Written Calculations in KS 2

Children should work towards knowing and understanding a compact written method for each numerical operation so that they are secure with these by the end of Year 6

From teaching written calculation QCA

During KS 2 the children will continue to develop and practice various mental strategies so that when written methods are introduced they can apply these skills appropriately.

In Year 3 the focus is still, as in KS 1, on mental calculations with the necessary jottings. Written methods are introduced by firstly using an expanded method and then move towards a more compact standard written method by Year 6.

It is important to remember that a child who is constantly making errors should return to the stage they understood, until they are ready to move on.

This document sets out the progression of the written methods of the calculations for the 4 operations throughout KS 2.

Progression in Addition

1. Mental first methods including partitioning, adding the tens first:

$$56 + 37 = (50 + 30) + (6 + 7)$$

$$= 80 + 13$$

$$= 93$$

2. Expanded vertical method – move towards adding the least significant digit first and to three digit numbers:

$$\begin{array}{r} 258 \\ +\ 496 \\ \hline 14 \\ 140 \\ 600 \\ \hline 754 \end{array}$$

3. Standard written method – eventually children will move to a more compact form:

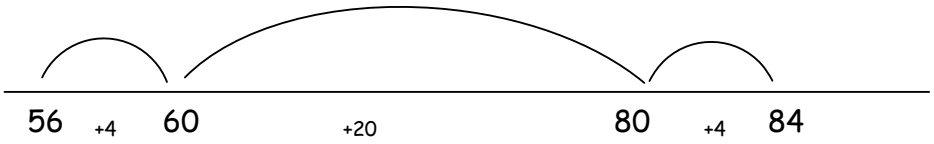
$$\begin{array}{r} 258 \\ 496 \\ \hline 754 \\ \hline 1\ 1 \end{array}$$

4. Children will become more confident and move to bigger numbers and decimals

Progression in Subtraction

1. Children will use mental methods such as "counting on" with tens and units:

eg 84 - 56 + 28



86
- 56
4 (to 60)
20 (to 80)
4 (to 84)

2. Subtraction by decomposition – the expanded version. The numbers are partitioned out and necessary adjustments made.

eg 564 - 279

500 + 60 + 4
200 + 70 + 9

(then change a 10 into units to make…)

500 + 50 + 14
200 + 70 + 9

(then change a 10 into units to make…)

400 + 150 + 14
200 + 70 + 9

200 + 80 + 5 = 285

To speed up and create less recording it maybe helpful just to repeat the top line adjustments

3. Standard decomposition method – the next step is a more compact version of point 2.

eg

$$\begin{array}{r} {}^{4}\cancel{5}\ {}^{15}\cancel{6}\ {}^{1}4 \\ 2\ \ 7\ \ 9 \\ \hline \end{array} \qquad \begin{array}{r} 5\ 5\ {}^{1}4 \\ -\ 2\ 7\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 4\ {}^{1}5\ {}^{1}4 \\ -2\ 7\ 9 \\ \hline 2\ 8\ 5 \end{array}$$

4. These methods can be further developed to bigger numbers and decimals.

Progression in Multiplication

1. Develop mental methods using partitioning:

eg $56 \times 6 = (50 \times 6) + (6 \times 6)$

$= 300 + 36$

$= 336$

2. Using the grid method when multiplying by units:

eg 256×5

X	200	50	6
5	1000	250	30

= 1280

3. Using the grid method to do long multiplication eg 65 x 28

X	60	5	
20	1200	100	1300
8	480	40	520

= 1820

4. Vertical format, expanded version for multiplication by units:

eg 46×8

$$\begin{array}{r} 46 \\ \times\ 8 \\ \hline 320 \\ 48 \end{array} \quad \begin{array}{l} \\ \\ (40 \times 8) \\ (6 \times 8) \end{array} \quad = 368$$

5. Vertical compact version for multiplication by units:

eg 46 x 8

$$\begin{array}{r} 46 \\ \times\ 8 \\ \hline 368 \\ \hline {\scriptstyle 4} \end{array}$$

6. Compact version of long multiplication:

eg

$$\begin{array}{rl} 72 & \\ 38 & \\ \hline 2160 & (72 \times 30) \\ 576 & (72 \times 8) \\ \hline 2736 & \\ \hline {\scriptstyle 1} & \end{array}$$

7. These methods can be further developed by using bigger numbers and decimals.

Progression in Division

1. Develop mental methods and begin to "chunk" multiples of the divisor:

eg $75 \div 4 = (40 + 35) \div 4$

$= 10 + 8$ remainder 3

$= 18$ r 3

2. Standard written method for short division by chunking multiples of the divisor:

Eg $295 \div 6$ 49 r 1 or $49\ 1/6$

$$
\begin{array}{r|l}
6 & 295 \\
 & -\ 240 \quad (40 \times 6) \\
 & \hline
 & 55 \\
 & -\ 54 \quad (9 \times 6) \\
 & \hline
 & 1
\end{array}
$$

3. Standard written method for long division by chunking multiples of the divisor (this method may need to use a method of multiplication to supplement it.)

eg $842 \div 26$ 32 r 10

$$
\begin{array}{r|l}
26 & 842 \\
 & -\ 780 \quad (30 \times 26) \\
 & \hline
 & 62 \\
 & -\ 52 \quad (2 \times 26) \\
 & \hline
 & 10
\end{array}
$$

4. Short hand division methods are also introduced in Years 5 and 6.

eg

$$7 \overline{)872} \quad 124 \text{ r } 4$$

5. These methods can be further developed by using bigger numbers and decimals.

In all the methods of calculation it is important to encourage the children to estimate their answers