



Norton Primary School

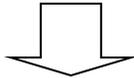
Calculation Booklet

As part of our calculation strategy children should be encouraged to see mathematics as both a written and spoken language. Teachers should support and guide children in the following important ways:

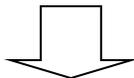
- Presenting mathematical concepts in a real and concrete way. Applying mathematical ideas to relevant 'real life' situations and contexts.
- Representing mathematical ideas in pictorial forms: 'showing' children what different processes and concepts mean.
- Developing children's understanding of written representations of abstract concepts (e.g. written numbers, mathematical symbols and written calculations).

When solving a problem children should always work through the following thinking process:

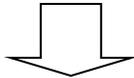
1. Can I do this in my head, using a mental method?



2. Can I do this in my head, using drawings or jottings to help me?



3. Can/should I use a calculator?



4. Which written method will I find most helpful?

Children need to have exposure to a variety of different strategies for each operation so that they may make informed choices about which method they feel more secure with and which are more useful in different situations.

For each operation, the written methods are presented as a progression. There is no age-appropriate expectation for which operations specific year groups should be using. Rather, children should be using whichever strategy they feel is most appropriate for them.

The long-term aim is for children to be able to select an efficient method of their choice (whether this be mental, written, or (in upper Key Stage 2) using a calculator) that is appropriate for the given task.

ADDITION

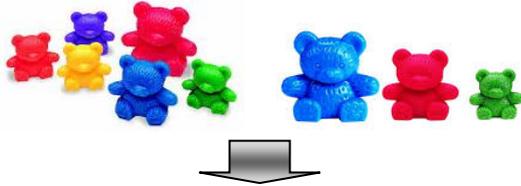
Early Addition (FS)

Children should have access to a wide range of concrete counting experiences using equipment and everyday objects as well as number tracks and number lines, etc. They should be introduced to written calculations **alongside** practical work and diagrams and be secure with the concept of addition and the symbols used to represent it.

Understanding Addition (KS1)

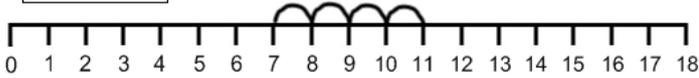
The following content teaches solid conceptual understanding, which is essential before written methods can be taught. These should be used **alongside** written calculations to record the practical work.

1. Practical addition (using counters and objects)



2. Counting on number lines, number squares, rulers, fingers, number tracks, etc.

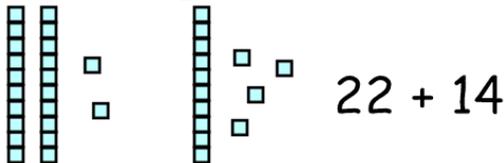
$$7 + 4 = 11$$



3. Using jottings and drawings



4. Practical partitioning



5. Expanded partitioning

$$\begin{array}{r} 20 \quad 4 \\ + 30 \quad 2 \\ \hline 50 \quad 6 \end{array} = 56$$

6. Expanded partitioning crossing tens barriers

$$\begin{array}{r} 30 \quad 7 \\ + 20 \quad 5 \\ \hline 50 \quad 12 \end{array} = 62$$

Column Addition (KS2)

The following content builds on the conceptual understanding taught in Key Stage 1 by applying place value assumptions and shortcuts, underpinned by simple number facts.

1. Simple column addition

$$\begin{array}{r} 22 \\ + 41 \\ \hline 63 \end{array}$$

2. Carrying extra tens

$$\begin{array}{r} 48 \\ + 25 \\ \hline 73 \\ 1 \end{array}$$

3. Extending use

$\begin{array}{r} 425 \\ + 736 \\ \hline 1161 \\ 1 \quad 1 \end{array}$	$\begin{array}{r} 4596 \\ + 3745 \\ \hline 8341 \\ 1 \quad 1 \quad 1 \end{array}$	$\begin{array}{r} 53216 \\ + 48791 \\ \hline 102007 \\ 1 \quad 1 \quad 1 \end{array}$
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4. Decimals

$\begin{array}{r} 243.7 \\ + 851.9 \\ \hline 1095.6 \\ 1 \end{array}$	$\begin{array}{r} 37.92 \\ + 28.35 \\ \hline 66.27 \\ 1 \quad 1 \end{array}$
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SUBTRACTION

Early Subtraction (FS)

Children should be exposed to subtraction in a variety of contexts: taking away, comparison, difference, sets within sets (e.g. 'there are 30 children in a class. 12 are boys and the rest are girls).

Children should have access to a wide range of concrete counting experiences using equipment and everyday objects as well as number tracks and number lines, etc. They should be introduced to written calculations **alongside** practical work and diagrams and be secure with the concept of subtraction and the symbols used to represent it.

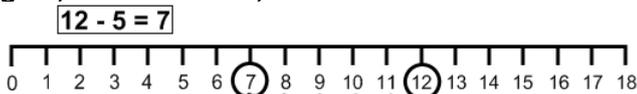
Understanding Subtraction (KS1)

The following content teaches solid conceptual understanding, which is essential before written methods can be taught. These should be used **alongside** written calculations to record the practical work.

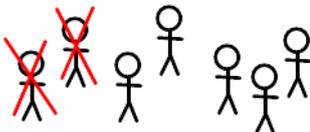
1. Practical subtraction (using counters and objects)



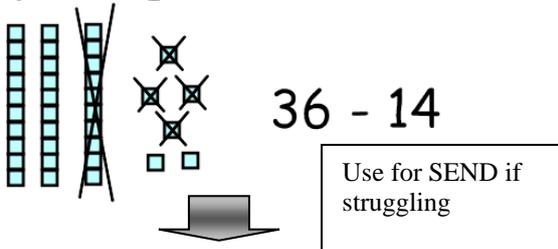
2. Counting on number lines, number squares, rulers, fingers, number tracks, etc.



3. Using jottings and drawings



4. Practical partitioning



5. Expanded partitioning including crossing the tens barrier

$$52 - 27$$

$$52 - 7 = 45$$

$$45 - 20 = 25$$

Column Subtraction (KS2)

The following content builds on the conceptual understanding taught in Key Stage 1 by applying place value assumptions and shortcuts, underpinned by simple number facts.

1. Simple column subtraction

$$\begin{array}{r} 78 \\ - 21 \\ \hline 57 \end{array}$$

2. Stealing and carrying

$$\begin{array}{r} \overset{4}{\cancel{5}} \overset{1}{3} \\ - 27 \\ \hline 26 \end{array}$$

3. Extending use

$$\begin{array}{r} \overset{3}{\cancel{4}} \overset{1}{3} \overset{1}{9} \\ - 154 \\ \hline 285 \end{array} \qquad \begin{array}{r} \overset{3}{\cancel{4}} \overset{1}{0} \overset{7}{\cancel{8}} \overset{1}{1} \\ - 2243 \\ \hline 1838 \end{array}$$

4. Decimals

$$\begin{array}{r} \overset{4}{\cancel{5}} \overset{1}{1} \overset{1}{\cancel{2}} \overset{1}{.} \overset{1}{2} \\ - 441.6 \\ \hline 70.6 \end{array} \qquad \begin{array}{r} \overset{1}{\cancel{2}} \overset{1}{3} \overset{5}{\cancel{6}} \overset{11}{.} \overset{1}{\cancel{2}} \overset{1}{5} \\ - 184.76 \\ \hline 51.49 \end{array}$$

MULTIPLICATION

Counting sequences and learning tables

Children should have frequent and regular (daily) practise counting forwards and backwards in jumps of different sizes, and reciting times table facts. This is in addition to practising recall of those facts.

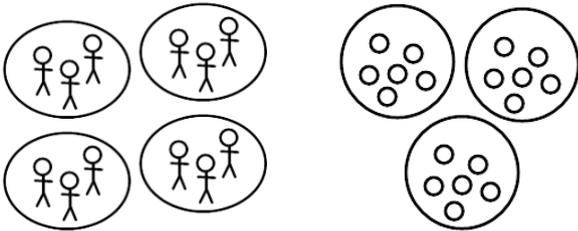
Understanding Multiplication (KS1)

These methods develop a solid understanding of multiplication as repeated addition, or of making groups of equal size and finding a total.

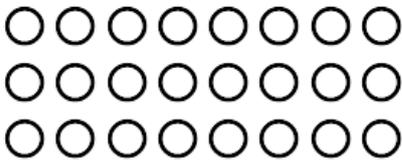
1. Practical grouping



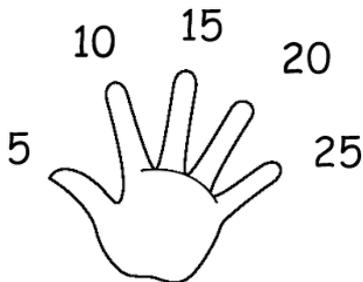
2. Using drawings and jottings



3. Using arrays



4. Using counting / times tables



Long and Short Multiplication (KS2)

These methods require a **solid** understanding of place value and secure times table knowledge.

1. Expanded short multiplication

$$\begin{array}{r} 32 \\ \times 6 \\ \hline 12 \quad (6 \times 2) \\ 180 \quad (6 \times 30) \\ \hline 192 \end{array}$$



2. Short multiplication

$$\begin{array}{r} 32 \\ \times 6 \\ \hline 192 \\ 1 \end{array}$$



3. Expanded long multiplication

$$\begin{array}{r} 24 \\ \times 33 \\ \hline 12 \\ 60 \\ \hline 120 \\ 600 \\ \hline 792 \end{array}$$

Use if required.



4. Long multiplication

$\begin{array}{r} 43 \\ \times 26 \\ \hline 258 \\ 860 \\ \hline 1118 \end{array}$	$\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \end{array}$	$\begin{array}{r} 427 \\ \times 63 \\ \hline 1281 \\ 25620 \\ \hline 26901 \end{array}$
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5. Decimals

25 x 12.8

$$\begin{array}{r} 128 \\ \times 25 \\ \hline 640 \\ 2560 \\ \hline 3200 \end{array} \div 10 = 320$$

DIVISION

Counting sequences and learning tables

Children should have frequent and regular practise counting forwards and backwards in jumps of different sizes, and reciting times table facts. This is in addition to practising recall of those facts.

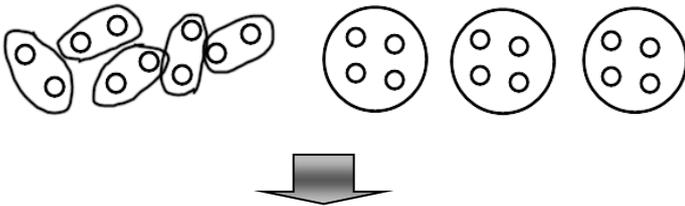
Understanding Division (KS1)

These methods develop a solid understanding of division as **both** sharing **and** grouping (finding how many groups of a certain size you can make from a set).

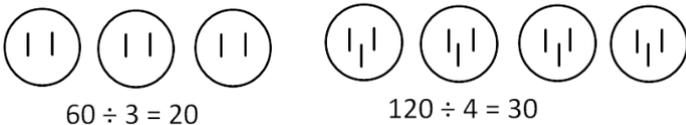
1. Practical sharing and grouping



2. Using drawings and jottings



3. Application to tens and hundreds



Long and Short Division (KS2)

These methods require a **solid** understanding of division as **grouping** (i.e. "how many 5s are there in 45?")

1. Expanded short division

$$20 + 1 = 21 \qquad 15 + 1 \text{ r } 2$$

$$4 \overline{) 80} \quad 4 \qquad 6 \overline{) 90} \quad 8 = 16 \text{ r } 2$$



2. Short division

$$21 \qquad 12 \qquad 16 \text{ r } 2$$

$$4 \overline{) 84} \qquad 7 \overline{) 84} \qquad 6 \overline{) 98}$$



3. Extending use

$$121 \text{ r } 2 \qquad 121 \text{ r } 5 \qquad 188$$

$$4 \overline{) 486} \qquad 6 \overline{) 731} \qquad 4 \overline{) 752}$$



4. Short division with decimal remainders

$$665.33$$

$$6 \overline{) 3992.00}$$



5. Long division with jottings

$$56$$

$$34 \overline{) 1904} \qquad 34$$

$$\begin{array}{r} -170 \\ \hline 0204 \\ -204 \\ \hline 000 \end{array} \qquad \begin{array}{r} 68 \\ 102 \\ 136 \\ 170 \\ 204 \end{array}$$



6. Decimals

$$02.25$$

$$9 \overline{) 20.25}$$