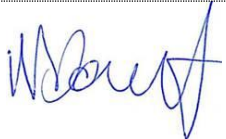





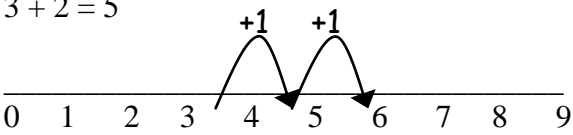
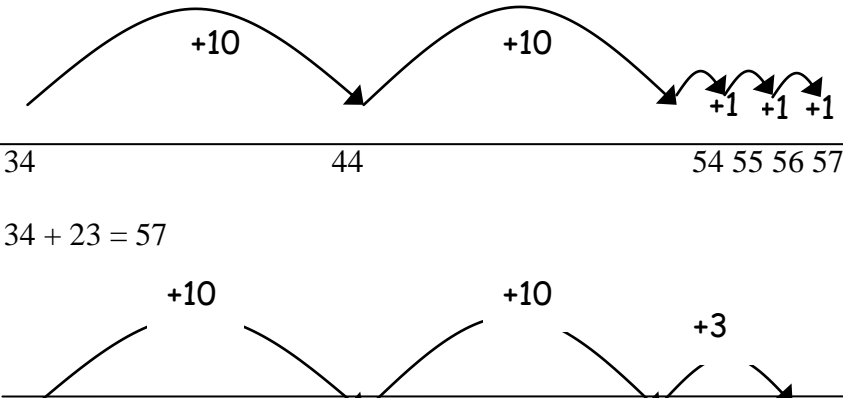
Calculation Policy

November 2017

Signed (Chair of the Local Governing Body):	
Date:	November 2017
Date of Review:	November 2018

The Arbor Academy Trust reviews this policy annually. The Trustees may, however, review the policy earlier than this, if the Government introduces new regulations, or if the Trust receives recommendations on how the policy might be improved. This document is also available in other formats e.g. e-mail and enlarged print version, on request to the School Offices and is displayed on the schools' websites.


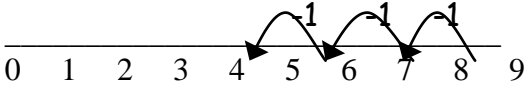
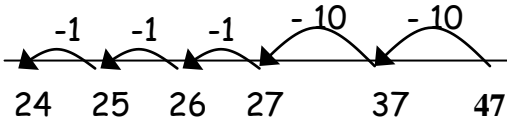
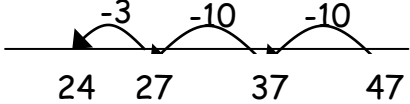
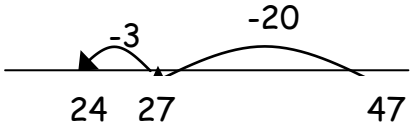
Addition

The Different Stages	Number Development	Strategy – What it Looks Like
Stage 1: Counting sets of object	Move on to combining	
Stage 2: Combining 2 sets of objects		For example $6 + 2$ the children may get 6 cubes, then 2 more and count how many altogether.
Stage 3: Drawing pictures/dots – informal jottings. Then counting back	Single unit add single unit	 = 5 $4 + 2 = 6$ * * * * + * *
Stage 4: Counting on a number line with numbers on it.		$3 + 2 = 5$ 
Stage 5: Steps in addition may be recorded on an empty number line. Steps often bridge through a multiple of ten.	1) Partition smaller number into tens and units 2) Add on the tens – progress to multiples of ten 3) Add on the units and groups of units	$34 + 23 = 57$ 

		<p>34 44 54 57</p> <p><u>Grouping tens</u> $34 + 23 = 57$</p>
Stage 6: Partitioning tens and units horizontally (KS2 or when appropriate)	Move on to vertical partitioning Tens and units and hundreds and tens and units.	$47 + 76 = (40 + 70) + (7 + 6) \text{ leading to}$ $= 110 + 13$ $= 123$
Stage 7: Partition numbers vertically in a column		$47 = 40 + 7$ $+ 76 = 70 + 6$ <hr style="width: 10%; margin-left: 0;"/> $110 + 13 = 123$
Stage 8: The numbers in columns adding the units first		$67 + 24$ $\begin{array}{r} 67 \\ + 24 \\ \hline 11 \\ \underline{80} \\ 91 \end{array}$ $131 + 209$ 131

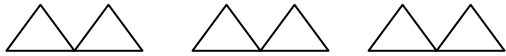


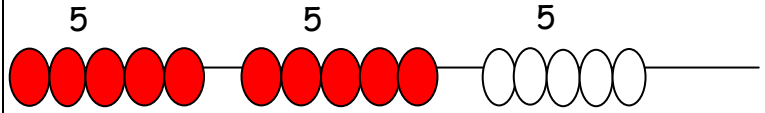
		$ \begin{array}{r} + 209 \\ \hline 10 \\ 30 \\ 300 \\ \hline 340 \end{array} $
<p>Stage 9: Compact method – where numbers get carried into the next column</p>	<p>Move on to adding with decimals up to three decimal places</p>	$ \begin{array}{r} 587 + 475 \\ 587 \\ + 475 \\ \hline 1062 \\ 11 \end{array} $ $ \begin{array}{r} 3587 + 675 \\ 3587 \\ + 675 \\ \hline 4262 \\ 111 \end{array} $

Subtraction

The Different Stages	Number Development	Strategy – What it Looks Like
Stage 1: Practical -	Practically get a group of objects and take some away	
Stage 2: Jottings: drawing a set of objects and then crossing some out.		$11 - 4 = 7$ 
Stage 3: count back on a number line with numbers on		$6 - 3 = 3$ 
Stage 4: Learning to count forward and back on an empty line		$47 - 23 = 24$  $47 - 23 = 24$  $47 - 23 = 24$ 

<p>Stage 5: Partitioned numbers are then written under one another – this is how we start to introduce the column subtraction method (KS2 or when appropriate)</p>		$\begin{array}{r} 74 - 23 \\ 7 \ 0 + 4 \\ \underline{2 \ 0 + 3} \\ 5 \ 0 + 1 = 51 \end{array}$	
<p>Stage 6: Expanded decomposition (2 digit numbers) Leads to the shorter version of the column subtraction method. We always start with the units number</p>		$\begin{array}{r} 74 - 27 \\ 7 \ 0 + 4 \\ \underline{2 \ 0 + 7} \end{array}$	$\begin{array}{r} 60 \ 14 \\ \underline{7 \ 0 + 4} \\ 2 \ 0 + 7 \\ \underline{4 \ 0 + 7} = 47 \end{array}$
<p>Stage 6: Expanded decomposition (3 digit numbers)</p>		$\begin{array}{r} 741 - 367 \\ 7 \ 0 \ 0 + 4 \ 0 + 1 \\ \underline{-3 \ 0 \ 0 + 6 \ 0 + 7} \end{array}$	$\begin{array}{r} 600 \ 130 \ 11 \\ \underline{7 \ 0 \ 0 + 4 \ 0 + 1} \quad \underline{\quad} \\ -3 \ 0 \ 0 + 6 \ 0 + 7 \\ \underline{\quad} \\ 3 \ 0 \ 0 + 7 \ 0 + 4 = 374 \end{array}$
<p>Stage 7: Compact Decomposition</p>		$\begin{array}{r} 74 - 27 \\ 6 \ 14 \\ \underline{7 - 4} \quad \underline{\quad} \\ 2 \ 7 \\ \underline{\quad} \\ 4 \ 7 \end{array}$ $\begin{array}{r} 6 \ 13 \ 11 \\ \underline{7 - 4 \ 1} \quad \underline{\quad} \\ -3 \ 6 \ 7 \\ \underline{\quad} \\ 3 \ 7 \ 4 \end{array}$ $\begin{array}{r} 5008 - 1257 \\ 9 \\ 4 \ 70 \ 10 \\ \underline{-5 \ 0 \ 0 \ 8} \\ -1 \ 2 \ 5 \ 7 \\ \underline{\quad} \\ 3 \ 7 \ 5 \ 1 \end{array}$	

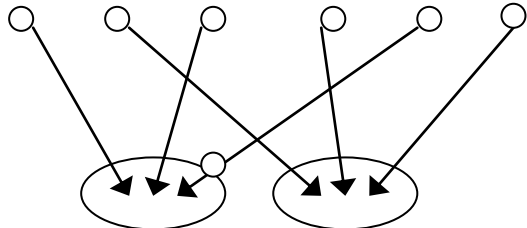
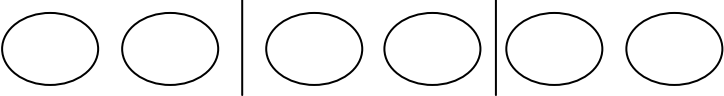
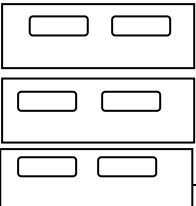
Multiplication

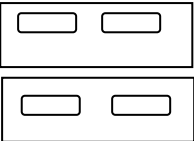
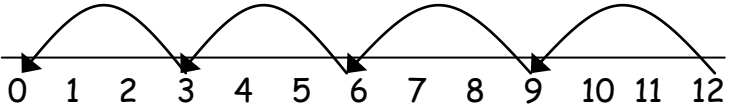
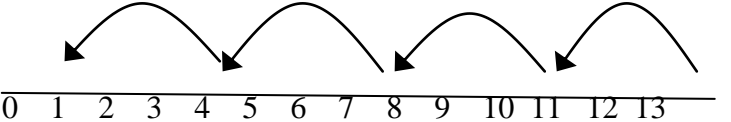
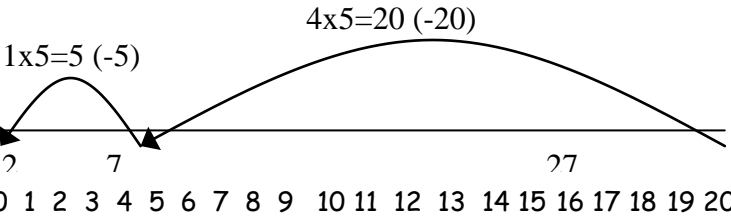
The Different Stages	Number Development	Strategy – What it Looks Like
See Mental Calculation policy section to review gaps and progression in mental times table and division facts knowledge.		
Stage 1: Counting practically in repeated groups/patterns.	Numbers up to 30	
Stage 2: Grouping using pictorial representations	2,5 10 times tables	$3 \times 2 = 6$ 
Stage 3: Arrays	2,5 10 times tables	$3 \times 2 = 6$ or $2 \times 3 = 6$ 
Stage 4: Repeated Addition 5 times 3 is $5+5+5=15$ or 3 lots of 5 or 5×3 Repeated addition can be shown easily on a number line.	All times tables TU x U	$5 \times 3 = 5 + 5 + 5$  0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 $5 \times 3 = 5 + 5 + 5$ 
Stage 5: Partitioning	TU x U HTU x U	$13 \times 5 =$ $10 \times 5 = 50$ $3 \times 5 = 15$ $50 + 15 = 65$
Stage 6: Long Multiplication. The next step is to show the method of recording in a column format but showing the	TU x U TU x TU HTU x TU	$38 \times 7 = 266$ $30 + 8$ $\begin{array}{r} X \quad 7 \\ \end{array}$

<p>working. This links to the grid method above.</p> <p>Children should describe what they do by saying the actual values of digits in the columns for example the first step in 38 x 7 is 30 multiplied by 7 not 3 x 7.</p>	<p>ThHTU x U</p>	$\begin{array}{r} 56 \quad 8 \times 7 = 56 \\ 210 \quad 30 \times 7 = 210 \\ \hline 266 \end{array}$ <p>Leading to condensed version of long multiplication</p> $\begin{array}{r} 38 \\ \times 7 \\ \hline 56 \\ 210 \\ \hline 266 \end{array}$ <p>56x27 is approximately 60 x 30= 1800</p> $\begin{array}{r} 56 \\ \times 27 \\ \hline 1000 \\ 120 \\ 350 \\ 42 \\ \hline 1512 \\ 1 \end{array}$
<p>Stage 7: Short multiplication</p> <p>The step here involves adding 210 and 50 mentally with only the 5 in the tens column being recorded.</p> <p>2 digit x 2 digit and beyond.</p> <p>Using rounding to make an estimation prior to the calculation.</p>	<p>TU x U</p> <p>TU x TU</p> <p>HTU x TU</p> <p>ThHTU x U</p>	$\begin{array}{r} 38 \\ \times 7 \\ \hline 266 \\ \hline 5 \end{array}$ <p>38 x 56 is approximately 30 x 60 = 1800</p>

		$\begin{array}{r} 38 \\ \times 56 \\ \hline 48 \\ 180 \\ 40 \\ 1500 \\ \hline 1768 \\ 1 \end{array}$
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Division

The Different Stages	Number Development	Strategy – What it Looks Like
See Mental Calculation policy section to review gaps and progression in mental times table and division facts knowledge.		
Stage 1: Children physically sharing objects	Numbers up to 30	6 sweets shared between 2 children.
Stage 2: Children will develop their understanding of division and use jottings to support calculations. (Pictorial and arrays)	2,5 10 times tables	<p>Sharing equally 6 sweets shared between 2 people. How many do they get each?</p> <p>1. Pictorial division</p>  <p>6 divided by 3 – 6 sweets divided between 3 people</p>  <p>$10 \div 2 = 5$</p> 

		
<p>Stage 3: Repeated Subtraction</p> <p>Including repeated subtraction leading to a remainder.</p>	All times tables	<p>$12 \div 3 = 4$</p>  <p>$13 \div 3 = 4r1$</p> 
<p>Stage 4: Repeated Subtraction, subtracting multiples of the divisor. (KS2 or when appropriate)</p>	All times tables $TU \div U$	
<p>Stage 5: Chunking method</p>	$TU \div U$ $HTU \div U$ $TU \div TU$	<p>$96 \div 6$</p> $6 \overline{) 96} \quad \begin{array}{r} 16 \\ \underline{6 } \\ 96 \\ \underline{96} \\ 0 \end{array}$

		$\begin{array}{r} - \underline{60} \quad 10x \\ 36 \\ - \underline{36} \quad 6x \\ 0 \end{array}$ <p>Answer : 16 ↓</p> <p>$256 \div 7 =$</p> $\begin{array}{r} 7 \overline{) 256} \\ \underline{70} \quad 10 \times 7 \\ 186 \\ - \underline{140} \quad 20 \times 7 \\ 46 \\ 42 \quad 6 \times 7 \\ \underline{4} \end{array}$ <p>So $10 + 20 + 6 = 36 \text{ r } 4$</p>
Stage 5: Short Division	TU ÷ U HTU ÷ U TU ÷ TU HTU ÷ TU	$560 \div 4$ $\begin{array}{r} 140 \\ 4 \overline{) 560} \end{array}$
Stage 6: Long Division	TU ÷ U HTU ÷ U TU ÷ TU HTU ÷ TU	$560 \div 24$ $\begin{array}{r} 23 \\ 24 \overline{) 560} \\ \underline{480} \\ 80 \\ \underline{72} \\ 8 \end{array}$ <p>Answer 23 r 8</p>