Cleves Primary School

Calculation Policy

Contents Page

Rationale:

This policy is intended to demonstrate how we teach different forms of calculation at Cleves Primary School. It is organised by year groups and designed to ensure progression for each operation in order to ensure smooth transition from one year group to the next. It also includes an overview of mental strategies required for each year group [Year 1-Year 6]. Mathematical understanding is developed through use of representations that are first of all concrete (e.g. base ten, apparatus), then pictorial (e.g. array, place value counters) to then facilitate abstract working (e.g. columnar addition, long multiplication).

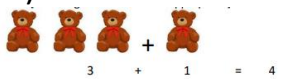
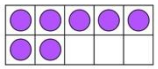
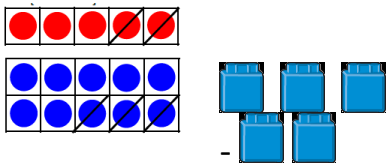
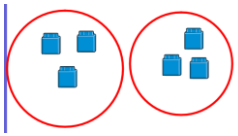
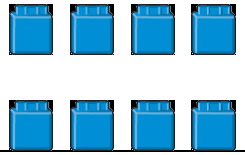
It is important that conceptual understanding, supported by the use of representation, is secure for procedures and if at any point a pupil is struggling with a procedure, they should revert to concrete and/or pictorial resources and representations to solidify understanding or revisit the previous year's strategy.

This policy is designed to help teachers and staff members at our school ensure that calculation is taught consistently across the school and to aid them in helping children who may need extra support or challenges.

This policy is also designed to help parents, carers and other family members support children's learning by letting them know the expectations for their child's year group and by providing an explanation of the methods used in our school.

How do I use this calculation policy?

Each page follows a similar format to help you find the information you need. Addition is paired with subtraction and division with multiplication as these operations are the inverse (opposite) of each other.

EYFS			
Addition	Subtraction	Multiplication	Division
Mental/Jottings **Pictures/Marks** Adding one more/one less  2 + 3 = 5 Number bonds to 5 and 10 (through ten base & objects)  	Mental/Jottings Pictures/Marks Subtracting one more/one less through a ten frame and cubes.  3 - 2 = 1	Mental/Jottings Doubling (Repeated Addition) Pictorials, Objects and Cubes  Can you double the spots on this ladybird?  How many wheels are there altogether?  3 + 3 = 6 3 x 2 = 6	Mental/Jottings Halving (Sharing into equal groups through cubes, dienes and real life objects)   There are 12 children. How would they share this between 3 people? Can you share these dienes into 2 equal groups? 

Year 1

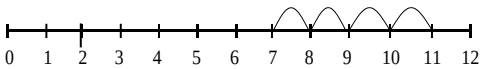
Addition

Pictures/ marks

3 + 2 = 5

Number lines (numbered)

7 + 4

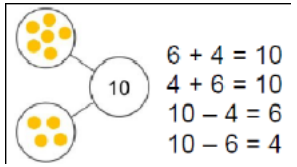


Recording by - drawing jumps on prepared lines

- constructing own number lines

(Teacher model number lines with missing numbers)

Reordering (e.g. largest number 1st)
2 + 7 = 7 + 2



Partition into tens and ones and recombine

12 + 6 =

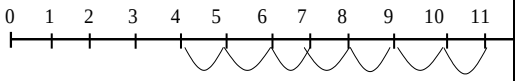
Subtraction

Pictures / marks

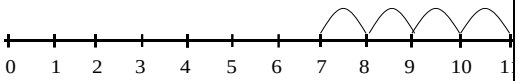
10 – 4 = 6

Number lines (numbered)

11 – 7
(Counting back)



The difference between 7 and 11
(Counting up)



Recording by - drawing jumps on prepared lines

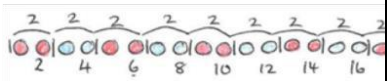
- constructing own lines

Part-Whole Model
(Using dienes and cubes)

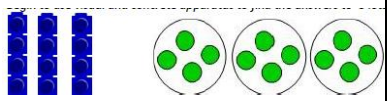
Multiplication

Pictures / marks

Counting in steps of 2 and 10.

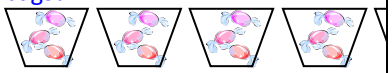


Grouping using concrete resources (dienes, cubes)



Visual Word Problems

There are 3 sweets in one bag.
How many sweets are there in 5 bags?

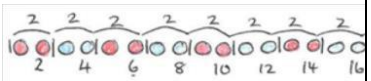


(Recording on a number line modelled by the teacher when solving problems)

Doubling

Division

Counting back back in steps of 2 and 10.

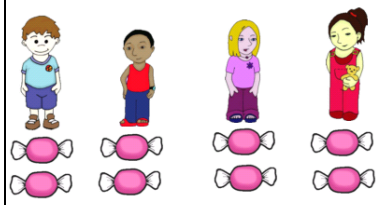


Grouping

Begin to use visual and concret arrays and 'sets of' objects to find the answers to 'How many towers of 3 can I make with 12 cubes?'

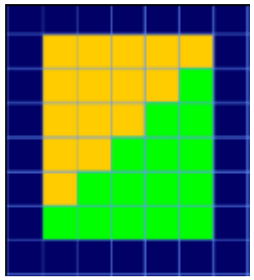
Pictures / marks

4 friends share 8 sweets between them. How many sweets do they each get?



10 + 2 + 6 = 18

1	2	3	4	5	6
11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36
41	42	43	44	45	46



Part-Whole Model

5 + 3 = 8

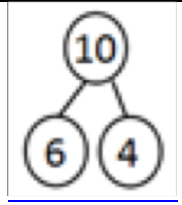
Using near doubles

5 + 6 = double 5 + 1

+ = signs and missing numbers

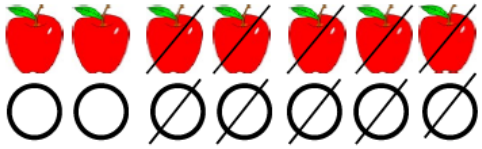
3 + 4 = □ □ = 3 + 4
3 + □ = 7 7 = □ + 4
□ + 4 = 7 7 = 3 + □
□ + ∇ = 7 7 = □ + ∇

Promoting covering up of operations and numbers.



Pictorial Representations

7 – 5 = 2



- = signs and missing numbers

7 - 3 = □ □ = 7 - 3
7 - □ = 4 4 = □ - 3
□ - 3 = 4 4 = 7 - □
□ - ∇ = 4
4 = □ - ∇

Recall of all doubles to 10 → Halving

7 + 7 = double 7

Corresponding halves

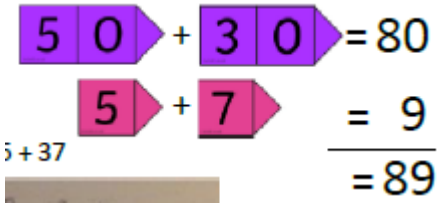
Year 2

Addition

Partition into tens and ones and recombine
(continue from Year1 using 2 digit numbers)

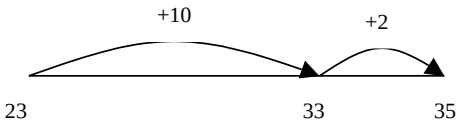
12 + 23 =

10 + 2 20 + 3
10 + 20 = 30 2 + 3 = 5
30 + 5 = 35

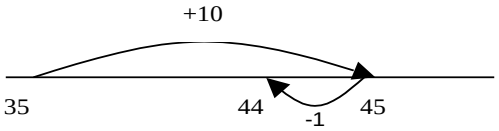


refine to partitioning the second number only:
23 + 12 = 23 + 10 + 2
= 33 + 2
= 35

Partition second number only to use on a blank number line



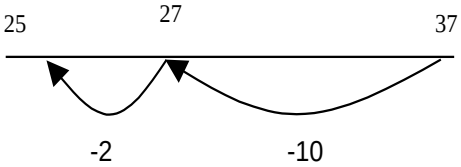
Add 9 or 11 by adding 10 and adjusting by 1
35 + 9 = 44



Near doubles
13 + 14 = double 13 + 1

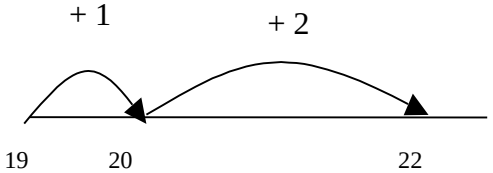
Subtraction

Use known number facts and place value to subtract (partition second number only)
37 – 12 = 37 – 10 – 2
= 27 – 2
= 25

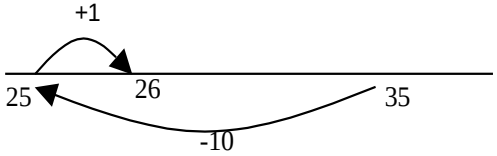


Find a small difference by counting up

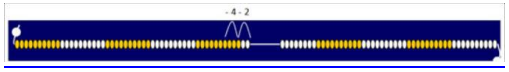
22 – 19 = 3



Subtract 9 or 11. Begin to add/subtract 19 or 21
35 – 9 = 26



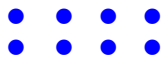
Bridging through multiples of 10
23 – 9 = 23 –3 -6



- = signs and missing numbers

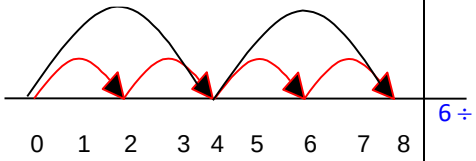
Multiplication

Arrays and repeated addition

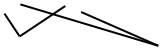


4 x 2 or 4 + 4
2 x 4
or repeated addition

2 + 2 + 2 + 2 or 4 + 4

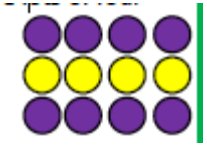


Partition
15 x 3



10 x 3 = 30 5 x 3 = 15
30 + 15 = 45

Grouping
Using arrays to identify that 5 x 6 is the same as 3 x 4.



x by multiple of 10
7 x 10 = 70

Doubling
Doubles of numbers to 15
Doubling multiples of 5 up to 50

15 x 2 = 30

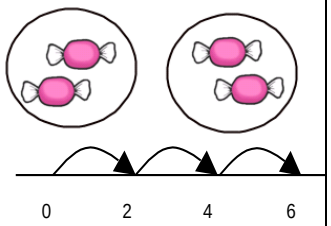
Division

Understand division as sharing and grouping

Sharing – 6 sweets are shared between 2 people. How many do they have each?

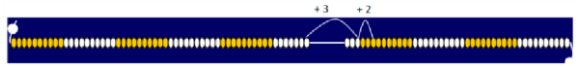
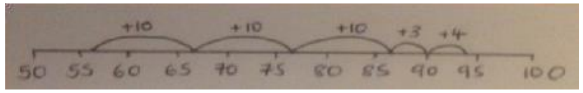
6 ÷ 2 can be modelled as:

Grouping – There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)



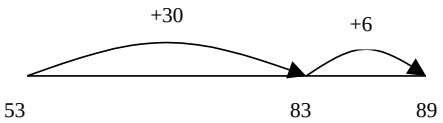
÷ by Multiple of 10
60 ÷ 10 = 6

Halving
Corresponding halves

Bridging through multiples of 10 6 + 7 = 6 + 4 + 3   **+ = signs and missing numbers** Continue using a range of equations as in Year 1 but with appropriate, larger numbers. Extend to 14 + 5 = 10 + □ and adding three numbers 32 + □ + □ = 100 35 = 1 + □ + 5	Continue using a range of equations as in Year 1 but with appropriate numbers. Extend to 14 + 5 = 20 - □	**x = signs and missing numbers** 7 x 2 = □ □ = 2 x 7 7 x □ = 14 14 = □ x 7 □ x 2 = 14 14 = 2 x □ □ x ∇ = 14 14 = □ x ∇ **WRITTEN** **Grid method** × | 10 | 5 3 | 30 | 15	**Finding Quantities of Amounts with Cubes/Dienes** **E.g:** ½, ¼ and ¾ of 16 cubes.  **÷ = signs and missing numbers** 6 ÷ 2 = □ □ = 6 ÷ 2 6 ÷ □ = 3 3 = 6 ÷ □ □ ÷ 2 = 3 3 = □ ÷ 2 □ ÷ ∇ = 3 3 = □ ÷ ∇

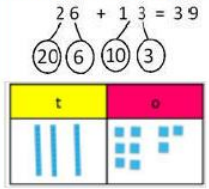
Year 3			
Addition	Subtraction	Multiplication	Division
MENTAL / JOTTINGS **+ = signs and missing numbers** Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers. **Partition into tens and ones and recombine**	- = signs and missing numbers **Continue using a range of equations as in Year and 2 but with appropriate numbers.** Find a small difference by counting up **Continue as in Year 2 but with appropriate numbers e.g. 102 – 97 = 5**	**x = signs and missing numbers** Continue using a range of equations as in Year 2 but with appropriate numbers. Number lines (repeated addition) 6 x 3 +6 +6 +6	**÷ = signs and missing numbers** Continue using a range of equations as in Year 2 but with appropriate numbers.

Partition both numbers and recombine. Refine to partitioning the second number only e.g.
36 + 53 = 53 + 30 + 6
= 83 + 6
= 89

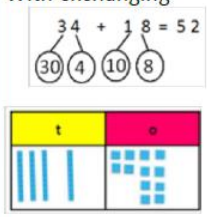


Partitioning numbers.

Without exchanging



With exchanging



Add a near multiple of 10 to a two-digit number
Continue as in Year 2 but with appropriate numbers e.g. 35 + 19 is the same as 35 + 20 – 1.

Bridging through multiples of 10
49 + 32 = 49 + 1 + 31

Near doubles
36 + 35 = double 36 – 1 or double 35 + 1

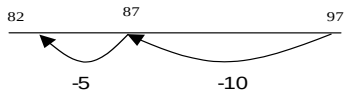
WRITTEN

Expanded column method

83 + 42 = 125

Subtract mentally a 'near multiple of 10' to or from a two-digit number
Continue as in Year 2 but with appropriate numbers e.g. 78 – 49 is the same as 78 – 50 + 1

Use known number facts and place value to subtract
Continue as in Year 2 but with appropriate numbers e.g.
97 – 15 = 72



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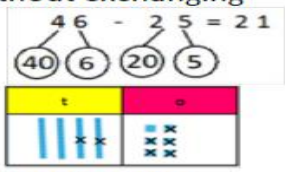
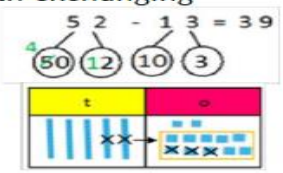
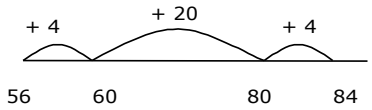


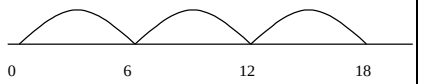
With exchanging



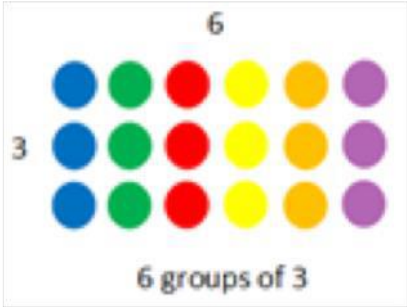
Complementary addition
84 – 56 = 28



Bridging through multiples of 10
54 – 17 = 54 – 4 – 13



Arrays and repeated addition
Continue to understand multiplication as repeated addition and continue to use arrays (as in Year 2).



Doubling multiples of 5 up to 100
35 x 2 = 70
Doubles of numbers to 20
Doubles of multiples of 50 to 500

And corresponding halves

X by a multiple of 10
26 x 10 = 260

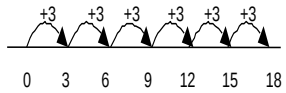
WRITTEN

Partition using grid method

x	30	5
2	60	10

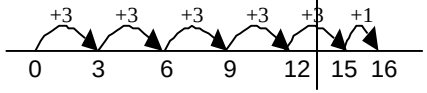
Understand division as sharing and grouping

18 ÷ 3 can be modelled as:
Sharing – 18 shared between 3 (see Year 2 diagram)
Or
Grouping - How many 3's make 18?



Remainders

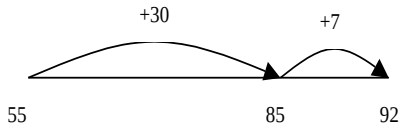
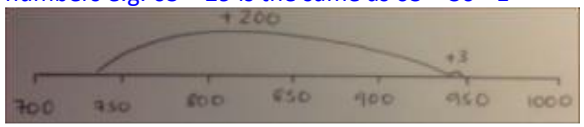
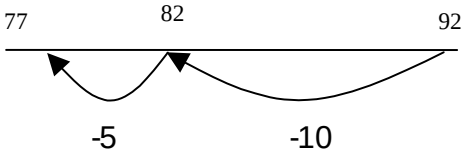
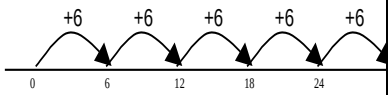
16 ÷ 3 = 5 r1
Sharing - 16 shared between 3, how many left over?
Grouping – How many 3's make 16, how many left over?
e.g.



Divide by multiple of 10

83 + 42 5 (3 + 2) 120 (80 + 40) 125		Use known facts and place value to carry out simple multiplications Use the same method as above (partitioning), e.g. 32 x 3 = 96 ~~x~~ ~~30~~ ~~2~~ 3 90 6	**150 ÷ 10 = 15**

Year 4

Addition	Subtraction	Multiplication	Division
+ = signs and missing numbers Continue using a range of equations as in Year 1 and 2 but with appropriate numbers. **Partition into tens and ones and recombine** Either partition both numbers and recombine or partition the second number only e.g. 55 + 37 = 55 + 30 + 7 = 85 + 7 = 92  **Add the nearest multiple of 10, then adjust** Continue as in Year 2 and 3 but with appropriate numbers e.g. 63 + 29 is the same as 63 + 30 - 1  Bridging through multiples of 10 Continue as in Year 3 with appropriate numbers	**- = signs and missing numbers** Continue using a range of equations as in Year 1 and 2 but with appropriate numbers. Find a small difference by counting up e.g. 5003 – 4996 = 7 This can be modelled on an empty number line (see complementary addition below). **Subtract the nearest multiple of 10, then adjust.** Continue as in Year 2 and 3 but with appropriate numbers. **Use known number facts and place value to subtract** 92 – 15 = 77  	**x = signs and missing numbers** Continue using a range of equations as in Year 2 but with appropriate numbers **X by multiples of 10** 4 x 60 = 240 79 x 100 = 7900 Doubles of numbers to 50 Doubles of multiples of 10 to 500 Doubles of multiples of 100 to 5000 ↓ And corresponding halves **WRITTEN** **Partition using grid method** Use the grid method of multiplication (as below) x 20 3 7 140 21	**÷ = signs and missing numbers** Continue using a range of equations as in Year 2 but with appropriate numbers. **Sharing and grouping** 30 ÷ 6 can be modelled as: grouping – counting on in groups of 6 then count number of groups used  = 5 groups used 30 ÷ 6 = 5 Sharing – sharing among 6, the number given to each person Remainders Grouping on number line as in Year 3 Divide by multiples of 10 580 ÷10 = 58 **WRITTEN**

Near doubles

Continue as in Year 3 with appropriate numbers

WRITTEN

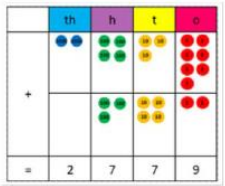
Expanded column method → Column method

```
  358
+  73
  11
 120
 300
 431
```

```
  358
+  73
  431
   1 1
```

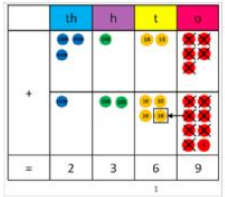
Without exchanging

	th	h	t	o
	2	4	3	7
+		3	4	2
	2	7	7	9



With exchanging

	3	1	2	5
+	1	2	3	6
	4	3	6	1
		1		



Extend to decimals in the context of money (vertically)

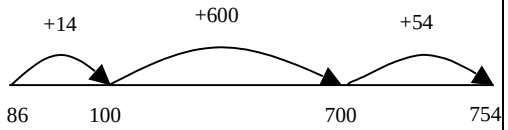
£ 2.50 + £ 1.75 = £ 4.25

```
  £ 2.50
+ £ 1.75
  £ 4.25
    1
```

(N.B. Revert to expanded methods if the children experience any difficulty

Complementary addition

754 – 86 = 668



WRITTEN

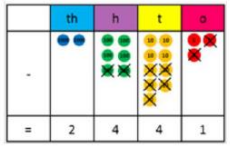
Expanded column method

78 – 27 =

```
  70 + 8
- 20 + 7
  50 + 1
```

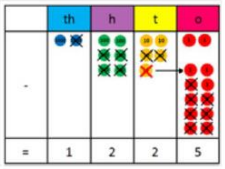
Without exchanging (crossing out)

	th	h	t	o
	2	6	9	3
-		2	5	2
	2	4	4	1



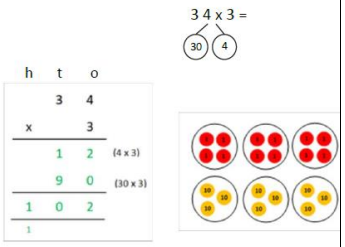
With exchanging

th	h	t	o
2	6	5	2
- 1	4	2	7
1	2	2	5



Extend to column method- multiplying by 1 digit number.

```
  234
×   2
  468
```



For multiplying 2 digit by 2 digit numbers revert to grid method

x	70	2
30	2100	60
8	560	16

Chunking

N.B. only use with sensible numbers, e.g. not 5342 ÷ 4 as it will take too long and is not the most efficient method.

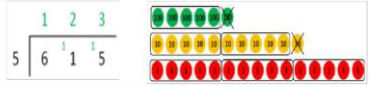
```
    15
5 | 75
    50   (10 groups) or (10×5)
    25
    20   (4 groups) or (4×5)
     5
     5   (1 group) or (1×5)
     0
        10 + 4 + 1 = 15
```

Short division of 2-digit and 3-digit number by single digit numbers.

Without regrouping

(ensure are children are grouping not sharing)

With regrouping



(children could use concrete counters or draw working out as a pictorial representation)

NB Children can be exposed to remainders at this stage but it should not act as a specific teaching point until Year 5.

With remainders

```
    15 r 1
5 | 76
    50   (10 groups) or (10×5)
    26
    20   (4 groups) or (4×5)
     6
     5   (1 group) or (1×5)
     1
        10 + 4 + 1 = 15 remainde
```

Year 5

Addition

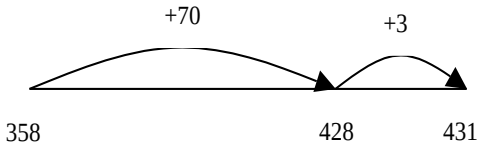
+ = signs and missing numbers

Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Partition into hundreds, tens and ones and recombine

Either partition both numbers and recombine or partition the second number only e.g.

358 + 73 = 358 + 70 + 3
= 428 + 3
= 431



Add or subtract the nearest multiple of 10 or 100, then adjust

Continue as in Year 2, 3 and 4 but with appropriate numbers e.g. 458 + 79 = is the same as 458 + 80 - 1

Bridging through multiples of 10

Continue as in Year 3 with appropriate numbers

Near doubles

Continue as in Year 3 with appropriate numbers

WRITTEN

Subtraction

- = signs and missing numbers

Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

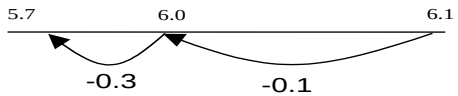
Find a difference by counting up
e.g. 8006 – 2993 = 5013
This can be modelled on an empty number line (see complementary addition below).

Subtract the nearest multiple of 10 or 100, then adjust.

Continue as in Year 2, 3 and 4 but with appropriate numbers.

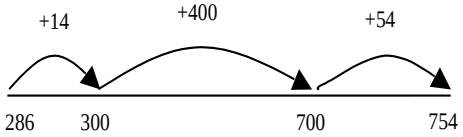
Use known number facts and place value to subtract

6.1 – 0.4 = 5.7



Complementary addition

754 – 286 = 468



WRITTEN

Expanded column method with exchanging

Multiplication

x = signs and missing numbers

Continue using a range of equations as in Year 2 but with appropriate numbers

Doubles of numbers to 100
Doubles of multiples of 10 to 1000
Doubles of multiples of 100 to 10000

↓

And corresponding halves

WRITTEN

Partition using grid method

Use the grid method of multiplication (as below)

72 x 38 is approximately 70 x 40 = 2800

x	70	2
30	2100	60
8	560	16

Extend to simple decimals with one decimal place.

Division

÷ = signs and missing numbers

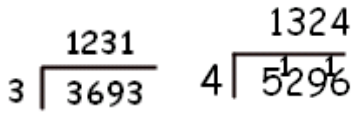
Continue using a range of equations as in Year 2 but with appropriate numbers.

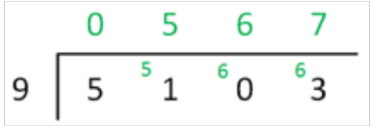
Sharing and grouping

Continue to understand division as both sharing and grouping.

WRITTEN

Compact method (no remainder)

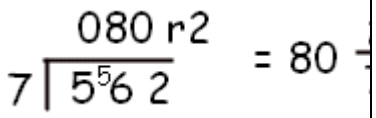




Compact method with remainder

Quotients (answer to a division sum) expressed as fractions or decimal fractions

61 ÷ 4 = 15 ¼ or 15.25



Column method

	5	2	8	9	4
+	3	9	5	1	5
	9	2	4	0	9
	1	1	1		

	5	2 •	1	5
+	2	9 •	5	7
	8	1 •	7	2
	1		1	

Extend to numbers with at least four digits

3587 + 675 = 4262

```
  3587
+  675
  4262
  111
```

Revert to expanded methods if the children experience any difficulty.
Extend to decimals (same number of decimals places) and adding several numbers (with different numbers of digits).

Model negative numbers using a number line.

74 – 27 =

```
   60   14
   ~~70~~ + ~~4~~
 - 20 + 7
 ---------
   40 + 7
```

	5 ~~6~~	1 7	7	8 ~~9~~	1 2
-	4	8	2	5	3
	1	9	5	3	9

	3 ~~4~~	1 5 •	7 ~~8~~	1 3
-	1	8 •	7	4
	2	7 •	0	9

	2	4	0	3
x				6
1	4	4	1	8
	2		1	

	2	8	9	4
x	4	4	1 2	5
1	4	4	7	0
2	8	9	4	0
4	3	4	1	0
1	1	1		

	50	2	.3
20	1000	40	6
5	250	10	1.5

Moving to formal methods of multiplication for decimals.
Carrying numbers underneath.

```
   357
 x   8
 -----
 2956
 4 5
```

	1	6	9	4	r2
5	8	3 4	4 7	2 2	

Year 6

Addition

+ = signs and missing numbers
Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Add the nearest multiple of 10, 100 or 1000, then adjust
Continue as in Year 2, 3, 4 and 5 but with appropriate numbers including extending to adding 0.9, 1.9, 2.9 etc

Bridging through multiples of 10
Continue as in Year 3 with appropriate numbers

Near doubles
Continue as in Year 3 with appropriate numbers

WRITTEN

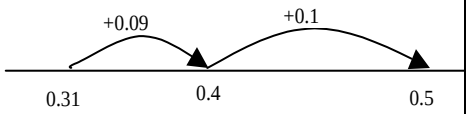
Column Method
Extend to numbers with any number of digits and decimals with 1 and 2 decimal places.
124.9 + 117.25 = 242.15

```
  124.9
+ 117.25
  242.15
   11
```

Subtraction

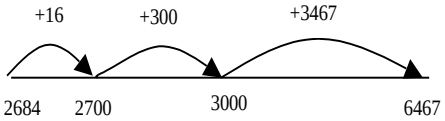
- = signs and missing numbers
Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Find a difference by counting up
e.g. 0.5 – 0.31 = 0.19
This can be modelled on an empty number line (see complementary addition below).



Subtract the nearest multiple of 10, 100 or 1000, then adjust
Continue as in Year 2, 3, 4 and 5 but with appropriate numbers.
Use known number facts and place value to subtract
Continue as year 5

Complementary addition
6467 – 2684 = 3783



WRITTEN

Multiplication

x = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers

Doubles of multiples of 10 to 1000
Doubles of multiples of 100 to 10000

↓

And corresponding halves

WRITTEN

Partition using the grid method
(units, then tens, hundreds etc)

372 x 24 is approximately 400 x 20 = 8000

x	300	70	2
20	6000	1400	40
4	1200	280	8

Extend to decimals with up to two decimal places.

Moving to formal methods of multiplication for decimals. Carrying numbers underneath.

Division

÷ = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers.

Sharing and grouping
Continue to understand division as both sharing and grouping (repeated subtraction).
Remainders
Quotients expressed as fractions or decimal fractions
676 ÷ 8 = 84.5

WRITTEN

Compact Method

Continue as in Year 5.

Extend to larger numbers and decimals.

```
      0 0 8 1
16 | 1 2 9 6
```

	1	4	• 9	5
+	1	2	• 3	5
	2	7	• 3	0
		1	1	

Revert to a stated earlier method if the children experience any difficulty.

Column method

```
 7 16 1
 2874
-1697
 1177
```

```
 2 1 9 14 1
 3056
-1297
 1759
```

	3	6 ~~7~~	• 10 ~~1~~	1 2
-	2	5	• 3	5
	1	1	• 7	7

```
  321
×  34
 1284
 9630
10914
  1
```

	5	5	8	6
x	1	1	1	2
1	1	1	7	2
5	5	8	6	0
6	7	0	3	2
	1	1		

```
     1 3 . 7 2
5 ) 6 18 . 36 10
```

```
     1  2  6  4
6 ) 7 1 5 3 8 2 4
```

```
     0  2  8   r12
15 ) 4  3  2
   −
     3  0  ↓
     1  3  2
   −
     1  2  0
     0  1  2
```