Rudgwick Primary School Calculation Policy

Aims of this policy

This calculation policy aims to set out our clear expectations for the progression of calculation stages for each of the four operations.

The pre-requisites and informal 'jotting' methods are taught before the children start learning their formal expanded and written methods. This enables the children to learn the written methods much more quickly, as the prior learning has been embedded and the calculation skills needed have already been taught and learnt.

This policy was last updated in 2018.

Year Group Expectations

This policy gives a guide as to which method children should be learning in each year group. However, some children who are particularly able at Maths may be working from methods in a Year group above , or those children who struggle with Maths may be working at a lower Year group's methods.

YEAR 1	Informal
Addition	Pictorial representation and concrete objects Number line addition jumping forward in ones
Subtraction	Pictorial representation and concrete objects Number line subtraction jumping back in ones
Multiplication	Pictorial representation and concrete objects
Division	Pictorial representation and concrete objects

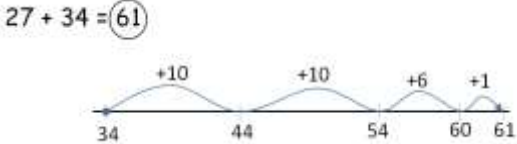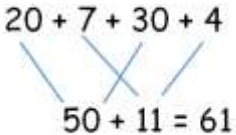| YEAR 2	Informal
Addition	Number lines, partitioning Develop mental addition of up to 2 digit numbers
Subtraction	Number lines, pictorial representation Develop mental subtraction of up to 2 digit numbers
Multiplication	Learn 2, 5 and 10 times tables Use repeated addition and arrays
Division	Learn division facts (e.g. 40÷10=4) Pictograms and arrays

YEAR 3	Informal	Formal
Addition	Number lines (Autumn term)	Expanded method
Subtraction	Number lines (Autumn term)	Expanded method
Multiplication	Learn 3, 4 and 8 times tables Use repeated addition /number lines Partitioning method	Grid method (Summer term)
Division	Learn division facts (e.g. 20 ÷ 4=5) Pictograms, arrays and number lines	

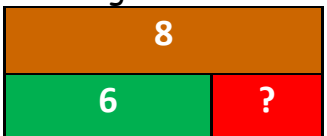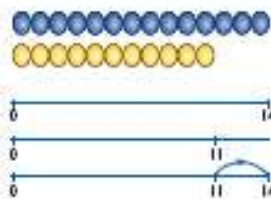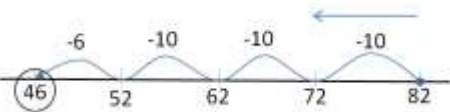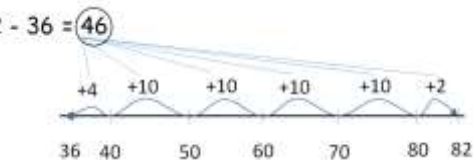| YEAR 4	Informal	Formal
Addition		Compact method
Subtraction		Compact method
Multiplication	Learn all times tables	Grid method *(Autumn)* Short Multiplication *(Expanded & Compact)*
Division	Learn division facts Pictograms, arrays and number lines	Short division *(Spring & Summer)*
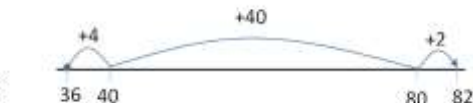
YEAR 5	Informal	Formal
Addition		Compact method *(Extend to decimals)*
Subtraction		Compact method *(Extend to decimals)*
Multiplication		Short & Long Multiplication *(Expanded & Compact)*
Division		Short division Long division

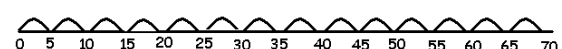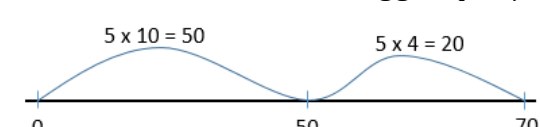| YEAR 6	Informal	Formal
Addition		As for Year 5
Subtraction		As for Year 5
Multiplication		As for Year 5
Division		As for Year 5
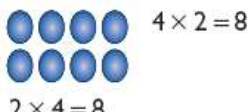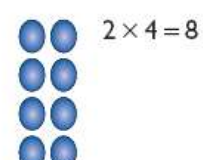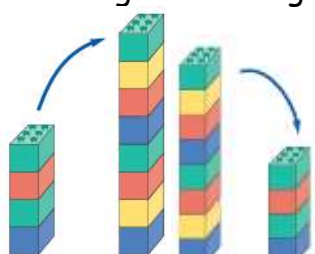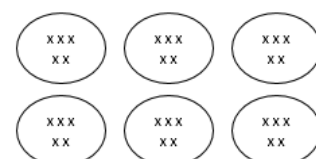
Rudgwick Primary School Calculation Policy

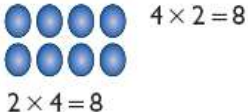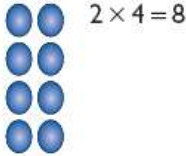| Area	Pre-requisites	Jottings to support Mental Calculations	Expanded Written Method	Compact Written Method
+	• Must know **number bonds to 10** and addition facts for all single-digit numbers • Addition can be done **in any order:** 34 + 56 or 56 + 34 • Usually start with the **biggest** number • Concrete apparatus available • Understand place value – can partition numbers • Counting forwards and backwards in steps of different sizes • Understand and use bar modelling 6+2=8 2+6=8 • Count forward in steps of 1, 10 and 100 along a number line.	• Pictorial representation Example 8 + 5 = 13 • Number line addition 27 + 34 = 61 Start with the bigger number and count on in tens then ones. OR More able pupils can make larger more efficient jumps. • Partitioning 27 + 34 20 + 7 + 30 + 4 50 + 11 = 61	Example: 494 + 368 Intermediate stage |	400	90	4
+	300	60	8
	700	150	12 | Total = 700 + 150 + 12 = 862 Final stage |	400	90	4
+	300	60	8
	800	60	2

	100	10			Example: 494 + 368
					
					   4 9 4
					+ 3 6 8
					   8 6 2
					   1 1
					
					Example:
					£29.94 + £4.37
					
					  £ 2 9 . 9 4
					+ £ 4 . 3 7
					  £ 3 4 . 3 1
					    1 1 1

Rudgwick Primary School Calculation Policy

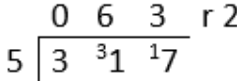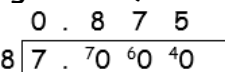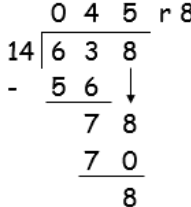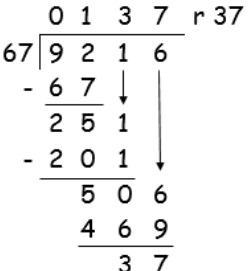| Area	Pre-requisites	Jottings to support Mental Calculations	Expanded Written Method	Compact Written Method
–	• Subtraction can be seen as: ○ Taking Away (Counting Back) ○ Finding the Difference (Counting on) • Number bonds to 10 • Count on/back in 1s/10s on a number line • Concrete apparatus available • Counting forwards / backwards in steps of different sizes • Understand and use bar modelling 8-6=2 8-2=6 • Complements of 100 • Subtracting 1, 10 or 100 mentally from 3 digit numbers	 The difference between 11 and 14 is 3. 14 – 11 = 3 11 + ☐ = 14 <u>Taking Away by Counting Back</u> 82 - 36 = 46 Answer is found at the left hand end of the number line. <u>Finding the Difference by Counting On</u> 82 - 36 = 46 OR Answer is found by adding up the total amount jumped.	Example: 723 - 346 Step 1 <table><tr><td></td><td>700</td><td>20</td><td>3</td></tr><tr><td>-</td><td>300</td><td>40</td><td>6</td></tr></table> Step 2 700 (crossed out, 10)	20 (crossed out)	3 (13) - 300	40	6 = 7 Step 3 600	110	13 700 (crossed)	20 (crossed)	3 (crossed) - 300	40	6 = 300	70	7 Answer: 377 NB – the steps are all done on the same grid. You don't draw a new grid for each step.	Example: 723 - 346 6 ¹1 7̶ 2̶ ¹3 - 3 4 6 ─────── 3 7 7 Example: £27.26 - £8.73 1 ¹6 £ 2̶ 7 . ¹2 6 - £ 8 . 7 3 ──────────── £ 1 8 . 5 3

Rudgwick Primary School Calculation Policy

Area	Pre-requisites	Jottings to support Mental Calculations	Expanded Written Method	Compact Written Method
| **X** | • understand the value of each digit<br>• group sets of objects reliably<br><br>• count up from 0 in 2s, 5s, 10s, etc.<br>• Understanding arrays<br>$4 \times 2 = 8$<br>$2 \times 4 = 8$<br>$2 \times 4 = 8$<br>$4 \times 2 = 8$<br>• doubling and halving<br>double 4 is 8<br>$4 \times 2 = 8$<br>half of 8 is 4<br>$8 \div 2 = 4$ | **U x U**<br>• Repeated addition using pictures<br>$5 \times 6$<br><br>OR<br><br>Using a number line<br><br>**TU x U**<br>$5 \times 14$<br>• Multiply by repeated addition<br><br>Use table facts to make bigger jumps<br>$5 \times 10 = 50$   $5 \times 4 = 20$<br>• Multiply by partitioning<br>$5 \times 10 = 50$   $5 \times 4 = 20$<br>So $5 \times 14 = 50 + 20 = 70$ | **Short Multiplication**<br>• Grid Method<br><br>| x | 300 | 20 | 9 |<br>| 8 | 2400 | 160 | 72 | = 2632<br><br>• Expanded Method<br><br>```
    3  2  9
 x        8
       7  2   (8 x 9)
    1  6  0   (8 x 20)
 2  4  0  0   (8 x 300)
 2  6  3  2
    1
```<br>**Long Multiplication**<br>• Grid Method<br><br>| x | 100 | 40 | 5 | |<br>| 20 | 2000 | 800 | 100 | 2900 |<br>| 4 | 400 | 160 | 20 | 580 |<br>= 3480<br><br>• Expanded Method<br>```
    4  7
 x  1  6
    4  2   (6 x 7)
 2  4  0   (6 x 40)
    7  0   (10 x 7)
 4  0  0   (10 x 40)
 7  5  2
 1
``` | **Short Multiplication**<br>• Compact Method<br>```
    3  2  9
 x        8
 2  6  3  2
    2  7
```<br><br>**Long Multiplication**<br>• Compact Method<br>```
    1  4  5
 x     2  4
    6  8  0   (4 x 145)
    1  2
 2  9  0  0   (20 x 145)
    1
 3  5  8  0
 1
```<br><br>These methods can be extended to include decimal calculations. |

Rudgwick Primary School Calculation Policy

Area	Pre-requisites	Jottings to support Mental Calculations	Jottings Extended	Compact Written Methods
÷	• understand the **sharing** and **grouping** models of division • That multiplication and division are inverse • Repeated addition and subtraction of numbers • Understanding arrays $4 \times 2 = 8$ $2 \times 4 = 8$ $2 \times 4 = 8$ $4 \times 2 = 8$ • Finding half and quarter • doubling and halving facts to 20 • Working out division facts related to times tables facts mentally. • Finding remainders on division mentally before learning short division.	• Derive division facts from multiplication facts. E.g. $5 \times 4 = 20$, so $20 \div 5 = 4$ and $20 \div 4 = 5$ • Using pictograms - **sharing model** $24 \div 4 = 6 \text{ r } 2$ • Using pictograms - **grouping model** $24 \div 4 = 6 \text{ r } 2$ • Repeated addition using a number line How many 3s in 15? $15 \div 3 = 5$	• Extend number line method e.g. $70 \div 14 = 5$ $70 \div 14 = 5$ The answer is the number of jumps • Extend pictograms - sharing model e.g. $317 \div 5 = 63 \text{ r } 2$ 20 20 20 20 20 (100) 20 20 20 20 20 (200) 20 20 20 20 20 (300) 2 2 2 2 2 (310) 1 1 1 1 1 (315) 1 1 (317) e.g. $373 \div 8 = 46 \text{ r } 5$ × 8 $20 \times 8 = 160$ (160) $20 \times 8 = 160$ (320) $5 \times 8 = 40$ (360) $1 \times 8 = 8$ (368) Remainder 5	• <u>Short Division</u> e.g. $317 \div 5$ 0 6 3 r 2 5) 3 ³1 ¹7 e.g. $7 \div 8$ (or $^7/_8$) 0 . 8 7 5 8) 7 . ⁷0 ⁶0 ⁴0 • <u>Long Division</u> e.g. $628 \div 14$ 0 4 5 r 8 14) 6 3 8 - 5 6 7 8 7 0 8 e.g. $9216 \div 67$ 0 1 3 7 r 37 67) 9 2 1 6 - 6 7 2 5 1 - 2 0 1 5 0 6 4 6 9 3 7