

Slaithwaite CE J & I School



Written Calculations Policy

P
O
L
I
C
Y



1. Introduction

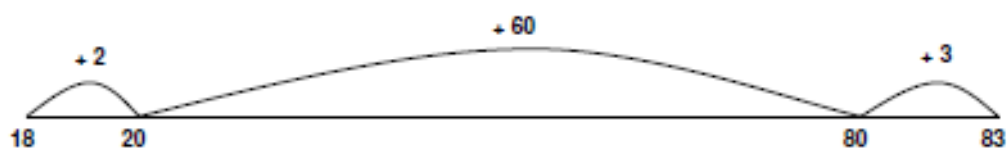
- 1.1. The National Numeracy Strategy provides a structured and systematic approach to teaching number. There is a considerable emphasis on teaching mental calculation strategies. Up to the age of 9 (Year 4) informal written recording should take place regularly and is an important part of learning and understanding. More formal written methods should follow only when the child is able to use a wide range of mental calculation strategies.

2. Reasons For Using Written Methods

- To aid mental calculation by writing down some of the numbers and answers involved.
 - To make clear a mental procedure for the pupil.
 - To help communicate methods and solutions.
 - To provide a record of work to be done.
 - To aid calculation when the problem is too difficult to be done mentally.
 - To develop and refine a set of rules for calculation.
- 2.1. A useful written method is one that helps children to carry out a calculation and can be understood by others.
 - 2.2. Written recording is needed to help us to keep track of where we are in our calculation and to help explain our method or thinking to someone else.
 - 2.3. It is important to encourage children to look at the problem and decide which is the best method to choose.
 - Pictures
 - Mental
 - Mental with jottings
 - Structured recording
 - Calculator
 - 2.4. This policy shows a developmental path through written calculations. Not all children will follow the route at the same speed. Some children will need lots of reinforcement of the previous year group and some children may move quicker than expected onto the next year group. It is important to move at the pace of the child and not rush them through written methods without full understanding.
 - 2.5. Where possible written methods will be practised through real life problems and opened up to include problem solving activities. Children will be given opportunities to explain their reasoning and methods to each other.
-

3. Whole School Approach

- 3.1. We have developed a consistent approach to the teaching of written calculation methods. This will establish continuity and progression throughout the school.
- 3.2. Mental methods will be established. These will be based on a solid understanding of place value in number and will include the following:
1. Adding and subtracting numbers of objects.
Counting on from number in first set.
 2. Adding and subtracting using number lines and number squares.
Counting on and back.
 3. Remembering number facts and recalling them without hesitation
e.g. pairs of numbers which make 10
Doubles & halves to 20
 4. Using known facts to calculate unknown facts
e.g. $6 + 6 = 12$ therefore $6 + 7 = 13$
 $24 + 10 = 34$ therefore $24 + 9 = 33$
 5. Understanding and using relationships between addition & subtraction to find answers and check results
e.g. $14 + 6 = 20$ therefore $20 - 6 = 14$
 6. Having a repertoire of mental strategies to solve calculations
e.g. doubles / near doubles
bridging 10 / bridging 20
adding 9 by +10 & -1
 7. Making use of informal jottings such as blank number lines to assist in calculations with larger numbers *e.g. $83 - 18 = 65$*



8. Solving one-step word problems (either mentally or with jottings) by identifying which operation to use, drawing upon their knowledge of Number bonds and explaining their reasoning
 9. Beginning to present calculations in a horizontal format and explain mental steps using numbers, symbols or words
 10. Learn to estimate/approximate first e.g. $29 + 30$ (round up to nearest 10, the answer will be near to 60).
-

- 3.3. When children begin formal recording they will put the + - x :- symbol on the left of the sum and numbers carried will be placed underneath the line.

4. When Are Children Ready For Written Calculations?

4.1. Addition and subtraction

- Do they know addition and subtraction facts to 20?
- Do they understand place value and can they partition numbers?
- Can they add three single digit numbers mentally?
- Can they add and subtract any pair of two digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?
- Do they use and apply the commutative and associative laws of addition?

4.2. Multiplication and division

- Do they know the 2, 3, 4, 5 and 10 times table
- Do they know the result of multiplying by 0 and 1?
- Do they understand 0 as a placeholder?
- Can they multiply two and three digit numbers by 10 and 100?
- Can they double and halve two digit numbers mentally?
- Can they use multiplication facts they know to derive mentally other multiplication facts that they do not know?
- Can they explain their mental strategies orally and record them using informal jottings?
- Do they use the commutative and associative laws for multiplication and the distributive law of multiplication over addition and subtraction?
- Do they recognise that multiplication and division are inverse operations.

- 4.3. The above lists are not exhaustive but are a guide for the teacher to judge when a child is ready to move from informal to formal methods of calculation.

5. Stages in Addition

5.1. **Addition Level 2** Mental methods (using jottings)

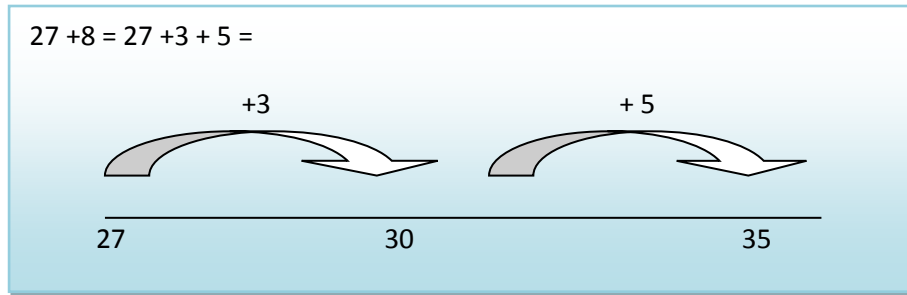
Partitioning

$$47 + 76 = (40 + 70) + (7 + 6)$$

Or

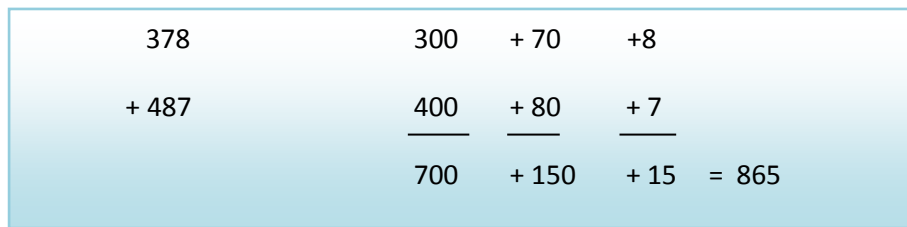
$$47 + 76 = (47 + 70) + 6$$

Using number lines, for example bridging through 10.



Developing other mental strategies and recall of number facts.

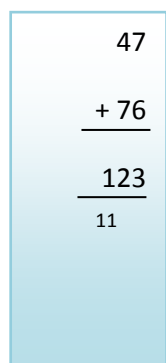
5.2. **Addition Level 3** Introduction to vertical layout, using partitioning



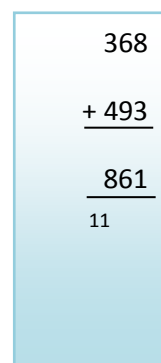
5.3. **Addition Year 4 – Year 6**

Standard Written Methods : Vertical layout to a compact efficient form, moving from **least** significant digit first:

Level 2



Level 3



Level 4

$$\begin{array}{r} 3547 \\ + 4769 \\ \hline 8316 \\ 111 \end{array}$$

Level 5

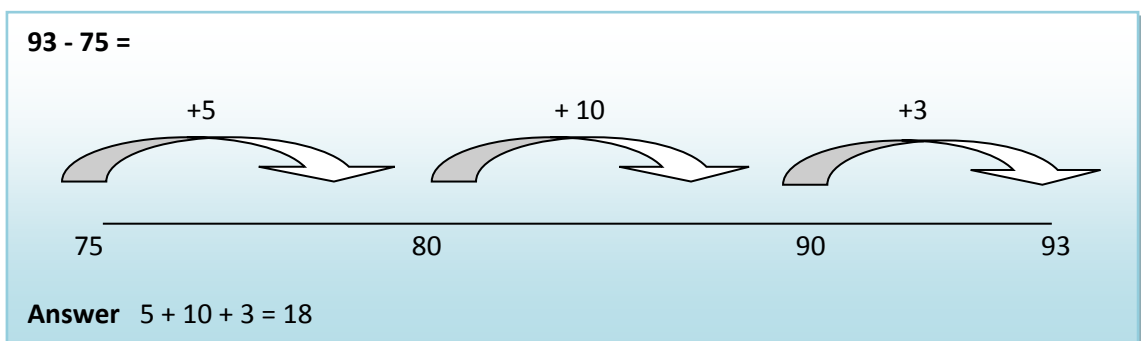
$$\begin{array}{r} 36.8 \\ + 49.3 \\ \hline 86.1 \\ 11 \end{array}$$

- 5.4. Make sure when adding quantities i.e. grams and kilograms that the quantities are written in the same unit.
- 5.5. Children should have experience of adding more than two sets of numbers and calculations should be practised through word problems including the use of money, decimals and measure.

6. Stages in Subtraction

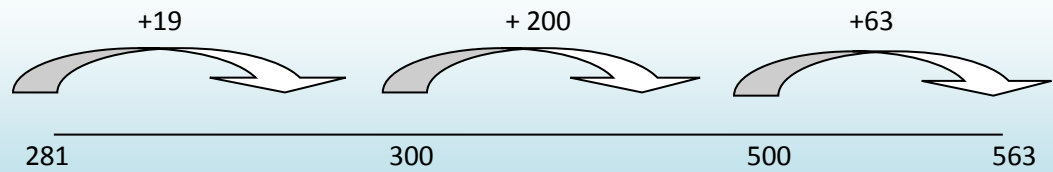
- 6.1. **Subtraction Level 2** Blank number line method - Finding the difference by counting on.

Level 2



Level 3

$$563 - 281 =$$



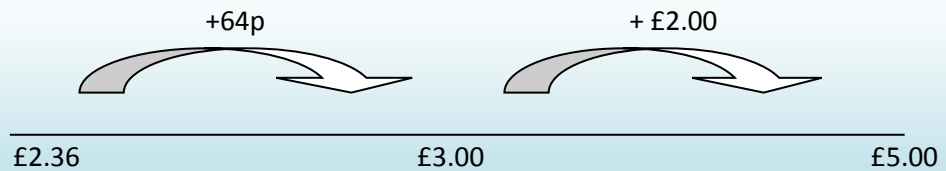
Answer $19 + 200 + 63 = 282$

Children will initially be taught to add on 9 to 290 and then 10 to make 300.

6.2. Subtraction

Level 4

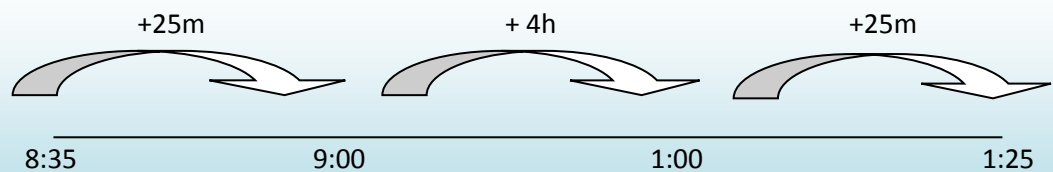
Money $£5 - £2.36 =$



Answer $£2.00 + 64p = £2.64$

Level 4

Time 8:35 to 1:25



Answer 4h 50m

7. Stages in Subtraction by Decomposition

7.1. Subtraction by Decomposition Level 3

$$563 - 278 =$$

$$\begin{array}{r} \overset{4}{5} \quad \overset{15}{6} \quad \overset{1}{3} \\ - 2 \quad 7 \quad 8 \\ \hline 2 \quad 8 \quad 5 \end{array}$$

Level 4 4 digit numbers

$$5243 - 1397 =$$

$$\begin{array}{r} \overset{4}{5} \quad \overset{11}{2} \quad \overset{13}{4} \quad \overset{1}{3} \\ - 1 \quad 3 \quad 9 \quad 7 \\ \hline 3 \quad 8 \quad 4 \quad 6 \end{array}$$

7.2. Subtraction by Decomposition Decimal numbers

Level 5 Decimal numbers

$$42.83 - 17.56 =$$

$$\begin{array}{r} \overset{3}{4} \quad \overset{1}{2} \quad \overset{7}{.8} \quad \overset{1}{3} \\ - 1 \quad 7 \quad . \quad 5 \quad 6 \\ \hline 2 \quad 5 \quad . \quad 2 \quad 7 \end{array}$$

8. Stages in Multiplication

8.1. Multiplication Level 3

Mental method using partitioning multiplying tens first: 32×3

$$32 \times 3 = (30 \times 3) + (2 \times 3) = 90 + 6 = 96$$

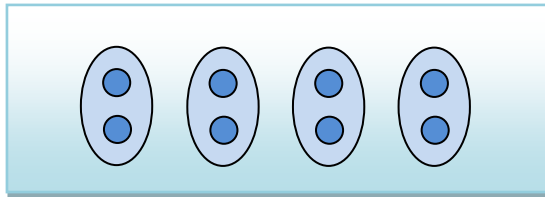
Reinforcement of multiplying by 10 and 100 and the effect this has on the place value of the digits.

$$6 \times 10 = 60$$

$$6 \times 100 = 600$$

$$6 \times 20 = 6 \times 2 \times 10 = 120$$

Arrays showing links to division



Learning multiplication tables

8.2. **Multiplication** Grid layout

Level 3

38 x 7 =			
x	30	8	
7	210	56	266
Answer = 266			

Grid layout - extend to bigger numbers

8.3. **Multiplication Level 3**

Vertical format expanded working

Level 3

$$\begin{array}{r}
 38 \\
 \times 7 \\
 \hline
 56 \quad (7 \times 8) \\
 \underline{210} \quad (7 \times 30) \\
 266
 \end{array}$$

8.4. Multiplication Level 4

Vertical format, expanded working

Level 4

$$\begin{array}{r}
 56 \\
 \times 27 \\
 \hline
 42 \quad (7 \times 6) \\
 350 \quad (7 \times 50) \\
 120 \quad (20 \times 6) \\
 \underline{1000} \quad (20 \times 50) \\
 1512
 \end{array}$$

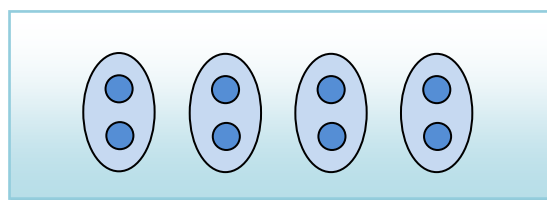
Level 5 Extend to decimals

$$\begin{array}{r}
 \mathbf{3.51 \times 4.9} \\
 351 \\
 \times 49 \\
 \hline
 3159 \\
 \underline{14040} \\
 17199 \\
 \mathbf{3.51 \times 4.9 = 17.20}
 \end{array}$$

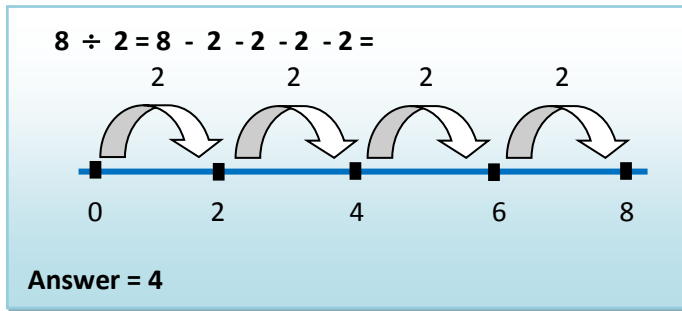
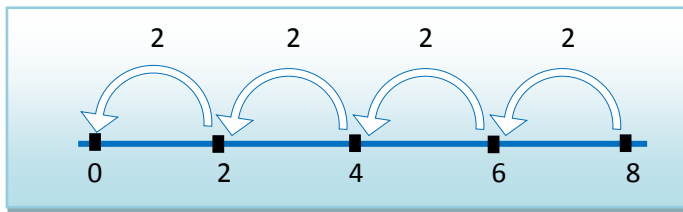
When multiplying and dividing decimals, remove the decimal point and calculate. Replace decimal point in the answer, Round up or down so you only have 2 numbers after the decimal point.

9. Stages in Division

9.1. Division Level 2



Number lines & grouping



Division by repeated subtraction – represented by counting back and counting up

9.2. Division Short methods

Level 3

$$72 \div 5 =$$

$$\begin{array}{r} 14 \text{ r } 2 \\ 5 \overline{) 72} \end{array}$$

Answer = 14 r 2

9.3. Division

Level 4

$$256 \div 7 =$$

$$\begin{array}{r} 36 \text{ r } 4 \\ 7 \overline{) 256} \end{array}$$

Answer = 36 r 4

9.4. Division

Level 4/5 Decimal numbers

$$87.5 \div 7 =$$
$$\begin{array}{r} 12.5 \\ 7 \overline{) 87.5} \\ \underline{7} \\ 17 \\ \underline{14} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

Answer = 12.5

Level 5 Extend to decimals with up to 2 decimal places

10. Summary

- 10.1. Children should always estimate first
- 10.2. Always check the answer, preferably using a different method eg. The inverse operation
- 10.3. Always decide first whether a mental method is appropriate
- 10.4. Pay attention to language - refer to the actual value of digits
- 10.5. Children who make persistent mistakes should return to the method that they can use accurately until ready to move on
- 10.6. Children need to know number and multiplication facts by heart
- 10.7. Discuss errors and diagnose problem and then work through problem - do not simply re-teach the method
- 10.8. When revising or extending to harder numbers, refer back to expanded methods. This helps reinforce understanding and reminds children that they have an alternative to fall back on if they are having difficulties.

Policy Reviewed - October 2014

Full Review - October 2015
