

SHEARS GREEN JUNIOR SCHOOL  
Progression of written calculation methods

- We will try to emphasise the importance of solving problems using mental calculation methods
- These written methods will be used for those calculations that cannot be solved easily using a mental calculation method.
- We have developed a consistent approach to teaching written calculation methods in order to establish continuity and progression through out the school
- The written methods show progression from Year 3 to Year 6 but individual class teachers will decide the appropriate stage for their pupils to access the written method depending on the ability of the pupils. This may change from year to year.

Contents:

[Progression in Addition](#)

[Progression in Subtraction](#)

[Progression in Multiplication](#)

[Progression in Division](#)

## Progression in Addition

### FOUNDATION

**Begin to relate addition to combining two groups of objects**

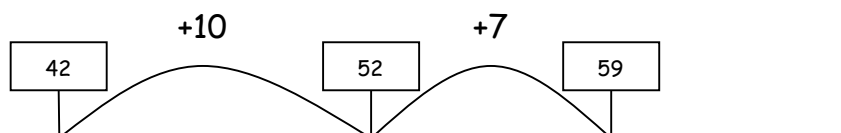
- Make a record in pictures, words or symbols of addition activities already carried out
- Construct number sentences to go with practical activities
- Relate addition to counting on

### KEY STAGE 1

**Understand the operation of addition and use the related vocabulary**

- Record simple mental additions in a number sentence using + and =
- Know that addition can be done in any order
- Count on from the most significant number
- Begin to partition and recombine  
e.g.  $12 + 15$  as  $10 + 10$  and  $2 + 5$ , then  $20 + 7$  as 27
- Use informal jottings with larger numbers (empty number line)

$$42 + 17$$



- **Develop pencil and paper methods for additions that cannot be done mentally**

$$\begin{array}{r} 35 + 52 \\ 30 + 50 = 80 \\ 5 + 2 = 7 \\ 80 + 7 = 87 \end{array}$$

(no formal layout, informal jottings)

YEAR 3

**Continue informal partitioning; reinforce use of empty number line**

- Expanded written method, vertical layout (NO 'carrying')

$$67 + 24$$

[Back](#)

$$\begin{array}{r} 60 + 7 \\ 20 + 4 \\ \hline 80 + 11 \end{array} \longrightarrow \begin{array}{r} 80 \\ + 11 \\ \hline 91 \end{array}$$

YEAR 4

**Expanded written methods, vertical layout**

- Add least significant digits first

$$\begin{array}{r} 264 \\ + 48 \\ \hline 12 \\ 100 \\ + 200 \\ \hline 312 \end{array}$$

END OF  
YEAR 4

**Compact written method**

- With 'carrying'

$$\begin{array}{r} 783 \\ + 135 \\ \hline 918 \\ 1 \end{array}$$

[Back](#)

YEAR 5

**Extend written methods to column addition of two integers less than 10 000** (explore larger numbers with expanded methods then apply compact method with least significant digit first)

- Add several numbers with different number of digits
- Extend column addition to decimal amounts of money, lengths, weights

[Back](#)

YEAR 6

**Extend written methods for addition**

- Any number of digits
- Several numbers with different numbers of digits
- Decimals with one or two decimal places

[Back](#)

## Progression in Subtraction

### FOUNDATION

#### **Begin to relate subtraction to 'taking away'**

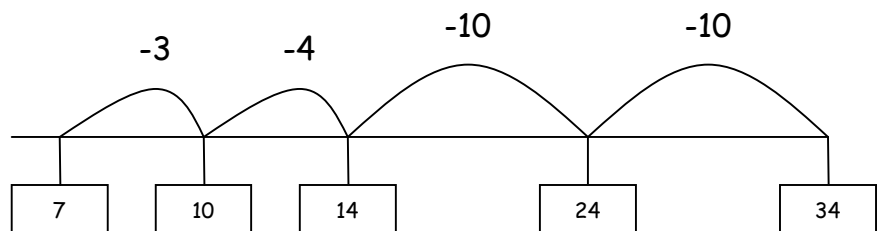
- Make a record in pictures, words or symbols of subtraction activities already carried out
- Construct number sentences to go with practical activities
- Relate subtraction to taking away and counting how many objects are left

### KEY STAGE 1

#### **Understand the operation of subtraction and use related vocabulary**

- Record simple mental subtractions in a number sentence using - and =
- Use jottings to support mental subtractions (empty number line)

$$34 - 27$$



- Begin to use an empty number line when counting on to find the difference

YEAR 3

Develop pencil and paper methods for subtractions that cannot, at this stage, be done mentally (two digit numbers)

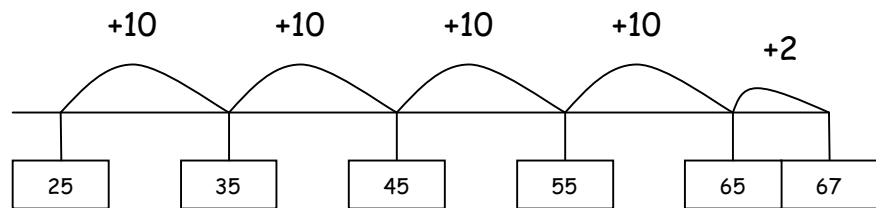
e.g.  $67 - 25 = 42$

- With jottings and partitioning

$$67 - 20 = 47$$

$$47 - 5 = 42$$

- Counting on to find the difference



Leading on to:

- Expanded written methods showing vertical layout

$$\begin{array}{r} 60 \ 7 \\ - 20 \ 5 \\ \hline 40 \ 2 \end{array} \longrightarrow 42$$

[Back](#)

YEAR 4

Expanded decomposition

$$\begin{array}{r} 81 - 57 \\ 80 \ 1 \\ - 50 \ 7 \\ \hline \end{array} \longrightarrow \begin{array}{r} 70 \ 11 \\ - 50 \ 7 \\ \hline 20 \ 4 \end{array} \longrightarrow 24$$

- Extend to 3 digit numbers and hundreds to tens decomposition

$$754 - 86 =$$

$$\begin{array}{r} 700 \ 50 \ 4 \\ - \quad 80 \ 6 \\ \hline \end{array} \longrightarrow \begin{array}{r} 700 \ 40 \ 14 \\ - \quad 80 \ 6 \\ \hline \end{array} \longrightarrow \begin{array}{r} 600 \ 140 \ 14 \\ - \quad \quad 80 \ 6 \\ \hline 600 \ 60 \ 8 \end{array} \longrightarrow 668$$

(Once the children are aware that tens or hundreds are brought across, they can cross numbers out and write the adjusted amount in each column, to make this method less time-consuming)

[Back](#)

$$\begin{array}{r}
 600 \quad 140 \quad 14 \\
 \cancel{700} \quad \cancel{50} \quad \cancel{4} \\
 - \quad \quad \underline{80 \quad 6} \\
 600 \quad 60 \quad 8 \quad \longrightarrow \quad 668
 \end{array}$$

YEAR 5

**Compact written methods involving decomposition**

$$363 - 127$$

$$\begin{array}{r}
 5 \quad 13 \\
 \cancel{3} \quad \cancel{6} \quad \cancel{3} \\
 - \underline{127} \\
 2 \quad 3 \quad 6
 \end{array}$$

- Extend to larger numbers (up to 10 000) and decimal sums of money

[Back](#)

YEAR 6

**Extend written methods for subtraction, to include decimal numbers with up to 2 decimal places.**

- Choose the most efficient and appropriate method for each calculation.
- **Some children will find the final compact method very difficult and will continue to use informal methods in Year 5 & 6**

[Back](#)

## Progression in Multiplication

### FOUNDATION

Begin to:

- Count in tens
- Count in twos

### YEAR 1

**Draw pictures to show equal sets:**

- 3 sets of 3 to make 9

xxx xxx xxx

- 2 sets of 4 to make 8

xxxx xxxx

- **Count in twos, fives and tens**
- Identify patterns of 2s, 5s and 10s on a hundred square

### YEAR 2

**Count confidently in steps of 2, 5 and 10**

**Begin to count in steps of 3 and 4**

- Use number lines and hundred squares as visual reminders when learning to count in steps of 3, 4 and 5

**Understand the operation of multiplication as repeated addition or as describing an array**

- Make arrays practically
- Draw on squared paper
- Use  $\times$  and  $=$  to record mental calculations

**Know facts for 10x table**

## YEAR 3

**Learn additional multiplication facts and work in different ways to derive new facts from those that they already know.**

- Know by heart multiplication facts for 2x, 5x and 10x tables
- Begin to learn/consolidate facts for the 3x and 4x tables
- Understand the effect of multiplying by 10
- Multiply a single digit by 1, 10 and 100

$$7 \times 10 = 70$$

$$4 \times 100 = 400$$

- Double any multiple of 5 up to 50

$$35 \times 2 = 70$$

$$\underline{\quad} \times 2 = 50$$

- Derive related facts

$$7 \times 5 = 35$$

$$5 \times 7 = 35$$

$$35 \div 7 = 5$$

$$35 \div 5 = 7$$

[Back](#)

YEAR 4

**Develop and refine written methods for multiplication**

- Begin to multiply a 2-digit number by a single digit number, multiplying the tens first

- Using multiples of 10 (mentally)  
e.g.  $4 \times 30 = (4 \times 3) \times 10$   
 $= 120$

- Jottings to show stages of calculation (TU x U)

$$32 \times 3 = (30 \times 3) + (2 \times 3)$$
$$= 90 + 6 \longrightarrow$$

$$\begin{array}{r} 90 \\ + 6 \\ \hline 96 \end{array}$$

By Year 4  
Summer Term

**Leading to grid method**

$$37 \times 4$$

x	30	7
4	120	28

 $\longrightarrow$  
$$\begin{array}{r} 120 \\ + 28 \\ \hline 148 \end{array}$$

[Back](#)

YEAR 5

**Extend written methods, encouraging estimation first**  
Grid method (HTU x U)

$$246 \times 7$$

x	200	40	6
7	1400	280	42

$$\begin{array}{r} 1400 \\ 280 \\ + 42 \\ \hline 1722 \end{array}$$

- Leading to the compact written method (for some children only at the end of Year 5)

$$\begin{array}{r}
 246 \\
 \times \quad 7 \\
 \hline
 42 \text{ (7} \times \text{6)} \\
 280 \text{ (7} \times \text{40)} \\
 + 1400 \text{ (7} \times \text{200)} \\
 \hline
 1722
 \end{array}$$

Year 5  
Summer Term

**Grid method (TU x TU)**

$$62 \times 36$$

x	60	2
30	1800	60
6	360	12

$$\begin{array}{r}
 1800 \\
 360 \\
 60 \\
 + 12 \\
 \hline
 2232
 \end{array}$$

[Back](#)

11

YEAR 6

**Extend written methods for multiplication, encouraging estimation first**

- Continue to use grid method and expanded written method
- Develop short multiplication

$$\begin{array}{r}
 625 \\
 \times \quad 6 \\
 \hline
 3750
 \end{array}$$

13

- Leading to multiplication of numbers involving decimals

$$\begin{array}{r} 4.62 \\ \times 3 \\ \hline 13.86 \\ 1 \end{array}$$

- **Most children will be encouraged to continue to use the grid method, as analysis of test results show this to be a more reliable method for most children.**
- Pupils will be taught the more compact method of multiplication if the teacher feels they are ready for it

[Back](#)

## Progression in Division

At Shears Green Junior School, we will teach the short method of division. The stages in the development of this method are shown below.

Teachers will progress pupils through these stages of the short division method at a pace suitable to the ability of each child.

- 1) No carrying

$$\begin{array}{r} 23 \\ 3 \overline{)69} \end{array}$$

- 2) Carrying, no remainders

$$\begin{array}{r} 042 \\ 3 \overline{)126} \end{array}$$

- 3) Carrying, with remainders

$$\begin{array}{r} 037 \text{ r } 2 \\ 3 \overline{)113} \end{array}$$

- 4) Remainders as fractions

$$\begin{array}{r} 037 \frac{2}{3} \\ 3 \overline{)113} \end{array}$$

- 5) Remainders as decimals

$$\begin{array}{r} 037.666 \\ 3 \overline{)113.2020} \end{array}$$

[Back](#)