

# Scotforth St. Paul's Church of England Primary and Nursery School



## Progression in Mental Calculations

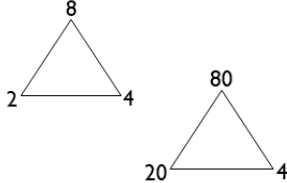
### A guide for Year 3 parents

This policy aims to summarise the number facts, mental calculation strategies and the stage(s) of the progression towards the written methods for each of the four operations. The strategies used within this document are taken from the Lancashire Mathematics Team Progression in Mental Calculation Strategies Policies and the Progression Towards Written Methods Policies.

## Arithmetic Expectations – Year 3

Skills	Examples
<b>Counting</b>	
<b>Find 1, 10 or 100 more or less than a given number.</b>	$229 + 1 = \underline{\quad}$ $229 + 10 = \underline{\quad}$ $229 + 100 = \underline{\quad}$ $200 = \underline{\quad} + 1$ $479 + \underline{\quad} = 480$ $726 + \underline{\quad} = 826$ $400 - 1 = \underline{\quad}$ $261 - 10 = \underline{\quad}$ $\underline{\quad} = 812 - 100$
<b>Count from 0 in multiples of 4, 8, 50 and 100</b> <b>Continue to count in 2s, 3s, 5s and 10s from Year 2</b>	Count from 0 in fours Count from 0 in eights What number is missing from this counting sequence? 0, 8, 16, 32, 40, 48 What number would come next in this counting sequence? 0, 50, 100, 150, 200, $\underline{\quad}$ What number comes immediately after 600 when counting up in steps of 100?
<b>Count up and down in tenths.</b>	Count on from 0 in tenths. What would come next in this counting sequence? $0, \frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \frac{4}{10}$  What is missing from this number sequence? $\frac{7}{10}, \frac{6}{10}, \frac{5}{10}, \frac{3}{10}, \frac{2}{10}$
<b>Number Facts</b>	
<b>Recall addition and subtraction facts for 100 (multiples of 5 and 10).</b>	$100 - 30 = \underline{\quad}$ $20 + \underline{\quad} = 100$ $100 = \underline{\quad} + 5$ $100 - 45 = \underline{\quad}$ $100 - \underline{\quad} = 15$ $65 = 100 - \underline{\quad}$
<b>Recall and use multiplication division facts for the 3, 4 and 8 multiplication tables.</b>	$6 \times 3 = \underline{\quad}$ $2 \times 4 = \underline{\quad}$ $4 \times 8 = \underline{\quad}$ $20 = 4 \times \underline{\quad}$ $21 = 3 \times \underline{\quad}$ $32 = \underline{\quad} \times 8$ $\underline{\quad} \times 4 = 28$ $30 \div 3 = \underline{\quad}$ $24 \div 4 = \underline{\quad}$ $72 \div 8 = \underline{\quad}$ $3 = 36 \div \underline{\quad}$ $\underline{\quad} = 32 \div 4$ $\underline{\quad} = 48 \div 6$
<b>Mental Calculation Strategies - Addition and Subtraction</b>	
<b>Identify and use knowledge of number bonds within a calculation.</b> <i>Concrete – tens frames, Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings, number line</i>	$42 + 38$ $42 + 30 + 8$ (recognising that 2 and 8 is a number bond to 10, so the answer will be a multiple of 10) $60 - 28$ $60 - 20 - 8$ (using knowledge that $10 - 8 = 2$ , so $40 - 8 = 32$ ) $120 - 50$ $120 - 20 - 30$ (using knowledge of number bonds to 100, leaving an answer of 70)
<b>Derive and use addition and subtraction facts for 100</b> <i>Concrete – Diennes equipment, place value counters, beadstring</i> <i>Pictorial – Number line</i>	$100 - 43 = \underline{\quad}$ $22 + \underline{\quad} = 100$ $100 = \underline{\quad} + 9$ $100 - 76 = \underline{\quad}$ $100 - \underline{\quad} = 48$ $66 = 100 - \underline{\quad}$
<b>Derive and use addition and subtraction facts for multiples of 100 that total 1000</b> <i>Concrete – Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings</i>	$1000 - 300 = \underline{\quad}$ $200 + \underline{\quad} = 1000$ $1000 = \underline{\quad} + 500$ $1000 - 400 = \underline{\quad}$ $1000 - \underline{\quad} = 100$ $600 = 1000 - \underline{\quad}$
<b>Reorder numbers in a calculation.</b> <i>Concrete – tens frames, Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings, number line</i>	$23 + 54$ $54 + 23$ $12 + 19 + 12$ $12 + 12 + 19$ (using knowledge of doubles) $6 + 8 + 4$ $6 + 4 + 8$ (using knowledge of number bonds to 10) $70 + 50 + 30$ $70 + 30 + 50$ (using knowledge of number bonds to 100)
<b>Partition and combine multiples of hundreds, tens and ones.</b> <i>Concrete – Diennes equipment, place value counters, beadstring</i>	$526 + 200$ counting on in hundreds $137 + 40$ counting on in tens $272 + 8$ counting on in ones (or using knowledge of bonds to 10)

<i>Pictorial – number line</i>	428 – 200 323 – 70 693 – 8 37 + 15 42 – 25	counting back in hundreds counting back in tens counting back in ones 37 add 10 and 5 = 37 add 10 add 5 (crossing tens boundaries) 42 take away 20 and 5 = 42 take away 20 take away 5 (crossing tens boundaries)
<b>Find differences by counting up through the next multiple of 10 or 100</b> <i>Pictorial - number line</i>	60 – 43 53 – 38 104 – 95 200 – 86	useful for time calculations, e.g. a journey time from 2:43 until 3:00 efficient because the numbers are close to each other efficient because the numbers are close to each other useful for money calculations, e.g. change from £2 when spending 86p
<b>Bridge through 10 when adding or subtracting a single digit number (partitioning, e.g. <math>58 + 5 = 58 + 2 + 3</math> or <math>76 - 8 = 76 - 6 - 2</math>)</b> <i>Pictorial - number line</i>	35 + 7 97 + 6 178 + 5 42 – 7 204 – 6 371 – 5	as 35 + 5 + 2 as 97 + 3 + 3 as 178 + 2 + 3 as 42 – 2 – 5 as 204 – 4 – 2 as 371 – 1 – 4
<b>Add or subtract 9, 19, 29 etc by rounding and compensating</b> <i>Pictorial - number line</i>	34 + 29 127 + 49 96 – 39 273 – 59	as 34 + 30 – 1 as 127 + 50 – 1 as 96 – 40 + 1 as 273 – 60 + 1
<b>Mental Calculation Strategies – Multiplication and Division</b>		
<b>Derive and use doubles of all numbers to 100 and corresponding halves.</b> <i>Concrete - Diennes equipment, place value counters</i> <i>Pictorial – part – part – whole diagram</i>	Double 46 29 + 29 38 × 2	Halve 86 Find half of 54 92 ÷ 2
<b>Derive and use doubles of all multiples of 50 to 500</b> <i>Concrete - Diennes equipment, place value counters</i> <i>Pictorial – part – part – whole diagram</i>	Double 350 400 + 400 450 × 2	
<b>Multiply a one- or two-digit number by 10 and a one-digit number by 100</b> <i>Concrete - Diennes equipment, place value counters</i> <i>Pictorial - place value chart</i>	3 × 10 7 × 100 62 × 10	
<b>Within known tables, use related facts to multiply a multiple of 10 by a one-digit number</b> <i>Concrete – Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings</i>	60 × 3 50 × 4 30 × 8	related to 6×3 because $60 \times 3 = 10 \times 6 \times 3$ which can be reordered to $6 \times 3 \times 10$ related to 5 × 4 because $50 \times 4 = 10 \times 5 \times 4$ which can be reordered to $5 \times 4 \times 10$ related to 3 × 8 because $30 \times 8 = 10 \times 3 \times 8$ which can be reordered to $3 \times 8 \times 10$
<b>Use partitioning to double any two-digit number</b> <i>Concrete – Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings, part-part-whole diagram to double e.g. double 76</i>		Double 39, double 52, double 85

<p><b>Use related facts or partitioning to double any multiple of 50 to 500</b>  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings, part-part-whole diagram to double e.g. double 350</i></p>	<p>Double 250, double 450, double 150</p>
<p><b>Use related facts to divide multiples of 10 by a one-digit number</b>  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings, division trio e.g. <math>8 \div 2 = 4</math> then <math>80 \div 20 = 4</math></i></p> 	<p><math>60 \div 3</math> related to <math>6 \div 3</math>  <math>80 \div 40</math> related to <math>8 \div 4</math>  <math>90 \div 3</math> related to <math>9 \div 3</math></p>
<p><b>Use partitioning to halve even numbers up to 200</b>  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings, part-part-whole diagram to halve e.g. halve 154</i></p>	<p>Find half of 162 by partitioning into 160 and 2  Find half of 94 by partitioning into 80 and 14  Find half of 136 by partitioning into 120 and 16</p>

Decision Making	Concrete → Pictorial → Abstract
<p>When calculating, children should ask themselves:</p> <ul style="list-style-type: none"> <li>- do I know the answer because it is a fact I have learnt?</li> <li>- can I work it out easily in my head?</li> <li>- can I use some equipment or a jotting?</li> <li>- do I need to use the written method?</li> </ul>	<p>All new concepts are introduced using concrete apparatus eg. cubes, counters, bead strings, Diennes (hundreds, tens and ones equipment). When children are ready, we then move on to representing the concept using pictures or jottings eg. numberlines, bar models, arrays, part/whole diagrams. The final stage is using abstract forms (numbers and symbols).</p>