Norton Primary School

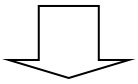
Calculation Booklet

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:

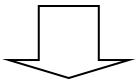
- Presenting mathematical concepts in a real and concrete way. Applying mathematical ideas to relevant 'real life' situations and contexts.
- Representing mathematical ideas in pictorial forms: 'showing' children what different processes and concepts mean.
- Developing children's understanding of written 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:

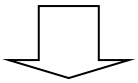
1. Can I do this in my head, using a mental method?



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.

Year one

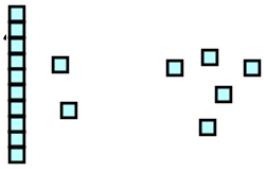
1. Practical addition (using counters and objects)

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

7 + 4 = 11

3. Using jottings and drawings

4. Practical partitioning



12 + 5

Year Two

5. Expanded partitioning

$$\begin{array}{rr} 20 & 4 \\ +\ 30 & 2 \\ \hline \multicolumn{2}{l}{50 + 6 = 56} \end{array}$$

6. Expanded partitioning crossing tens barriers

$$\begin{array}{rr} 30 & 7 \\ +\ 20 & 5 \\ \hline \multicolumn{2}{l}{50 + 12 = 62} \end{array}$$

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.

Year Three

1. Simple column addition

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

2. Carrying extra tens

$$\begin{array}{r} 48 \\ +\ 25 \\ \hline 73 \\ {\scriptstyle 1\ \ } \end{array} \qquad \begin{array}{r} 425 \\ +\ 736 \\ \hline 1161 \\ {\scriptstyle 1\ \ 1} \end{array}$$

3. Extending use

Year Four

$$\begin{array}{r} 4596 \\ +\ 3745 \\ \hline 8341 \\ {\scriptstyle 1\ 1\ 1} \end{array}$$

Year Five/Six

4. Larger numbers and decimals

$$\begin{array}{r} 53216 \\ +\ 48791 \\ \hline 102007 \\ {\scriptstyle 1\ 1\ 1} \end{array} \qquad \begin{array}{r} 37.92 \\ +\ 28.35 \\ \hline 66.27 \\ {\scriptstyle 1\ \ 1} \end{array}$$

$$\begin{array}{r} 53216 \\ +\ \ 8791 \\ \hline 62007 \\ {\scriptstyle 1\ 1\ 1} \end{array}$$

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).

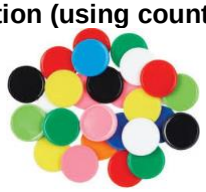
Children should have access to a wide range of concrete counting experiences using equipment and everyday objects as well as number tracks and number lines, etc. They should be introduced to written calculations **alongside** practical work and diagrams and be secure with the concept of subtraction and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

Understanding Subtraction (KS1)

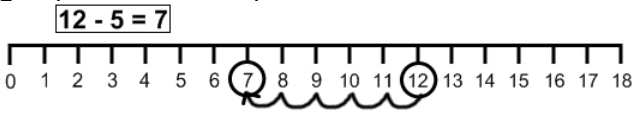
The following content teaches solid conceptual understanding, which is essential before written methods can be taught. These should be used **alongside** written calculations to record the practical work.

Year One

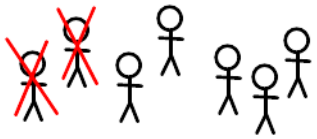
1. Practical subtraction (using counters and objects)



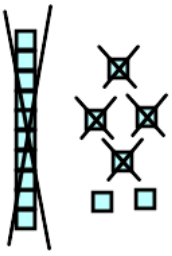
2. Counting on number lines, number squares, rulers, fingers, number tracks, etc.



3. Using jottings and drawings



4. Practical partitioning



16 - 14

Use for SEND if struggling

Year Two

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.

Year Three

1. Simple column subtraction

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

2. Stealing and carrying

$$\begin{array}{r} {}^{4}\not{5}\,{}^{1}3 \\ -\,27 \\ \hline 26 \end{array} \qquad \begin{array}{r} {}^{3}\not{4}\,{}^{1}39 \\ -\,154 \\ \hline 285 \end{array}$$

3. Extending use

Year Four

$$\begin{array}{r} {}^{3}\not{4}\,{}^{1}0\,{}^{7}\not{8}\,{}^{1}1 \\ -\,2243 \\ \hline 1838 \end{array}$$

4. Larger numbers and decimals

Year Five/Six

$$\begin{array}{r} {}^{6}\not{7}\,{}^{12}\not{3}\,{}^{13}\not{4}\,{}^{1}28 \\ -\,26492 \\ \hline 46936 \end{array} \qquad \begin{array}{r} 7\,{}^{3}\not{2}\,{}^{12}\not{4}\,{}^{1}30 \\ -\,\;2247 \\ \hline 70183 \end{array}$$

$$\begin{array}{r} {}^{1}2\,{}^{1}\not{3}\,{}^{5}\not{6}.{}^{11}\not{2}\,{}^{1}5 \\ -\,184.76 \\ \hline 51.49 \end{array}$$

MULTIPLICATION

Counting sequences and learning tables

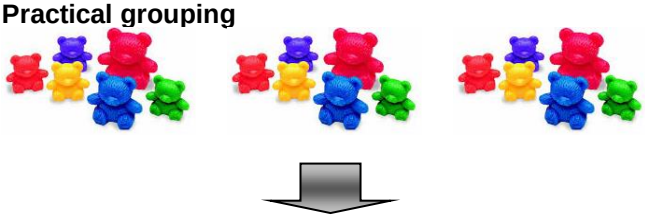
Children should have frequent and regular (daily) practise counting forwards and backwards in jumps of different sizes, and reciting times table facts. This is in addition to practising recall of those facts.

Understanding Multiplication (KS1)

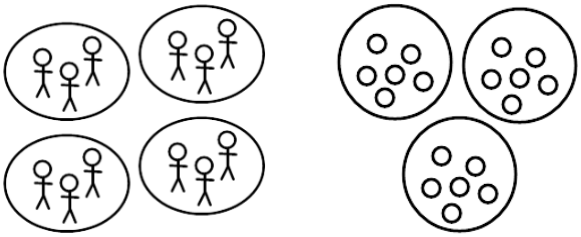
These methods develop a solid understanding of multiplication as repeated addition, or of making groups of equal size and finding a total.

Year One/Two

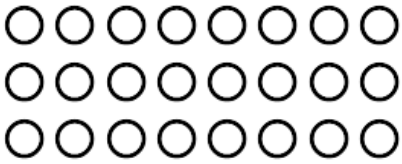
1. Practical grouping



2. Using drawings and jottings

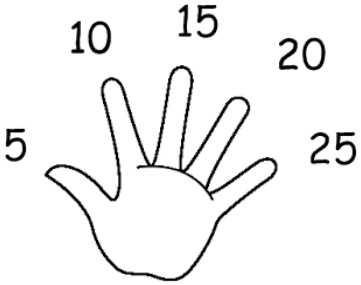


3. Using arrays



4. Using counting / times tables

Year Two



Long and Short Multiplication (KS2)

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

Year Three

1. Expanded short multiplication

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

Year Three — Year Four

2. Short multiplication

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

3. Extending use

$$\begin{array}{r} 243 \\ \times\ \ 3 \\ \hline 729 \\ {\scriptstyle 1} \end{array}$$

Year Five/Six

$$\begin{array}{r} 2124 \\ \times\ \ 6 \\ \hline 12744 \\ {\scriptstyle 1\ \ 2} \end{array}$$

4. Long multiplication

$$\begin{array}{r} 43 \\ \times\ 26 \\ \hline 258 \\ 860 \\ \hline 1118 \\ {\scriptstyle 1} \end{array}$$

$$\begin{array}{r} 427 \\ \times\ 63 \\ \hline 1281 \\ 25620 \\ {\scriptstyle 1\ 4\ \ 2} \\ \hline 26901 \\ {\scriptstyle 1} \end{array}$$

Year Six

5. Decimals

23 x 12.8

$$\begin{array}{r} 12.8 \\ \times\ 23 \\ \hline 384 \\ {\scriptstyle 2} \\ 2560 \\ {\scriptstyle 1} \\ \hline 294.4 \\ {\scriptstyle 1} \end{array}$$

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.

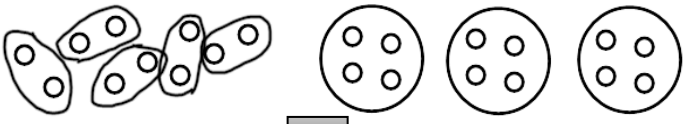
Understanding Division (KS1)

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).

Year One/Two

1. Practical sharing and grouping

2. Using drawings and jottings



Year Two

3. Application to tens and hundreds

60 ÷ 3 = 20

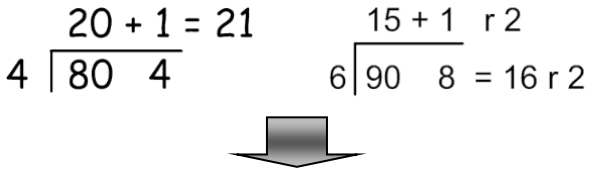
120 ÷ 4 = 30

Long and Short Division (KS2)

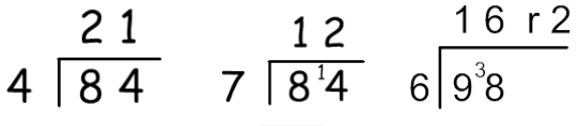
These methods require a **solid** understanding of division as grouping (i.e. "how many 5s are there in 45?)

Year Three

1. Expanded short division



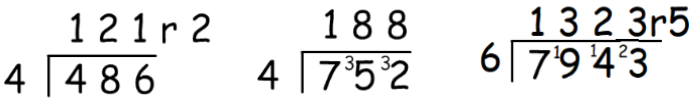
2. Short division



Year Four

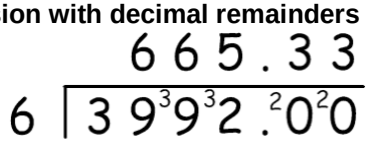
Year Five

3.Extending use

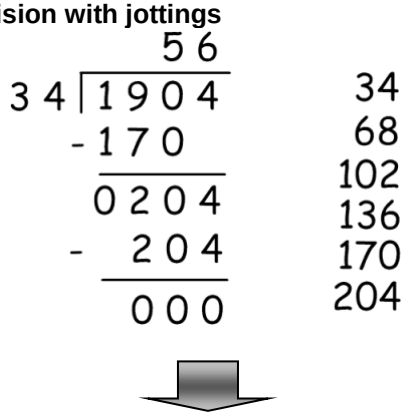


Year Six

4. Short division with decimal remainders



5. Long division with jottings



6. Decimals