

Netherleigh and Rossefield School

Calculation Policy

September 2016

This policy reflects the school's values and philosophy in relation to Maths: it should be read in conjunction with the EYFS Framework, the National Curriculum 2014 document, the Maths Goals sheets and the Numicon scheme as appropriate.

1 Aims and Objectives

- 1.1 To ensure consistency and progression in our approach to calculation and that calculation is taught in a mathematically valid way.
- 1.2 To ensure that children develop an efficient, reliable, formal written method of calculation for all operations
- 1.3 To ensure that children can use these methods accurately with confidence and understanding
- 1.4 To deepen children's mathematical understanding.

2 How to Use this Policy

- 2.1 Use the policy, in conjunction with Numicon, the EYFS Framework and the Maths Scheme of Work, as the basis of your planning but ensure you use previous assessment to allow for individual learning.
- 2.2 If, at any time, children are making significant errors, return to a simpler stage of calculation.
- 2.3 Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate. Up to Year 3, work should be practical where possible. Once written methods are introduced, mental skills should be kept sharp through regular practice.
- 2.4 Encourage children to make sensible choices about the methods they use when solving problems.
- 2.5 Working should always be shown; if the child is able to complete the sum mentally, they must still record their method in writing.

3 Planning

- 3.1 Foundation Stage: use the EYFS Framework.
- 3.2 Key Stage One: the Numicon scheme forms the basis of the planning for Year One and Two, in conjunction with the target sheets for their Year Group and the examples laid out in Appendix 1.
- 3.3 Key Stage Two: staff should use the target sheets for their Year Group(s) as the basis for their planning, in conjunction with the examples laid out in Appendix 1.

3.4 Challenging more able children: more able children should be challenged by deepening their understanding and extending their reasoning in relation to the topics and skills taught to their year group. See Appendix 2 for examples. Giving a child a textbook from the year group above is not the way to extend reasoning and deepen understanding, and, furthermore, creates difficulties for the teacher in that Year Group.

4 Textbooks

- 4.1** Textbooks should be used where possible: these are stored in the archive room, if not in use or there is not sufficient space in the classroom.
- 4.2** Given the available range of textbooks in school, teachers must use the books appropriate to the year group(s) in their class. As stated above, children must not be given the textbook from the Year Group above their own.
- 4.3** Mental Maths Books: see Appendix 3 for more information.

5 Presentation of Work

- 5.1** Where squared paper is used, numbers must be written with one digit in each square. If squared paper is not used, care must be taken to ensure numbers are positioned according to their place value.
- 5.2** Decimal points are placed on the line between squares. This is to maintain consistency of place value: moving one square left always represents a 10-fold increase in value, whereas moving one square right always represents a 10-fold decrease in value.
- 5.3** Where carrying is required, numbers are written above the relevant column for addition and multiplication. For short division, carried numbers should be written in the next square. When borrowing, the borrowed number should be written in the next square to the right.
- 5.4** See Appendix 1 for examples.

6 Monitoring and Review

- 6.1** It is the responsibility of the Headteacher and/or the Maths Co-ordinator to monitor adherence to this policy. Monitoring will take place on a regular basis and may include of planning and book scrutinies, as well as pupil interviews and analysis of assessment data.

7 Appendix 1: Examples of Formal Written Methods

Mental Calculations (ongoing):

mental recall of number bonds e.g $4 + 6 = 10$, $3 + \underline{\quad} = 10$

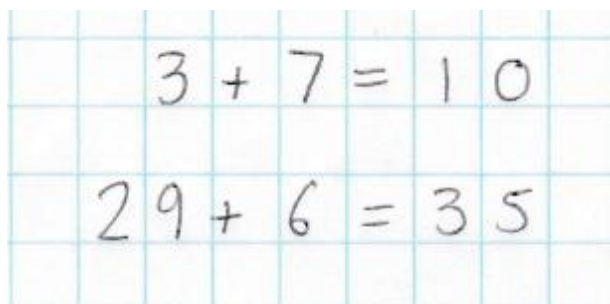
$$12 + 8 = 20 \quad \underline{\quad} + 19 = 20$$

$$64 + 36 = 100 \quad 45 + \underline{\quad} = 100$$

This also includes the use of number bonds to derive larger answers , e.g. $16 + 4 = 20$ can be used to derive $160 + 40 = 200$.

Written Methods

Addition



3 + 7 = 10

29 + 6 = 35

Horizontal Method

Vertical (column) Method

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$$\begin{array}{r} 436 \\ + 43 \\ \hline 479 \end{array}$$
$$\begin{array}{r} 315 \\ + 269 \\ \hline 584 \end{array}$$
$$\begin{array}{r} 829 \\ + 138 \\ + 416 \\ \hline 1,383 \end{array}$$

When working with decimals, children should record the sum so that the decimal points are lined up: this will ensure that place value is correct. (Children have a tendency to line the

$$0.8 + 0.1 = 0.9$$
$$\begin{array}{r} 3.6 \\ + 1.3 \\ \hline 4.9 \end{array}$$
$$\begin{array}{r} 16.3 \\ + 2.8 \\ \hline 19.1 \end{array}$$

numbers up, resulting in incorrect place value)

Where the numbers do not have the same number of decimal places, children should still line the decimal points up, but be encouraged to use zero as a place keeper, as in the following example.

$$14.2 + 3.63 =$$

$$\begin{array}{r} 14.2 \\ + 3.63 \\ \hline \end{array}$$

↓

$$\begin{array}{r} 14.20 \\ + 3.63 \\ \hline 17.83 \end{array}$$

Subtraction

$$6 - 2 = 4$$

$$18 - 9 = 9$$

Horizontal Method

$$\begin{array}{r} 24 \\ - 13 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 21 \\ \cancel{8}6 \\ - 19 \\ \hline 17 \end{array}$$

Vertical (column) Method

When working with decimals, children should record the sum so that the decimal points are lined up: this will ensure that place value is correct. (Children have a tendency to line the numbers up, resulting in incorrect place value)

$$\begin{array}{r} 8.4 \\ - 7.2 \\ \hline 1.2 \end{array}$$

$$\begin{array}{r} 9.6 \\ - 7.9 \\ \hline 1.7 \end{array}$$

Where the numbers do not have the same number of decimal places, children should still line the decimal points up, but be encouraged to use zero as a place keeper, as in the following example.

$$16.2 - 4.83 =$$

$$\begin{array}{r} 16.2 \\ - 4.83 \\ \hline 11.37 \end{array}$$

Multiplication

(incl. decimals)

Horizontal Method

$$4 \times 3 = 12$$

$$18 \times 4 = 72$$

$$1.4 \times 3 = 4.2$$

Vertical (column) Method

Handwritten multiplication problems on grid paper:

$$\begin{array}{r} 37 \\ \times 2 \\ \hline 74 \end{array}$$

$$\begin{array}{r} 45 \\ \times 27 \\ \hline 215 \\ 900 \\ \hline 1,115 \end{array}$$

$$\begin{array}{r} 364 \\ \times 242 \\ \hline 728 \\ 14560 \\ 72800 \\ \hline 88,088 \end{array}$$

When working with decimals, children should treat the sum as if there were no decimal fractions in the question, using the vertical method as outlined above. When they have completed the working out, the decimal point can then be put in the correct place. In the example below, there are two decimal places in the numbers in the question (one in each number) so there needs to be two decimal places in the answer, if the digits are to have the correct place value.

Handwritten multiplication of decimals on grid paper:

$$13.4 \times 2.6 =$$

$$\begin{array}{r} 13.4 \\ \times 2.6 \\ \hline 804 \\ 2680 \\ \hline 3484 \end{array} \longrightarrow 34.84$$

Short & Long Division

(incl. decimals & converting remainders into fractions/decimal fractions)

Whichever method is used, children should be encouraged to use their times tables knowledge to derive the answers, and jot down any relevant working.

Horizontal Method

$$8 \div 4 = 2$$
$$25 \div 5 = 5$$

$$\begin{array}{r} 243 \\ 2 \overline{)486} \end{array}$$

Short Division

$$580 \div 5 =$$

$$\begin{array}{r} 116 \\ 5 \overline{)580} \end{array}$$

$$\begin{array}{r} 124r5 \\ 6 \overline{)749} \end{array}$$

$$\begin{array}{r} 11.2 \\ 8 \overline{) 89.6} \end{array}$$

$$\begin{array}{r} 28.4 \\ 0.2 \overline{) 5.68} \end{array}$$

$$81 \div 0.4 =$$

$$\begin{array}{r} 202.5 \\ 0.4 \overline{) 81.00} \end{array}$$

Long Division

$$\begin{array}{r} 111 \\ 11 \overline{) 1221} \\ \underline{-0} \\ 12 \\ \underline{-11} \\ 12 \\ \underline{-11} \\ 11 \\ \underline{-11} \\ 0 \end{array}$$

$$\begin{array}{r}
 90 \\
 \hline
 14 \overline{) 1260} \\
 \underline{- 0} \\
 12 \\
 \underline{- 0} \\
 126 \\
 \underline{- 126} \\
 00
 \end{array}$$

$10 \times 14 = 140$ - Too large, so try
 $9 \times 14 = 126$

Converting Remainders into Fractions/Decimal Fractions

$$\begin{array}{r}
 1090 \text{ r } 7 \\
 \hline
 9 \overline{) 9817}
 \end{array}$$

To convert a remainder into a fraction, children should be taught to use the remainder as the numerator, and the divisor as the denominator. In the example above, the remainder - 7 - would be the numerator, and the divisor - 9 - the denominator, so the final answer would be recorded as 1,090 $\frac{7}{9}$.

$$\begin{array}{r}
 1613 \text{ r } 3 \\
 \hline
 4 \overline{) 6455}
 \end{array}$$

To convert a remainder into a decimal fraction, children should be taught to follow the above process, then use their knowledge of decimal/fraction equivalents. In the example, the answer would first be recorded as 1,613 $\frac{3}{4}$, and then as 1,613.75.

Appendix 2: Sample Questions for Deepening Understanding

These questions have been taken from the Mathematical Association's Primary Maths Challenge.

If a parrot learns five new words every fifteen minutes, how many new words will it learn in a day?

For one journey, my bus fare has increased from £2.05 to £2.15. I make this journey twice each day from Monday to Friday. How much extra do I pay in one week?

An equilateral triangle, a square, a regular pentagon and a regular hexagon each has a perimeter of 60cm. Which of these shapes has the longest side length?

Please see following sheets for examples of questions and sentence stems to promote mathematical understanding.

Appendix 3: Mental Maths Books

Schofield & Sims Mental Maths books are used from Year 2 upwards.

Year 2: introductory book.

Year 3: book 1.

Year 4: book 2.

Year 5: book 3.

Year 6: book 4.

Children should complete one test per week and a child making appropriate progress will be expected to complete one book a year. It is recommended that targets are set accordingly for each half term: for example, in a six week half term, a child would be expected to complete six tests. Please be aware that these books extend up to book 6.