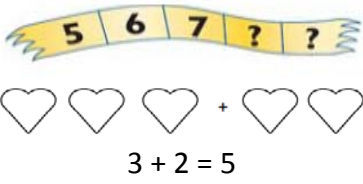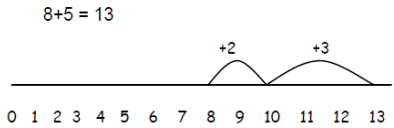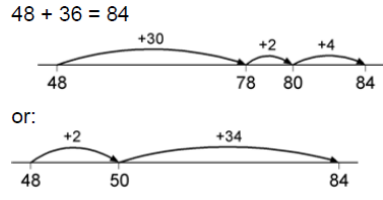## Calculation policy – quick reference guide

At Grove Road we believe that children should be introduced to the processes of calculation through practical, oral and mental activities. As children begin to understand the underlying ideas, they develop ways of recording to support their thinking and calculation methods, they also learn to interpret and use the signs and symbols involved. Over time children learn how to use models and images, such as empty number lines, to support their mental and informal written methods of calculation. As children's mental methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to efficient written methods that can be used more generally. By the end of Year 6 children are equipped with mental, written and calculator methods that they understand and can use correctly. When faced with a calculation, children are able to decide which method is most appropriate and have strategies to check its accuracy. At whatever stage in their learning, and whatever method is being used, it must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful.
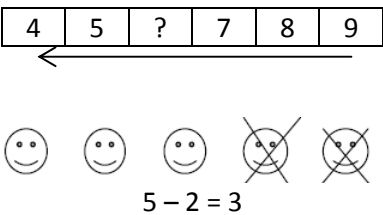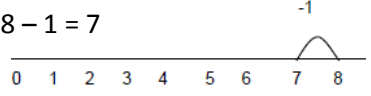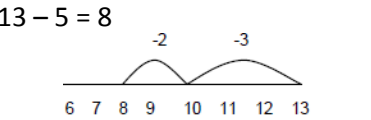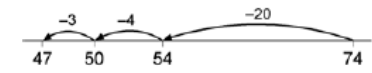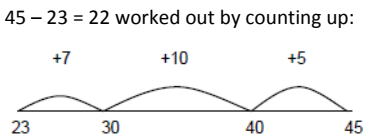
On the next two pages there is a brief summary of our calculation policy – the stages which children move through as they become proficient with both mental and written calculations. Please refer to the full calculation policy for more detail.

Calculation policy – quick reference guide

Addition

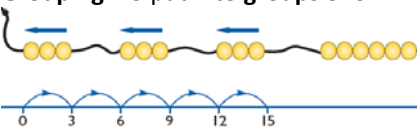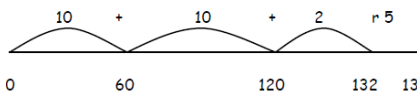| Phase 1: **Counting and adding with objects** Develop secure one-one correspondence and understanding of addition. Using practical apparatus and real objects.	Phase 2: **The number line and 100 square** The number line helps children to move from using concrete objects. The 100 square supports children to understand that when adding ten to a number the units stay the same.	Phase 3: **The empty number line** The empty number line helps to record the steps on the way to calculating the total. Children will partition the number to do this.	Phase 4: **Partitioning** The next stage is to record mental methods using partitioning. Partitioning the numbers into tens and units before adding enables children to work with manageable parts, before recombining to find the answer.	Phase 5: **Expanded method in columns** Using columns to add vertically, starting with units, then tens. This then leads into **Phase 6: Column method (standard short method)** This involves children understanding that digits can be 'carried' into the next column.
5 6 7 ? ? ♡ ♡ ♡ + ♡ ♡ 3 + 2 = 5	8+5 = 13 +2 +3 0 1 2 3 4 5 6 7 8 9 10 11 12 13	48 + 36 = 84 +30 +2 +4 48 78 80 84 or: +2 +34 48 50 84	47 + 76 40 + 70 = 110 7 + 6 = 13 = 123 47 = 40 + 7 +76 70 + 6 110 + 13 = 123	Phase 5 Phase 6 47 366 + 76 +458 13 824 110 1 1 123

Subtraction

Phase 1: **Counting backwards and subtracting with objects** Develop secure one-one correspondence and understanding of subtraction.	Phase 2: **The number line and 100 square** When children are ready to move on from concrete objects and begin recording, these can support their thinking. On a 100 square, when we take away 10 we can see that the units digit remains the same.	Phase 3: **Using the empty number line** The empty number line helps to record or explain the steps in preparation for mental subtraction. A calculation like 74 – 27 can be recorded by counting back 27 from 74 to reach 47. Children can also be taught that you can also count up between the 2 numbers to find the difference.	Phase 4: **Partitioning** Subtraction can be recorded using partitioning to write equivalent calculations that can be carried out mentally. For 74 – 27 this involves partitioning the 27 into 20 and 7, and then subtracting the 20 and the 7 from 74 in turn.	Phase 5 and 6: **Expanded layout, leading to column method (standard short method)** Partitioning the numbers into tens and units and writing one under the other mirrors the column method. When they are fully confident with partitioning and understanding the effect, they are ready to move to the more efficient short version.
4 5 ? 7 8 9 ☺ ☺ ☺ ⊗ ⊗ 5 – 2 = 3	8 – 1 = 7 -1 0 1 2 3 4 5 6 7 8 13 – 5 = 8 -2 -3 6 7 8 9 10 11 12 13	74 – 27 = 47 worked by counting back: -3 -4 -20 47 50 54 74 45 – 23 = 22 worked out by counting up: +7 +10 +5 23 30 40 45	74 – 27 = 74 – 20 – 7 74 – 20 = 54 54 – 7 = 47 So: 74 – 27 = 47	Phase 5: Phase 6: 400 160 4 16 500 + 60 + 3 5 6 3 – 200 + 70 + 1 – 2 7 1 200 + 90 + 2 2 9 2

Calculation policy – quick reference guide

Multiplication

Phase 1: Hands on experiences, including x facts and arrays	Phase 2: Mental and informal written multiplication using partitioning	Phase 3: The grid method	Phase 4: Expanded short multiplication	Phase 5: Short multiplication
Initially children put objects into groups/ sets. They then move on to solve multiplication through repeated addition. We also use arrays to solve multiplication problems. Children start to identify patterns within multiplications and begin learning their x tables facts.	The number being multiplied can be partitioned, usually into tens and units, each part is then multiplied with the answers then added together to find the final total. Children use this as an informal written method before it becomes a mental method. Two possible methods are shown:	As a staging post, an expanded method which uses a grid can be used. This is based on the distributive law and links directly to the mental method. It is an alternative way of recording the same steps, but can be used with more digits. This method can also work for decimals.	The next step is to represent the method in a column, but showing the steps in working out. Draw attention to the links with the grid method (phase 3). Children should describe what they do by referring to the actual values of the digits in the columns. For example 38 × 7 is 'thirty multiplied by seven and eight multiplied by seven.'	The recording is reduced further, with carry digits recorded below the line. If, after practice, children cannot use the compact method without making errors, they should return to an expanded format. It is important that children choose methods they feel comfortable with.

6 lots of 5 fingers

$5 + 5 + 5 + 5 + 5 + 5$ or $6 \times 5 = 30$

An array to show 4×2 or 2×4:

4 group of 2, or, 2 groups of 4:

$4 \times 2 = 8$

$2 \times 4 = 8$

---

14 can be partitioned into 10 and 4:

$$14 \times 3 = (10 + 4) \times 3$$
$$= (10 \times 3) + (4 \times 3) = 30 + 12 = 42$$

43 can be partitioned into 40 and 3:

$43 \times 6 =$

$40 + 3$ ×6

$240 + 18 = 258$

$38 \times 7 =$

×	7
30	210
8	56
	266

$143 \times 26 = 3718$

x	20	6
100	2000	600
40	800	240
3	60	18
	2860 +	858

$30 + 8$
$\times \ 7$
210 $30 \times 7 = 210$
$\underline{56}$ $8 \times 7 = 56$
266

38
$\times \ 7$
210
$\underline{56}$
266

56
$\times \underline{27}$
1120 56×20
$\underline{392}$ 56×7
1512
1

38
$\times \underline{\ 7}$
$\underline{266}$
$_5$

Division

Phase 1: Hands on experience, sharing and grouping, linking to x facts and repeated subtraction	Phase 2: Mental division using partitioning	Phase 3 and 4: Chunking on a number line and 'Expanded' method for (H)TU ÷ U, using idea of repeated subtraction	Phase 5: Long division	Phase 6: standard short method
To divide on a number line initially with no remainders and later with remainders.	One way to work out TU ÷ U mentally is to partition TU into a multiple of the divisor plus the remaining part, then divide each part separately.	Children start by taking off groups of 10x the number, and when they have a secure knowledge of multiplication facts and place value, they should be able to move on quickly to using bigger 'chunks' e.g. 30x or 50x the number as appropriate.	The next step is to tackle HTU ÷ TU. The layout, which links to chunking, is in essence the 'long division' method.	Standard short method works best for ÷ U e.g. HTU ÷ U and can be applied to dividing by decimals e.g. HTU.t ÷ U.

Sharing: 6 eggs **shared between** 2 nests

Grouping: 15 put **into groups of** 3

$84 \div 7 = 12$: We know 70 and 14 are multiples of 7, so we can use these when we partition the number.

84
$70 + 14$ ÷7
$10 + 2 = 12$

$137 \div 6 = 22 \ r \ 5$

Count up in groups of 6
e.g. $10 \times 6 = 60$ (These chunks help us to work out how many 6s are in 137).

$196 \div 6 = 32 \ r \ 4$

$6\overline{)196}$
$-\underline{180}$ 6×30
16
$-\underline{12}$ 6×2
4 32

$560 \div 24 = 23 \ r \ 8$

23
$24\overline{)560}$
-480
80
-72
8

$0 \ 4 \ 6 \ . \ 4$
$7\overline{)3\ ^32\ ^44\ .\ ^28}$