



Cogenhoe
Primary School

Calculation Policy

	Name	Signature	Date
Headteacher's Approval	Charley Oldham		8 th January 2020
Committee Chair Approval	Piyus Tanna		8 th January 2020
Chair of Governors' Approval	Alison Barrett		8 th January 2020
Recommended Review Date:	April 2021		

Version Number

This document is issued and maintained in accordance with Cogenhoe Primary School procedures. Any changes must be clearly identified and discussed with the Governors. The most recent version must be detailed to staff and kept with the other policies for all appropriate stakeholders including parents where applicable.

Version	Date	Description of Change	Changed By
1	19 th March 2015	Updated	BD / CS

- the practical implications of withdrawal
- the circumstances in which it would be reasonable to accommodate parents wishes



Cogenhoe Primary School

Calculation Policy

This calculation policy has been written to ensure consistency and progression across the school in the teaching and learning of the four operations in Mathematics.

The Aim -

- 1) For children to be shown a range of calculation methods throughout their time at Cogenhoe.
- 2) For children to engage in a two-way dialogue with teachers and peers about the methods being used.
- 3) For children to select preferred methods and to have the confidence to use these methods independently.


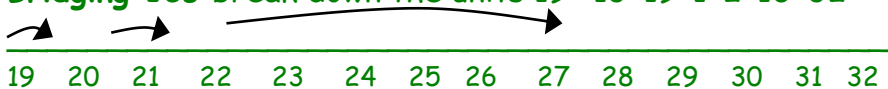
Points to remember

Use of Number lines - jumps should be shown on the number line - with jumps above the number line for addition and under the number line for subtraction.

The inverse - children should be encouraged (when appropriate) to use the inverse for checking subtraction and division.

Calculation Policy- Addition

By the end of each Stage:

<p>EYFS Stage -To be able to use quantities and objects to add two single digit numbers and count on to find the answer.</p> <div style="text-align: center;">  <p>$3 + 2 = 5$</p> <p style="text-align: center;">↪ ↪</p> <hr style="width: 100%;"/> <p style="text-align: center;">0 1 2 3 4 5 6 7 8 9</p> </div>	<p>Stage 1 -To be able to add one digit and two digit numbers to 20 including 0.</p> <p>Always start with the biggest number and count on $3 + 5 =$ "I'm going to do $5+3$ instead because it's easier to start with the bigger number".</p> <div style="text-align: center;"> <hr style="width: 100%;"/> <p style="text-align: center;">0 1 2 3 4 5 6 7 8 9</p> <p style="text-align: center;">↪ ↪ ↪</p> </div>		
<p>Stage 2 -To begin to move from a pictorial representations to a more formal columnar method.</p> <p>Bridging 10s-break down the units $19+ 13=19+1+2+10=32$</p> <div style="text-align: center;">  </div> <p>NB - 100 squares and Base 10 materials to be used too.</p> <p>Partitioned column method. $67 + 42 =$</p> $\begin{array}{r} 60 + 7 \\ 40 + 2 \\ \hline 100 + 9 = 109 \end{array}$	<p>Stage 3 -To be able to add numbers with up to 3 digits using a formal written method of columnar addition.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px; vertical-align: top;"> <p>Partitioned informal method</p> $267 + 127 = ?$ $\text{O } 7 + 7 = 14$ $\text{T } 60 + 20 = 80$ $\text{H } 200 + 100 = 300$ $14 + 80 + 300 =$ $380 + 10 + 4 = 394$ </td> <td style="width: 50%; padding: 5px; vertical-align: top;"> <p>Partitioned column method.</p> $\begin{array}{r} 200+60+7 \\ \hline 100+ 20+7 \\ \hline 300 +80+14 \\ \hline 394 \end{array}$ </td> </tr> </table>	<p>Partitioned informal method</p> $267 + 127 = ?$ $\text{O } 7 + 7 = 14$ $\text{T } 60 + 20 = 80$ $\text{H } 200 + 100 = 300$ $14 + 80 + 300 =$ $380 + 10 + 4 = 394$	<p>Partitioned column method.</p> $\begin{array}{r} 200+60+7 \\ \hline 100+ 20+7 \\ \hline 300 +80+14 \\ \hline 394 \end{array}$
<p>Partitioned informal method</p> $267 + 127 = ?$ $\text{O } 7 + 7 = 14$ $\text{T } 60 + 20 = 80$ $\text{H } 200 + 100 = 300$ $14 + 80 + 300 =$ $380 + 10 + 4 = 394$	<p>Partitioned column method.</p> $\begin{array}{r} 200+60+7 \\ \hline 100+ 20+7 \\ \hline 300 +80+14 \\ \hline 394 \end{array}$		
<p>Stage 4-To be able to add numbers with up to 4 digits using an extended column method.</p> $\begin{array}{r} 1267 \\ + 2127 \\ \hline 14 \text{ (7+7)} \\ 80 \text{ (60 + 20)} \end{array}$	<p>Stage 5 - To be able to add whole numbers and decimals with more than 4 digits using a compact written method (column addition).</p> $\begin{array}{r} 1358 \\ + 3473 \\ \hline 4831 \\ 11 \end{array} \quad 1.358$	<p>Stage 6-To be able to solve addition and subtraction multi step problems in context, deciding which methods to use and why.</p>	

$300_{(200+100)}$ <u>$3000_{(1000+2000)}$</u> 3394		
---	--	--

Calculation Policy - Subtraction

EYFS Stage - To be able to use quantities and objects to subtract two single digit numbers and count back to find the answer.

Counting Back

Understand subtraction as 'taking away'

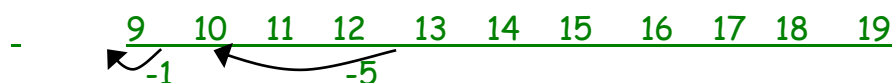


three take away 2 leaves....1 dog.

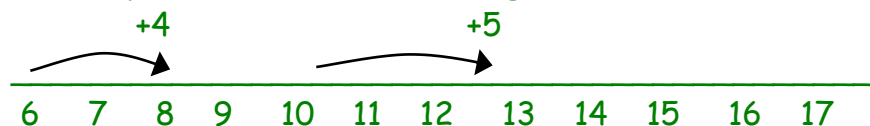
Stage 2 - To be able to subtract numbers with up to 2 digits using a number line.

2. Using a number line to take away - bridging tens.

$$15 - 6 = 15 - 5 - 1 = 9$$

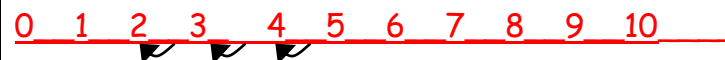


Count up - subtraction as finding the difference



Stage 1 - To be able to subtract one digit and two digit numbers to 20 including 0.

You can count backwards on a number line. $5 - 3 = 2$



-1 -1 -1 OR start with 3 and count on to 5. The difference is 2.

Stage 3 - To be able to subtract 3-digit numbers using a partitioned written method.

Horizontal partitioning

$$253 - 117$$

$$253 - 7 = 246$$

$$246 - 10 = 236$$

$$236 - 100 = 136$$

NB Only partition the smaller number to avoid negatives.

Column partitioned method

$$253 - 117$$

$$253 - 7 = 246$$

$$246 - 10 = 236$$

$$236 - 100 = 136$$

$$\begin{array}{r} 40 \quad 13 \\ 200 + 50 + 3 \\ - 100 + 10 + 7 \\ \hline 100 + 30 + 6 \\ \hline 136 \end{array}$$

Stage 4 - To be able to subtract 4-digit numbers using a partitioned column method.

$$3253 - 1117$$

$$\begin{array}{r} 40 \quad 13 \\ 3000 + 200 + 50 + 3 \\ - 1000 + 100 + 10 + 7 \\ \hline 2000 + 100 + 30 + 6 \\ \hline 2136 \end{array}$$

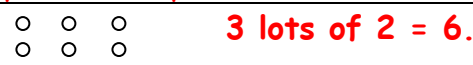
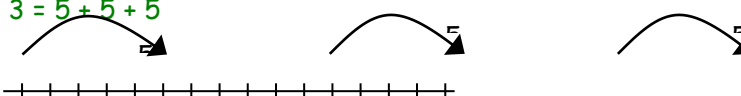
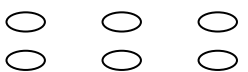
Stage 5 - To be able to subtract numbers and decimals with more than 4 digits using a compact formal written method (column subtraction).

$$\begin{array}{r} 6 \quad 14 \quad 14 \\ 3754 \\ - 1286 \\ \hline 2468 \end{array} \qquad \begin{array}{r} 6 \\ 14 \quad 14 \\ 3.754 \\ - 1 \\ \hline 2.468 \end{array}$$

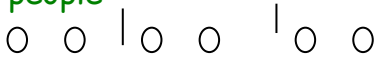
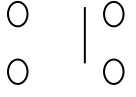
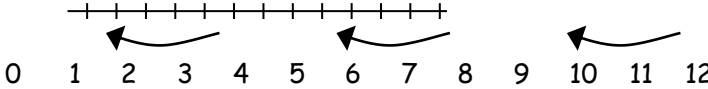
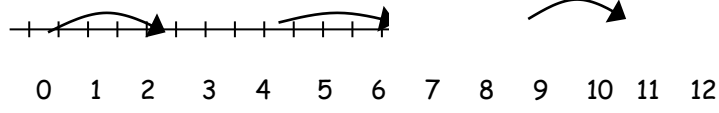

Stage 6 - To be able to solve subtraction and addition multi step problems in context, deciding with operations and methods to use and why.

2.468

Calculation Policy- Multiplication

<p>EYFS -To be able to solve problems including doubling objects.</p> <p>Doubling: Giving double the amount of objects.</p>	<p>Stage 1 -To be able to solve one step multiplication problems using objects, pictorial representations and arrays with support.</p> <p style="text-align: center;">  </p>																															
<p>Stage 2 - To understand multiplication using arrays and repeated addition.</p> <p>Counting - Count objects by grouping them in 2s, 5s or 10s</p> <p>Repeated addition</p> <p>$5 \times 3 = 5 + 5 + 5$</p>  <p>Arrays</p>  <p>$2 \times 3 =$</p>	<p>Stage 3 -To be able to multiply 2-digit by 1-digit using a partitioned written method.</p>																															
	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; padding: 5px;"> <p>Grid Method</p> <p>$38 \times 3 =$</p> <table style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="border-right: 1px solid black; padding: 0 5px;">X</td> <td style="border-right: 1px solid black; padding: 0 5px;">30</td> <td style="padding: 0 5px;">8</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 0 5px;">3</td> <td style="border-right: 1px solid black; padding: 0 5px;">90</td> <td style="padding: 0 5px;">24</td> </tr> </table> <p>$= 90 + 24 = 90 + 20 + 4 = 114$</p> </td> <td style="width: 50%; border: none; padding: 5px;"> <p>Partitioned method</p> <table style="margin-left: 20px;"> <tr><td style="text-align: right;">30 + 8</td></tr> <tr><td style="text-align: right;">$X \quad 3$</td></tr> <tr><td style="text-align: right;">24(3x8)</td></tr> <tr><td style="text-align: right;"><u>90 (3 x 30)</u></td></tr> <tr><td style="text-align: right;">114</td></tr> </table> </td> </tr> </table>	<p>Grid Method</p> <p>$38 \times 3 =$</p> <table style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="border-right: 1px solid black; padding: 0 5px;">X</td> <td style="border-right: 1px solid black; padding: 0 5px;">30</td> <td style="padding: 0 5px;">8</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 0 5px;">3</td> <td style="border-right: 1px solid black; padding: 0 5px;">90</td> <td style="padding: 0 5px;">24</td> </tr> </table> <p>$= 90 + 24 = 90 + 20 + 4 = 114$</p>	X	30	8	3	90	24	<p>Partitioned method</p> <table style="margin-left: 20px;"> <tr><td style="text-align: right;">30 + 8</td></tr> <tr><td style="text-align: right;">$X \quad 3$</td></tr> <tr><td style="text-align: right;">24(3x8)</td></tr> <tr><td style="text-align: right;"><u>90 (3 x 30)</u></td></tr> <tr><td style="text-align: right;">114</td></tr> </table>	30 + 8	$X \quad 3$	24(3x8)	<u>90 (3 x 30)</u>	114																		
<p>Grid Method</p> <p>$38 \times 3 =$</p> <table style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="border-right: 1px solid black; padding: 0 5px;">X</td> <td style="border-right: 1px solid black; padding: 0 5px;">30</td> <td style="padding: 0 5px;">8</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 0 5px;">3</td> <td style="border-right: 1px solid black; padding: 0 5px;">90</td> <td style="padding: 0 5px;">24</td> </tr> </table> <p>$= 90 + 24 = 90 + 20 + 4 = 114$</p>	X	30	8	3	90	24	<p>Partitioned method</p> <table style="margin-left: 20px;"> <tr><td style="text-align: right;">30 + 8</td></tr> <tr><td style="text-align: right;">$X \quad 3$</td></tr> <tr><td style="text-align: right;">24(3x8)</td></tr> <tr><td style="text-align: right;"><u>90 (3 x 30)</u></td></tr> <tr><td style="text-align: right;">114</td></tr> </table>	30 + 8	$X \quad 3$	24(3x8)	<u>90 (3 x 30)</u>	114																				
X	30	8																														
3	90	24																														
30 + 8																																
$X \quad 3$																																
24(3x8)																																
<u>90 (3 x 30)</u>																																
114																																
<p>Stage 4 -To be able to multiply three-digit numbers by a one-digit number using a partitioned written method.</p>	<p>Stage 5 - To be able to multiply 4-digit numbers by a one/ two digit number using a formal written method.</p>	<p>Stage 6 - To be able to multiple multi-digit numbers up to 4 digits by a 2 two digit number using the formal written method of long multiplication.</p>																														
<p>Partitioned written Method</p> <table style="margin-left: 20px;"> <tr><td style="text-align: right;">200+30+8</td></tr> <tr><td style="text-align: right;">$X \quad 3$</td></tr> <tr><td style="text-align: right;">24(3x8)</td></tr> <tr><td style="text-align: right;">90 (3 x 30)</td></tr> <tr><td style="text-align: right;"><u>600 (3 x 200)</u></td></tr> <tr><td style="text-align: right;">714</td></tr> </table>	200+30+8	$X \quad 3$	24(3x8)	90 (3 x 30)	<u>600 (3 x 200)</u>	714	<table style="margin-left: 20px;"> <tr><td style="text-align: right;">1238</td></tr> <tr><td style="text-align: right;">$X \quad 3$</td></tr> <tr><td style="text-align: right;">24(3x8)</td></tr> <tr><td style="text-align: right;">90 (3 x 30)</td></tr> <tr><td style="text-align: right;">600 (3 x 200)</td></tr> <tr><td style="text-align: right;"><u>3000 (3 x 1000)</u></td></tr> <tr><td style="text-align: right;">3714</td></tr> </table>	1238	$X \quad 3$	24(3x8)	90 (3 x 30)	600 (3 x 200)	<u>3000 (3 x 1000)</u>	3714	<table style="margin-left: 20px;"> <tr><td style="text-align: right;">1238</td></tr> <tr><td style="text-align: right;">$X \quad 13$</td></tr> <tr><td style="text-align: right;">24(3x8)</td></tr> <tr><td style="text-align: right;">90 (3 x 30)</td></tr> <tr><td style="text-align: right;">600 (3 x 200)</td></tr> <tr><td style="text-align: right;">3000 (3 x 1000)</td></tr> <tr><td style="text-align: right;">80 (10 x 8)</td></tr> <tr><td style="text-align: right;">300 (10 x 30)</td></tr> <tr><td style="text-align: right;">2000 (10 x 200)</td></tr> <tr><td style="text-align: right;"><u>10000 (10 x 1000)</u></td></tr> <tr><td style="text-align: right;">16094</td></tr> </table>	1238	$X \quad 13$	24(3x8)	90 (3 x 30)	600 (3 x 200)	3000 (3 x 1000)	80 (10 x 8)	300 (10 x 30)	2000 (10 x 200)	<u>10000 (10 x 1000)</u>	16094	<table style="margin-left: 20px;"> <tr><td style="text-align: right;">1325</td></tr> <tr><td style="text-align: right;">$X \quad 27$</td></tr> <tr><td style="text-align: right;">9275</td></tr> <tr><td style="text-align: right;"><u>26500</u></td></tr> <tr><td style="text-align: right;">35775</td></tr> </table>	1325	$X \quad 27$	9275	<u>26500</u>	35775
200+30+8																																
$X \quad 3$																																
24(3x8)																																
90 (3 x 30)																																
<u>600 (3 x 200)</u>																																
714																																
1238																																
$X \quad 3$																																
24(3x8)																																
90 (3 x 30)																																
600 (3 x 200)																																
<u>3000 (3 x 1000)</u>																																
3714																																
1238																																
$X \quad 13$																																
24(3x8)																																
90 (3 x 30)																																
600 (3 x 200)																																
3000 (3 x 1000)																																
80 (10 x 8)																																
300 (10 x 30)																																
2000 (10 x 200)																																
<u>10000 (10 x 1000)</u>																																
16094																																
1325																																
$X \quad 27$																																
9275																																
<u>26500</u>																																
35775																																

Calculation Policy- Division

<p>EYFS - To be able to solve problems including halving and sharing.</p>	<p>Stage 1 - To be able to solve one step problems involving division, using concrete objects and pictorial representations.</p>
<p>Sharing - giving out objects so that everyone gets the same amount.</p>	<p>Halving - using objects/ shapes/ pictures Sharing - giving out objects so that everyone gets the same amount.</p>
<p>Stage 2 - To understand the division (\div) sign as sharing/ grouping.</p>	<p>Stage 3 - To be able to divide 2-digit by 1-digit using repeated subtraction.</p>
<p>1. Sharing/ grouping - 6 divided by 3 - 6 sweets divided between 3 people</p> <div style="text-align: center;">  </div> <p>2. Halves - half of 4 is 2 - To learn halves to 20</p> <div style="text-align: center;">  </div>	<p>Division as repeated subtraction 12 divided by 4 = 3</p> <div style="text-align: center;">  </div> <p>Division by repeated addition to check</p> <div style="text-align: center;">  </div>
<p>Stage 4 - To be able to divide 3-digit by 1 digit using chunking.</p>	<p>Stage 5 - To be able to divide up to 4 digits by a 1 digit number using the written method of short division.</p>
<div style="display: flex;"> <div style="flex: 1;"> <p>Chunking on a number line</p> <p>$96 \div 6$</p> <div style="text-align: center;">  </div> <p>0 60 90 96</p> <p>Answer : 16</p> <p>Optional Challenge - Vertical chunking</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> $\begin{array}{r} 16 \\ 6 \overline{) 96} \\ \underline{- 60} \\ 36 \\ \underline{- 36} \\ 0 \end{array}$ </div> <div> <p>10x</p> <p>6x</p> </div> </div> </div> <div style="flex: 1;"> <p>Partitioning</p> <p>96 divided by 6 = $(60 + 30 + 6)$ divided by 6 = 60 divided by 6 = 10 30 divided by 6 = 5 6 divided by 6 = 1 $10 + 5 + 1 = 16$</p> </div> </div>	<p>Short division</p> <div style="text-align: center;"> $\begin{array}{r} 16 \\ 6 \overline{) 936} \end{array}$ </div>
	<p>Stage 6 - To be able to divide numbers with up to 4 digits by a 2 digit number using long division and interpret remainders as fractions/decimals.</p>
	<p>Long Division</p> <div style="text-align: center;"> $\begin{array}{r} 0327r3 \\ 6 \overline{) 1965} \\ \underline{6} \\ 19 \\ \underline{18} \\ 16 \\ \underline{12} \\ 45 \\ \underline{42} \\ 3 \end{array}$ </div> <p>$r \frac{3}{6} = \frac{1}{2} = 0.5$</p>