



Henry Chichele Primary School

Maths calculations

Progression from mental to written calculations – why?

Teaching throughout the school is progressive. Pupils develop their understanding in the four different operations, addition, subtraction, multiplication and division. With the new curriculum expectations, pupils need to be able to explain and reason what they have done. The plan is that the progressive methods are continued into secondary school.

Addition – The Vertical Method

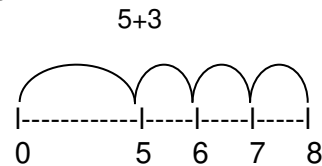
The number line method will be used during the early stages of grasping the concept of adding numbers and will be used alongside concrete objects to illustrate written methods. In EYFS, pupils also learn to explain what they have written.

As the pupils progress through the school, the emphasis moves away from a number line (although can still be used for pupils who are less confident than others) and the traditional method of ‘carrying’ is introduced.

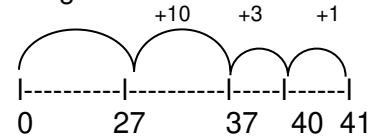
The ‘carrying’ method is introduced to pupils as and when they are ready.

Addition

1. Practical counting on and combining activities
2. Pupil talks about what he/she is doing
3. Draws pictures to represent thinking
4. Show on a number line e.g.
5. Be able to explain a number line



6. Larger calculations on number line e.g. $27 + 14$



7. Partitioning, $27 + 59$,

$$\begin{array}{r} 7 + 9 = 16 \\ 20 + 50 = \underline{70} \\ 86 \end{array}$$

8. Vertical addition, lowest column first

$$\begin{array}{r} \text{Tu} + \text{Tu} \qquad 27 \\ \text{HTu} + \text{Tu} \qquad +\underline{59} \\ \text{HTu} + \text{HTu} \qquad 16 \\ \qquad \qquad \qquad \underline{70} \\ \qquad \qquad \qquad 86 \end{array}$$

9. Compact method

$$\begin{array}{r} \text{Add numbers of any size and decimals} \qquad 27 \\ \qquad \qquad \qquad \qquad \qquad \qquad +\underline{59} \\ \qquad \qquad \qquad \qquad \qquad \qquad \underline{86} \\ \qquad \qquad \qquad \qquad \qquad \qquad 1 \end{array}$$

Subtraction – number line and decomposition

The number line method will be used during the early stages of grasping the concept of subtracting numbers and will be used alongside concrete objects to illustrate written methods. In EYFS, pupils also learn to explain what they have written.

Subtraction begins in EYFS and Key Stage 1, based on the idea of counting back and using only small numbers with small differences.

However, as the pupil become more confident, they will develop the skills of 'counting on' on the number line.

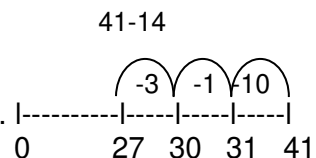
Subtraction

1. Practical counting back and taking away activities
2. Pupil reason about what he/she is doing
3. Draws pictures to represent thinking
4. Show on a number line e.g. 8 - 5



5. Be able to explain a number line

6. Larger calculations on number line e.g.



7. Pupils understand the concept of difference and understand that difference can be found by counting on or back.

e.g. $0 \underline{\hspace{2cm}} 32$

$32 + 25 = 57$

$0 \underline{\hspace{2cm}} + 20 \underline{\hspace{1cm}} + 5 \underline{\hspace{1cm}} 57$

$57 - 32 = 25$

The diagram shows a number line starting at 0 and ending at 57. A large curved arrow starts at 32 and ends at 57. A smaller curved arrow starts at 32 and ends at 52. Another smaller curved arrow starts at 52 and ends at 57. This illustrates counting on 20 from 32 to 52, and then counting on 5 from 52 to 57.

8. Partitioning 2nd number 52-36,
52-30=22
22- 6=16

9. Expanded subtraction

$$\begin{array}{r} 40 \\ 50 \\ -30 \\ \hline 10 \end{array} + \begin{array}{r} 12 \\ 6 \\ \hline 18 \end{array} = 16$$

$$\begin{array}{r} T_u - T_u \\ HT_u - T_u \\ HT_u - HT_u \end{array}$$

10. Compact method – subtracting numbers of any size and decimals.

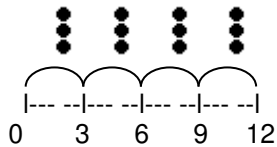
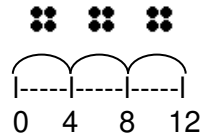
$$\begin{array}{r} 4 \\ 5 \ 12 \\ \underline{3 \ 6} \\ 1 \ 6 \end{array}$$

Multiplication – The grid method and long multiplication

Pupils in Key Stage 1 use concrete objects to group and sort before jumping up a number line in jumps of 2 and 5 for example. The pupils then progress into arrays of numbers. The main focus has to be for the pupils to learn their tables – by the end of Y3, they really should know 2-10 X tables and by the end of Y4, they should know them all! When the pupil is ready, the grid method is introduced to pupils to support the transition from arrays to grid method layout. Written, formal methods for multiplication are introduced. However, this is only when pupils feel confident to move to this strategy.

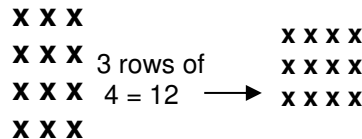
Multiplication

1. Practical grouping activities linked to tables e.g. 3 vases of flowers with 4 in each vase. Emphasise same number in each.
2. Talk about what doing, understand repeated addition $4 + 4 + 4 = 12$
3. Draw array
4. Show on a number line , 3 lots of 4 = 3×4 and explain
5. Understand 4 lots of 3 gives same answer and show on a number line.



4 groups of 3
 4×3

6. Show as an array $\rightarrow 4$ rows of 3 = 12 \rightarrow



7. Partitioning 13×4 $\begin{array}{r} 40 \\ 4 \times 10 \quad 3 \quad 12 \\ \hline 4 \quad 40 \quad 12 = 52 \end{array}$
 Grid method TU x U

8. Vertical expanded

$$\begin{array}{r} 13 \\ \times 4 \\ \hline 40 \\ + 12 \\ \hline 52 \end{array} \quad \begin{array}{r} 13 \\ \times 4 \\ \hline 12 \\ + 40 \\ \hline 52 \end{array}$$

10. Vertical compact

$$\begin{array}{r} 13 \\ \times 4 \\ \hline 52 \\ 1 \end{array}$$

11. Grid method Tu x Tu
 32×47

X	30	2
40	120	80
7	210	14

$$\begin{array}{r} 120 + 80 \\ \underline{210 + 14} \\ 330 + 94 = 424 \end{array}$$

12. Long multiplication

$$\begin{array}{r} 32 \\ \times 47 \\ \hline 14 \\ 210 \\ \hline 120 \\ 424 \end{array}$$

Written division (sharing)

In EYFS and Key Stage 1, pupils use objects to group and sort. As pupils progress in Key Stage 1, we can also use number lines to jump whilst identifying the link between multiplication and division. The pupils also use a number line to illustrate the link with multiplication. When pupils are ready, the pupils are introduced to short division and long division (chunking) is used.

Division

1. Practical sharing activities – one for you, one for you etc
2. Practical grouping activities – how many groups of 2 are there in 8?
3. Talk and reason about what they are doing
4. Understand repeated addition and repeated subtraction and that both show 4 groups of 2 in 8 on number line



5. Show as arrays and link to multiplication – 4 groups of 2 $\begin{matrix} \times & \times \\ \times & \times & \times & \times \\ \times & \times & \times & \times \end{matrix}$ $8 \div 2 = 4$ $\begin{matrix} \times & \times \\ \times & \times \\ \times & \times \\ \times & \times \end{matrix}$

8. Vertical expanded

$$\begin{array}{r} 16 \\ 6 \overline{) 96} \\ \underline{60} \quad (10 \times 6) \\ 36 \\ \underline{30} \quad (5 \times 6) \\ 6 \\ \underline{6} \quad (1 \times 6) \\ 0 \quad 16 \times 6 \end{array}$$

9. Short division / bus stop method

$$6 \overline{) 96} \begin{matrix} 16 \\ \rightarrow \end{matrix}$$

$$96 \div 6 = 16$$