

St Just Primary School Calculation Policy

This policy contains the key procedures that are to be taught throughout the school. It has been written to ensure consistency and progression throughout the school. We are aiming to get each child to show fluency, reasoning and problem solving skills from EYFS – Year 6.

- Although the main focus of this policy is showing the core **Concrete, Pictorial and Abstract** ways of solving Maths problems, it is important to recognise that the ability to calculate mentally lies at the heart of numeracy.
- Mental calculation is not at the exclusion of written recording and should be seen as complementary to and not as separate from it. In every written method there is an element of mental processing.
- Written recording both helps children to clarify their thinking and supports and extends the development of more *fluent* and sophisticated mental strategies.
- Children are encouraged to use the most efficient method for them, making sure they use ones they have a clear understanding of.
- The long-term aim is for children to be able to select an efficient method of their choice that is appropriate for a given task. They should do this by always asking themselves:
 - 'Do I need to use manipulatives to help me?'
 - 'Can I do this using drawings or jottings?'
 - 'Do I need to use a written method?'
 - 'Can I do this in my head?'

Stem sentences are in red, these are to help children embed their learning.

Please continue daily counting at the start of the lessons – age appropriate for your year group. E.g. year 3 – embed 2/5/10 from year 2, introduce 3/4/8 for year 3 and when ready – continue with other counting increments.



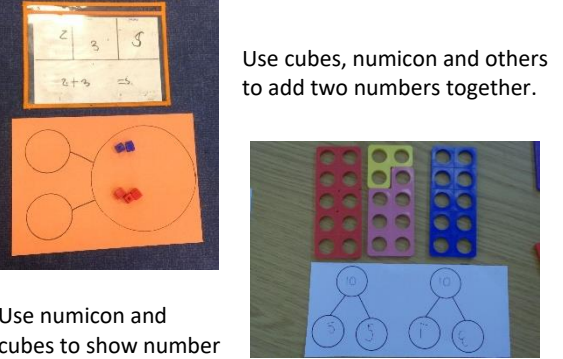
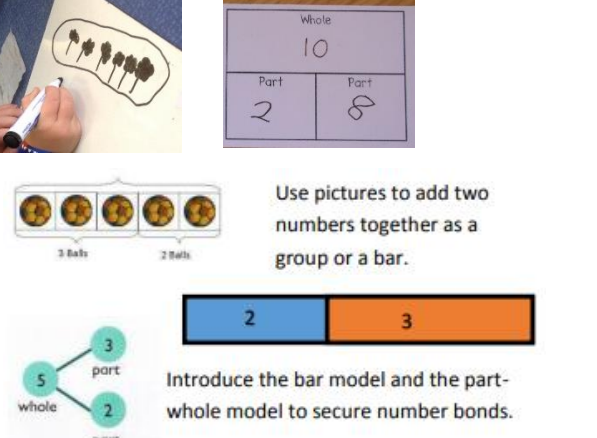
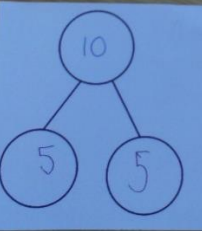
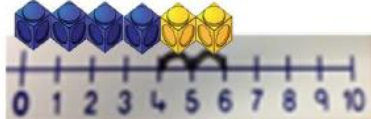
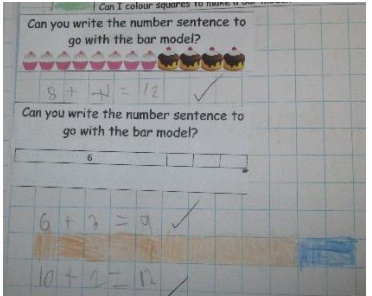

Compiled by K Bird adapted from White Rose. Updated Sept 2022.

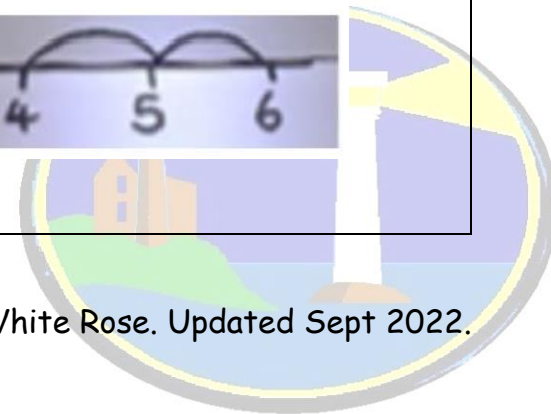
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Addition

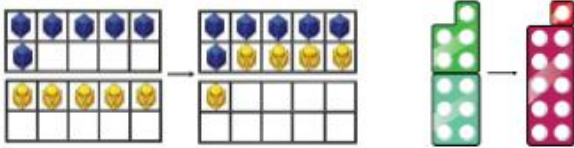
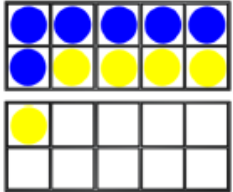

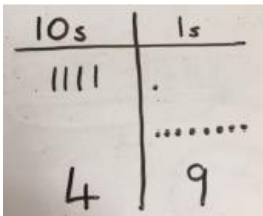
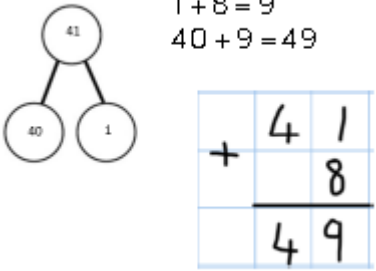
Vocab: add, plus, more than, total, sum of,

Bar model, part-part-whole, number line, tens frame, base 10, place value counters, missing numbers,

STEM sentences	Concrete (can we MAKE it?)	Pictorial (can we draw it?)	Abstract (can we write the calculation?)
<p>_____ is a whole,</p> <p>_____ is a part,</p> <p>_____ is a part.</p> <p>There are _____ in total.</p>	 <p>Use cubes, numicon and others to add two numbers together.</p> <p>Use numicon and cubes to show number bonds.</p>	 <p>Use pictures to add two numbers together as a group or a bar.</p> <p>Introduce the bar model and the part-whole model to secure number bonds.</p>	<p>$5 + 5 = 10$ 5 is a part, 5 is a part, the whole is ten.</p> 
<p>First... Then... Now...</p> <p>E.g. First there were 4 children on the bus, then 3 children got on, Now there are 7 children on the bus.</p> <p>(this will help with the inverse)</p>	<p>Counting on using number lines using cubes or Numicon.</p> 	<p>A bar model which encourages the children to count on rather than count all.</p> 	<p>The abstract number line:</p> <p>What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2?</p> <p>$4 + 2$</p> 

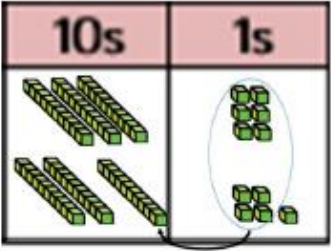
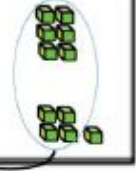
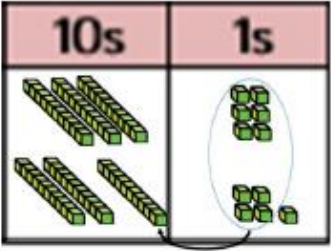
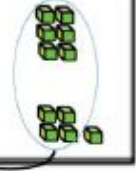
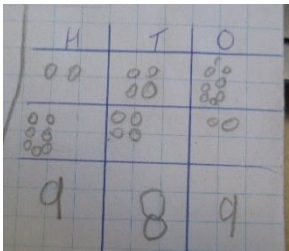
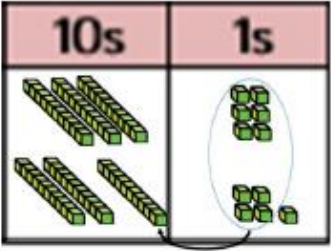
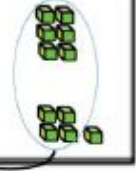


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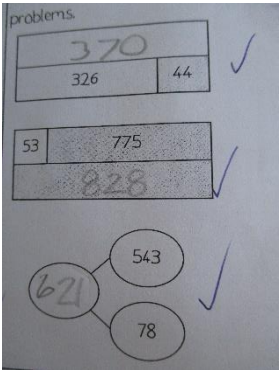
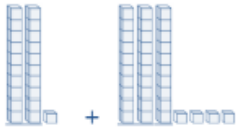









<p>relationship and missing number)</p>			
<p>I need ____ to make ten. I have ____ left over. 10 + ____ is ____.</p>	<p>Regrouping to make 10; using ten frames and counters/cubes or using Numicon.</p> <p>6 + 5</p> 	<p>Children to draw the ten frame and counters/cubes.</p> 	<p>Children to develop an understanding of equality e.g.</p> <p>$6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$</p>
	<p>TO + O using base 10. Continue to develop understanding of partitioning and place value.</p> <p>41 + 8</p> 	<p>Children to represent base 10 e.g. lines for tens and dots for ones.</p> 	<p>41 + 8</p> <p>$1 + 8 = 9$ $40 + 9 = 49$</p> 



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<p>TO + O using base 10. Continue to develop understanding of partitioning and place value. $36 + 25$</p> <div style="display: flex; align-items: center; justify-content: center;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr style="background-color: #f8d7da;"><th style="padding: 5px;">10s</th><th style="padding: 5px;">1s</th></tr> <tr> <td style="padding: 5px;"></td><td style="padding: 5px;"></td></tr> </table> <div style="margin-left: 20px;"> $\begin{array}{r} 36 \\ +25 \\ \hline \end{array}$ </div> </div> <p style="text-align: center; margin-top: 10px;">6 1</p>	10s	1s			<p>Children to represent the base 10 or place value counters, in a place value chart</p> 	<p>Looking for ways to make 10.</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 20px;"> $\begin{array}{r} 36 + 25 = \\ \swarrow \quad \searrow \\ 1 \quad \quad 5 \end{array}$ </div> <div> $\begin{array}{r} 30 + 20 = 50 \\ 5 + 5 = 10 \\ 50 + 10 + 1 = 61 \end{array}$ </div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="margin-right: 20px;"> $\begin{array}{r} 36 \\ +25 \\ \hline 61 \\ \hline 1 \end{array}$ </div> <div> <p>Formal method:</p> $\begin{array}{r} +25 \\ 36 \\ \hline 61 \\ \hline 1 \end{array}$ </div> </div>
10s	1s					
						

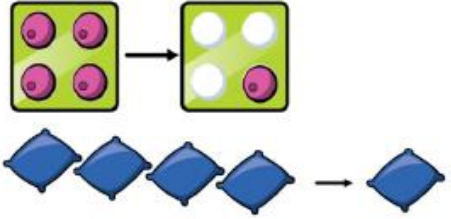
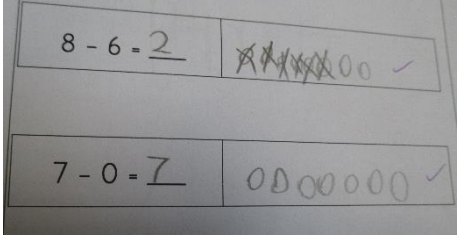
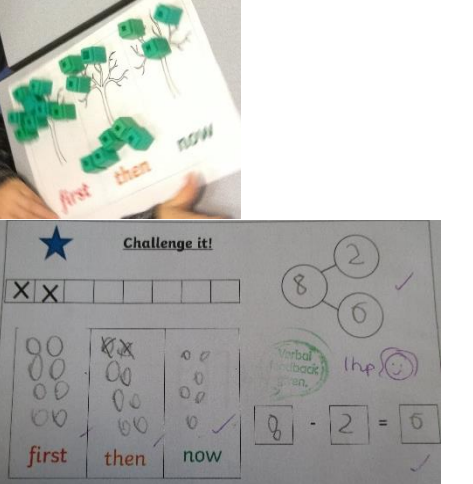
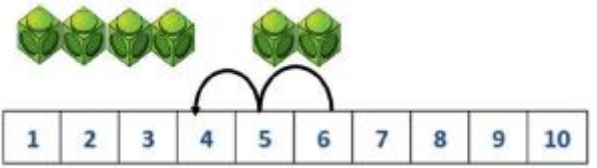
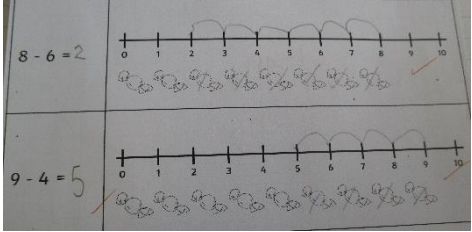
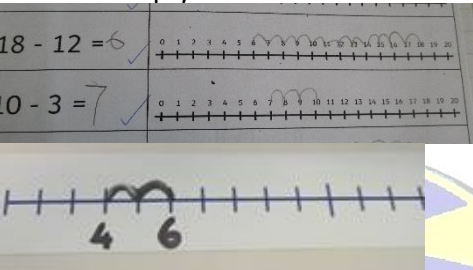
Conceptual variation; different ways to ask children to solve $21 + 34$

	<p>Word problems: In year 3, there are 21 children and in year 4, there are 34 children. How many children in total? $21 + 34 = 55$. Prove it</p>	<div style="text-align: center;"> $\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$ $21 + 34 =$ <div style="border: 1px dashed black; width: 30px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> □ </div> $= 21 + 34$ </div> <p>Calculate the sum of twenty-one and thirty-four.</p>	<div style="text-align: center;">  </div> <p>Missing digit problems:</p> <table border="1" style="margin: 0 auto; border-collapse: collapse; text-align: center;"> <tr style="background-color: #f8d7da;"><th style="padding: 5px;">10s</th><th style="padding: 5px;">1s</th></tr> <tr> <td style="padding: 5px;"></td><td style="padding: 5px;"></td></tr> <tr> <td style="padding: 5px;"></td><td style="padding: 5px;">?</td></tr> <tr> <td style="padding: 5px;">?</td><td style="padding: 5px;">5</td></tr> </table>	10s	1s				?	?	5
10s	1s										
											
	?										
?	5										

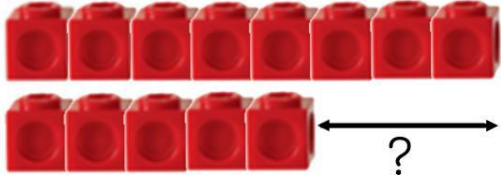
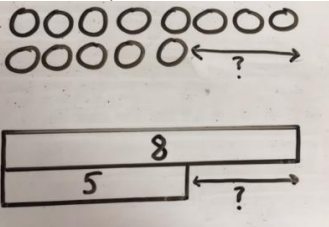
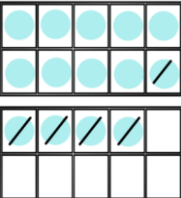
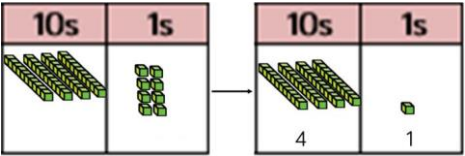
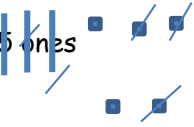


Subtraction

Vocab: take away, less than, the difference, subtract, minus, fewer, decrease, exchange

STEM sentences	Concrete	Pictorial	Abstract
<p>First... Then... Now... e.g. First there were 4 children in the car, then 1 child got out, Now there are 3 children in the car.</p>	<p>Physically taking away objects from a whole (tens frame, numicon, cubes etc...) $4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.</p> 	
<p>The whole is _____. The part we are taking away is _____. Start on _____ and count back _____.</p>	<p>Counting back (using number lines or tracks) $6 - 2 =$ Children start at 6 and count back 2</p> 	<p>Children to represent what they see pictorially e.g.</p> 	<p>Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line</p> 

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	<p>Finding the difference (using cubes, Numicon or other objects can also be used). Calculate the difference between 8 and 5.</p> 	<p>Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.</p> 	<p>Find the difference between 8 and 5.</p> <p>$8 - 5$, the difference is <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/></p> <p>Children to explore why $9 - 6 = 8 - 5 = 7 - 4 =$ have the same difference.</p>
		<p>Children to present the ten frame pictorially and discuss what they did to make 10.</p> 	<p>When children are confident they can draw this themselves. Remind them to show order and uniform to help them.</p>
	<p>Column method using base 10 or place value counters.</p> <p>48-7</p> 	<p>Children to represent the base 10 pictorially.</p> <p>$35 - 23 =$</p>  <p>5 ones</p> <p>draw the 3 tens and</p> <p>cross out the ones</p> <p>cross out the tens</p> <p>look how much</p> <p>remains</p>	<p>Encourage children to use mental strategies</p>



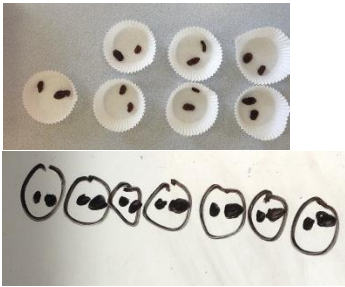
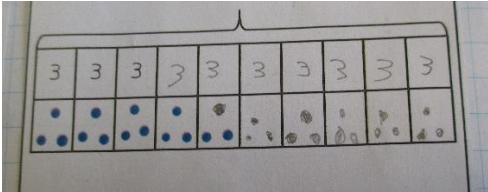
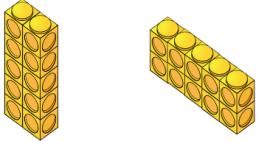
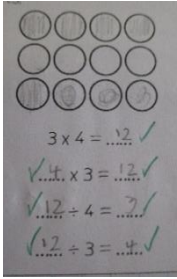
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<p>Column method using base 10 or place value counters and having to exchange. 41 - 26</p> <div style="text-align: center;"> </div> <p style="text-align: center;">41 Here 1 ten has been exchanged for 10 ones Answer</p>	<p>Represent the place value counters pictorially; remembering to show what has been exchanged.</p> <div style="text-align: center;"> </div>	<p>Formal column method. Children must understand what has happened when they have crossed out digits.</p> <div style="text-align: center;"> </div>				
<p>Conceptual variation; different ways to ask children to solve 391 - 186</p>						
<div style="text-align: center;"> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr><td colspan="2" style="text-align: center;">391</td></tr> <tr><td style="text-align: center;">186</td><td style="text-align: center;">?</td></tr> </table> </div>	391		186	?	<p>Raj spent £391, Timmy spent £186. How much more did Raj spend? Calculate the difference between 391 and 186.</p>	<div style="text-align: center;"> <p> = 391 - 186</p> $\begin{array}{r} 391 \\ -186 \\ \hline \end{array}$ <p>What is 186 less than 391?</p> </div>
391						
186	?					
<div style="text-align: center;"> <p>Missing digit calculations</p> $\begin{array}{r} 39\Box \\ -\Box\Box6 \\ \hline \Box05 \end{array}$ </div>						



Multiplication

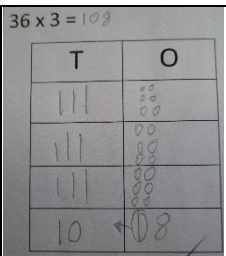
Vocab: double, times, multiplied by, the product of, groups of, lots of, equal groups, exchange

STEM sentences	Concrete	Pictorial	Abstract
<p>We are counting in multiples of ____ so we count every ____.</p> <p>There are ____ in each group. There are ____ groups. We have to add ____ times.</p>	<p>Repeated grouping/repeated addition 7×2 $2 + 2 + 2 + 2 + 2 + 2 + 2 =$ There are 7 equal groups, with 2 in each group.</p> 	<p>Children to represent the practical resources in a picture and use a bar model.</p> 	<p>$3 \times 4 = 12$ $4 + 4 + 4 = 12$</p>
<p>____ lots of ____ is the same as ____ lots of ____.</p>	<p>Use arrays to illustrate commutativity counters and other objects can also be used. $2 \times 5 = 5 \times 2$</p>  <p>2 lots of 5 5 lots of 2</p>	<p>Children to represent the arrays pictorially.</p> 	<p>Children to be able to use an array to write a range of calculations e.g.</p> <ul style="list-style-type: none"> • $10 = 2 \times 5$ • $5 \times 2 = 10$ • $2 + 2 + 2 + 2 + 2 = 10$ • $10 = 5 + 5$



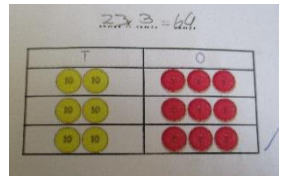
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____ can be partitioned into ____ and ____.
 ____ lots of ____ ones is ____.
 ____ lots of ____ tens is ____.
 ____ ones add ____ tens is ____.

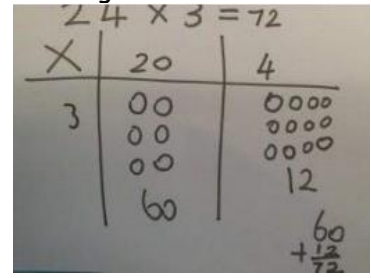


To first introduce the grid method, use Base 10 before moving towards a more compact method.
 $36 \times 3 =$
 Make 36 on each row, there are 3 rows.
 Add up each column, starting with the ones and exchange if needed.

Move on to Place Value Counters to show how we are finding groups of a number. We are multiplying by 3 so need 3 rows.



Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.



Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

X	30	5
7	210	35

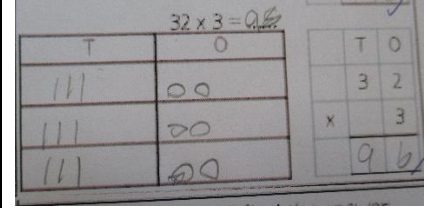
$210 + 35 = 245$

Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

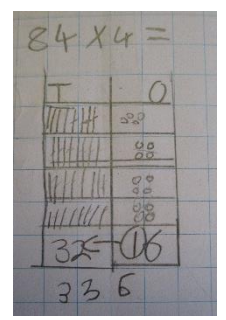
X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

____ ones times ____ ones is ____ ones.
 ____ ones times ____ tens is ____ tens.
 Because we are multiplying by ten, we need to add in a zero as a place value holder.
 We cannot have more than one digit in any place value column, so we need to exchange ____ ones as ____ ten

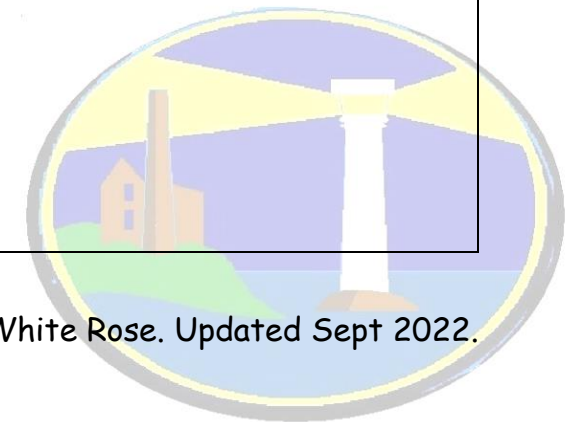
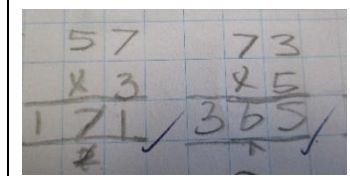
Formal column method with place value counters (base 10 can also be used.)
 32×3









Children to represent the base 10 or place value counters pictorially.



Formal Written Method



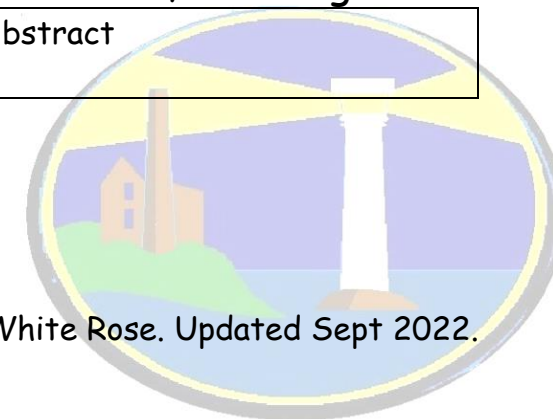
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	<p>When children start to multiply $3d \times 3d$ and $4d \times 2d$ etc..., they should be confident with the abstract:</p> <p>To get 744 children have solved 6×124.</p> <p>To get 2480 they have solved 20×124.</p>		$\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \end{array}$ <p style="text-align: right;">Answer: 3224</p>																			
Conceptual variation; different ways to ask children to solve 23×6																						
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>23</td><td>23</td><td>23</td><td>23</td><td>23</td><td>23</td> </tr> <tr> <td colspan="6" style="text-align: center;">?</td> </tr> </table>	23	23	23	23	23	23	?						<p>Mae had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week?</p> <p>With the counters prove that $23 \times 6 = 138$</p>	<p>Find the product of 6 and 23</p> $6 \times 23 = \underline{\quad}$ $\underline{\quad} = \begin{array}{r} 23 \\ \times 6 \\ \hline \end{array} \quad \begin{array}{r} 6 \times 23 \\ \times 23 \\ \hline \end{array}$	<p>What is the calculation? What is the product?</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="background-color: #f8d7da;">100s</th> <th style="background-color: #f8d7da;">10s</th> <th style="background-color: #f8d7da;">1s</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;">  </td> <td style="text-align: center;">  </td> </tr> </tbody> </table>	100s	10s	1s			
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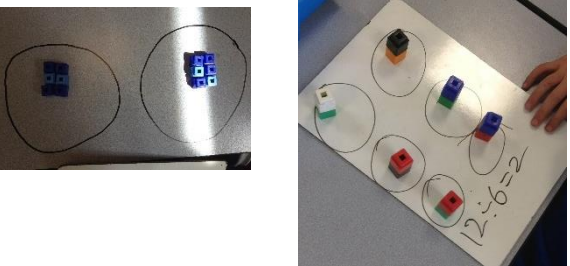
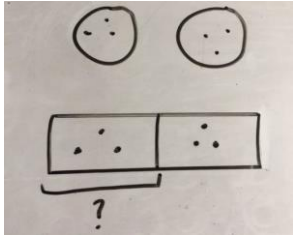
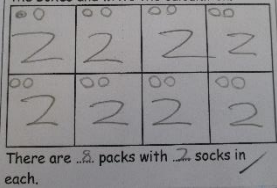
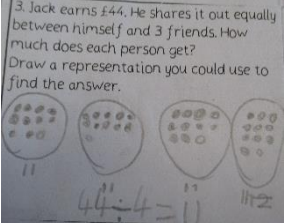
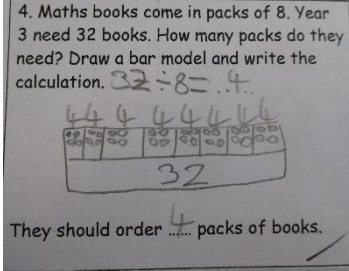
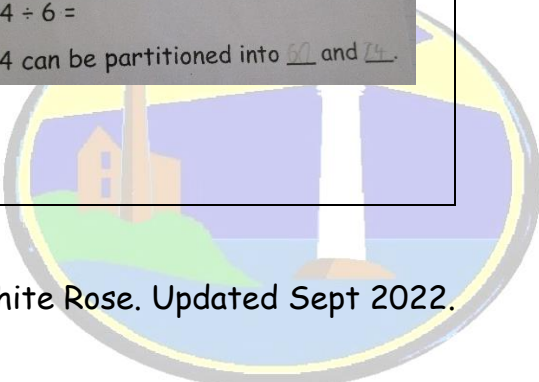
Division

Vocab: share, group, divide, divided by, half, divisor, dividend, quotient, remainder, exchange

STEM sentences	Concrete	Pictorial	Abstract
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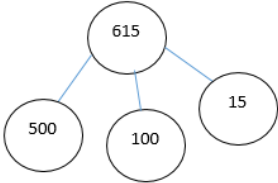
St Just Primary School Calculation Policy

<p>___ shared equally between ___ is ___</p>	<p>Sharing a range of objects $12 \div 2 =$</p> 	<p>Represent the sharing pictorially</p> 	<p>$6 \div 2 = 3$</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2" style="text-align: center;">6</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> </tr> </table> <p>Children should also be encouraged to use their 2 times tables facts.</p>	6		3	3
6							
3	3						
	<p>Sharing - using concrete methods</p>	<p>1. Use counters to represent the problem. Sam has 8 packs of socks. He has 16 socks in total. How many socks are in a pack? Draw your representation using the boxes and write the calculation.</p>  <p>There are <u>8</u> packs with <u>2</u> socks in each.</p> <p>3. Jack earns £44. He shares it out equally between himself and 3 friends. How much does each person get? Draw a representation you could use to find the answer.</p> 	<p>Children can use a bar model to help represent the division.</p>  <p>4. Maths books come in packs of 8. Year 3 need 32 books. How many packs do they need? Draw a bar model and write the calculation. $32 \div 8 = 4$.</p> <p>They should order <u>4</u> packs of books.</p>				
<p>In division, we start from the largest place value column. We start from the right. ___ is ___ tens and ___ ones. ___ tens divided by ___ is ___.</p>	<p>Sharing using place value counters. $42 \div 3 = 14$</p>	<p>Children to represent the place value counters pictorially.</p>	<p>Children to be able to make sense of the place value counters and write calculations to show the process.</p> <p>$84 \div 6 =$</p> <p>84 can be partitioned into <u>60</u> and <u>24</u>.</p> 				

St Just Primary School Calculation Policy

<p style="color: red;">ones divided by _____ is _____.</p> <p style="color: red;">_____ add _____ is _____.</p>	<p>The diagram shows three place value charts. The first chart has 10 ones in the 1s column. An arrow points to the second chart where one ten has been placed in the 10s column and the 1s column is empty. A third arrow points to the third chart where the ten is broken down into 10 ones, and the 10s column is empty.</p>	<p style="text-align: center;">$99 \div 3 = 33$</p>	<p>$60 \div 6 = 10$ $24 \div 6 = 4$ $10 + 4 = 14$ So, $84 \div 6 = 14$</p>																
<p>Short division using place value counters to group. $615 \div 5$</p>	<div style="text-align: center;"> <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr style="background-color: #f8d7da;"> <th style="padding: 5px;">100s</th> <th style="padding: 5px;">10s</th> <th style="padding: 5px;">1s</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </tbody> </table> <p style="text-align: center;">1 2 3</p> </div> <ol style="list-style-type: none"> 1. Make 615 with place value counters. 2. How many groups of 5 hundreds can you make with 6 hundred counters? 3. Exchange 1 hundred for 10 tens. 4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones? 	100s	10s	1s										<p>Represent the Place Value counters pictorially</p> <p>The pictorial shows three columns labeled 100s, 10s, and 1s. The 100s column has 6 circles, the 10s column has 1 circle, and the 1s column has 5 circles. Below the columns are the numbers 1, 2, and 3, likely representing groups.</p>	<p>Children to do the calculation using short division scaffold</p> <div style="text-align: center; font-size: 2em;"> $5 \overline{) 615}$ $\begin{array}{r} 123 \\ 5 \overline{) 615} \\ \underline{5} \\ 11 \\ \underline{10} \\ 15 \\ \underline{15} \\ 0 \end{array}$ </div>				
100s	10s	1s																	
<p>Long division using place value counters $2544 \div 12$</p>	<div style="text-align: center;"> <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr style="background-color: #f8d7da;"> <th style="padding: 5px;">1000s</th> <th style="padding: 5px;">100s</th> <th style="padding: 5px;">10s</th> <th style="padding: 5px;">1s</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </tbody> </table> <p style="text-align: center;">We can't group 2 thousands into groups of 12 so will exchange them.</p> </div>	1000s	100s	10s	1s					<div style="text-align: center;"> <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr style="background-color: #f8d7da;"> <th style="padding: 5px;">1000s</th> <th style="padding: 5px;">100s</th> <th style="padding: 5px;">10s</th> <th style="padding: 5px;">1s</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </tbody> </table> </div> <p style="text-align: center;">We can group 24 hundreds into groups of 12 which leaves with 1 hundred.</p>	1000s	100s	10s	1s					<div style="text-align: center;"> $12 \overline{) 2544}$ $\begin{array}{r} 212 \\ 12 \overline{) 2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 24 \\ \underline{24} \\ 0 \end{array}$ </div>
1000s	100s	10s	1s																
1000s	100s	10s	1s																

St Just Primary School Calculation Policy

Conceptual variation; different ways to ask children to solve $615 \div 5$			
	<p>Using the part whole model below, how can you divide 615 by 5 without using short division?</p> 	<p>I have £615 and share it equally between 5 bank accounts. How much will be in each bank account?</p> <p>615 pupils need to be put into 5 groups. How many will be in each group?</p>	<div style="text-align: center;"> $5 \overline{)615}$ </div> <p>$615 \div 5 = \underline{\quad}$</p> <p>$\underline{\quad} = 615 \div 5$</p>
			<p>What is the calculation? What is the answer?</p> 