—</td></tr> <tr><td>+ 8</td></tr> <tr><td>100</td></tr> <tr><td>400</td></tr> <tr><td>508</td></tr> </table> <p>e.g.</p> <table style="display: inline-table; vertical-align: top;"> <tr><td>HTU</td></tr> <tr><td>263</td></tr> <tr><td>+ 245</td></tr> <tr><td>—</td></tr> <tr><td>508</td></tr> <tr><td>1</td></tr> </table> <p>Though this is a quick and efficient method to use, it is a method that many pupils are not competent with until the later stages of secondary school</p>	HTU	263	+ 245	—	+ 8	100	400	508	HTU	263	+ 245	—	508	1
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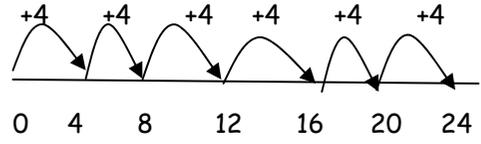
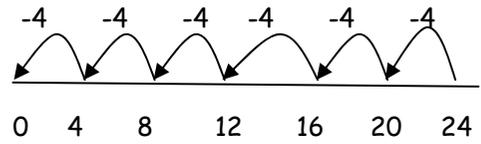
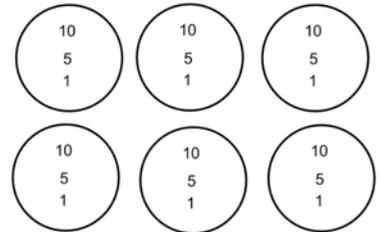
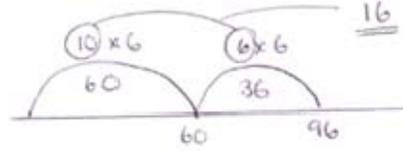
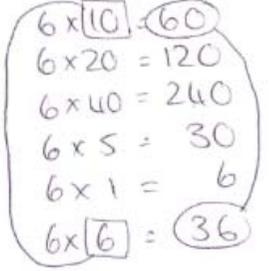
Subtraction

Stage 1	Stage 2	Stage 3	Stage 4
<ul style="list-style-type: none"> • Practical activities and discussion • Finding one less than a number from 1 to 10 • Begin to relate subtraction to 'taking away' • Begin to use the - and = sign to record mental calculations. • Know by heart all subtraction facts to 10 	<p>Methods for subtraction mirror many of the addition methods. It is worth remembering that many people if asked to subtract values in their head will tend to "count up" rather than take away. Very few try to do a column method in their head!</p> <p><u>Number Line</u> 846 - 275</p> <p>"counting down"</p>  <p>This pupil has partitioned 275 into 100, 100, 70, and 5 and counted down from 846.</p> <p>"counting up"</p>  <p>This pupil has started at 275 and jumped in amounts to allow them to count up to 846. They have then added up the jumps they have taken.</p> <p>It is worth remembering that pupils may take different steps depending on how confident they are feeling (ie. may do 20 as 2 steps of 10). It is important that they have choice over this, as they will naturally choose the most efficient method that they are confident with.</p>	<p><u>Partitioning</u></p> $\begin{array}{r} 700 \quad 140 \\ \cancel{800} \quad \cancel{40} \quad 6 \\ - \quad 200 \quad 70 \quad 5 \\ \hline 500 + 70 + 1 \end{array}$ <p>The pupil here has partitioned each value into hundreds, tens and units and then looked at "borrowing".</p> <p>Pupils need to have a strong understanding of the place value system to use this method and should always write the full amount being "borrowed"</p>	<p><u>Decomposition</u></p> $\begin{array}{r} 7 \quad 1 \\ \cancel{8}46 \\ - \quad 275 \\ \hline 571 \end{array}$ <p>This is a method that many pupils tend to struggle with and should only be introduced when fully competent at stages 1, 2 and 3.</p> <p>Again many of our pupils are not competent at this (even if they are in top set) and NEVER become fully competent with it.</p> <p>Each of the methods in stages 1, 2 and 3 can also be used when calculating with decimals, so pupils can adapt the method they are most confident with to approach decimal calculations.</p>

Multiplication

Stage 1	Stage 2	Stage 3	Stage 4									
<ul style="list-style-type: none"> Working at a practical level to gain experience of doubling and become familiar with appropriate language Know by heart addition doubles to at least 5 Understand multiplication as repeated addition Can count in 2s, 5s and 10s Know by heart the multiplication facts for 10, 5 and 2 multiplication tables 	<p><u>Repeated Addition</u></p> <p>12 × 8</p> <p>Pupils will do 12 jumps of 8 on a number line here or 8 jumps of 12</p> <p><u>Arrays</u></p> <p>Pupils draw out 12 rows of 8 dots OR 8 rows of 12 dots and count the dots. These are then used to introduce division, but are also used to start to show partitioning</p>  <p>This array has been split into 10 columns of 8 and 2 columns of 8. This helps pupils count up the dots but starts them thinking about 10 × 8 and 2 × 8</p>	<p><u>Partitioning</u></p> <p>To do 36 × 8</p> $ \begin{array}{r} 36 \times 8 \\ \swarrow \quad \searrow \\ 30 + 6 \\ \downarrow \quad \downarrow \\ 240 + 48 = 288 \end{array} $ <p>OR</p> $ \begin{array}{r} 10 \times 8 = 80 \\ 10 \times 8 = 80 \\ 10 \times 8 = 80 \\ \underline{6 \times 8 = 48} \\ 288 \end{array} $ <p>There are various ways to split numbers. Pupils need to be encouraged to lay out their working in an ordered manner so that again it is transparent what they have done. Though it may seem obvious to partition with tens and units, pupils may choose to partition differently</p> <p>eg. The 8 could be partitioned into 5 and 3 if they are more confident with their 5 and 3 times tables</p>	<p><u>Grid Method</u></p> <p>To do the calculation 12 × 18. Each value has been partitioned</p> <table border="1" data-bbox="1653 515 2040 866"> <tr> <td></td> <td>10</td> <td>2</td> </tr> <tr> <td>10</td> <td>(10×10) 100</td> <td>(10×2) 20</td> </tr> <tr> <td>8</td> <td>(10×8) 80</td> <td>(2×8) 16</td> </tr> </table> <p>Pupils then add 100 + 80 + 20 + 16 using their favoured method</p> <p>Many students will not have seen a column method for multiplication and we continue to use the grid method throughout secondary school</p>		10	2	10	(10×10) 100	(10×2) 20	8	(10×8) 80	(2×8) 16
	10	2										
10	(10×10) 100	(10×2) 20										
8	(10×8) 80	(2×8) 16										

Division

Stage 1	Stage 2	Stage 3	Stage 4
<ul style="list-style-type: none"> Working at a practical level to gain experience of sharing and to become familiar with the appropriate language Understand division as grouping or sharing and recording informally including calculations with remainders Sharing 6 sweets between two people 	<p>Number Line: repeated subtraction of multiples or repeated addition Using practical informal methods to divide 2-digit numbers</p> <p>e.g. $24 \div 4 = 6$</p> <p><u>Repeated addition</u></p>  <p><u>Repeated subtraction</u></p>  <p><u>Sharing</u> In this method pupils share parts of the 96 into the 6 circles they have drawn. Some pupils may tally 1 at a time</p> 	<p><u>Number line to do repeated addition</u></p> <p>As pupils become more confident they may decide to repeated addition with groups of a number</p> <p>e.g. $96 \div 6 = 16$</p>  <p>This pupil has used some number facts ($10 \times 6 = 60$) to help them count up</p>	<p><u>Chunking</u></p> <p>Pupils write down number facts they know and then decide which ones they can use to solve the problem</p> <p>This pupil knew all these facts about multiplying by 6 and then used 6×10 and 6×6 to make 96. Adding the 10 and 6 would give them the correct answer of 16</p>  <p><u>Bus Stop</u></p> <p>This may be the method that you were taught when you were at school but very few pupils choose this as their preferred method</p> 