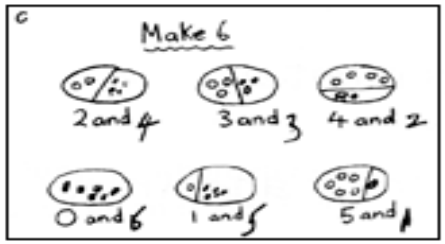
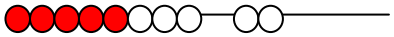
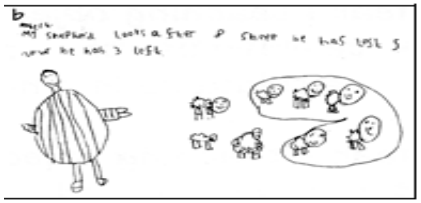
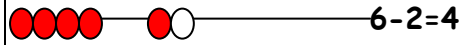
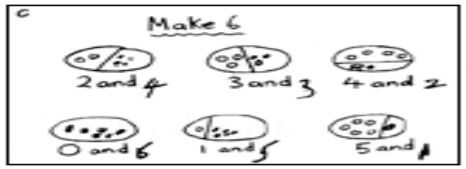
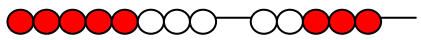
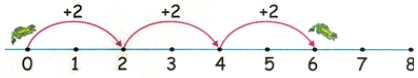
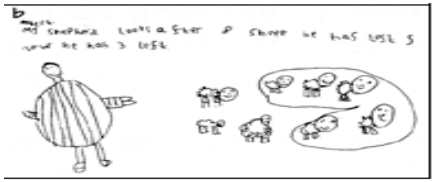
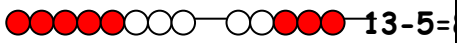
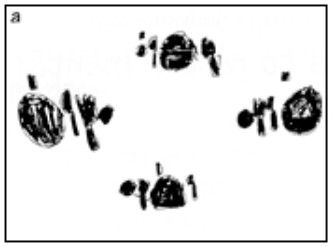
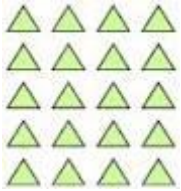
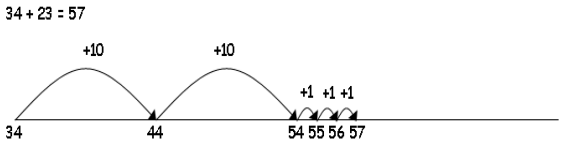
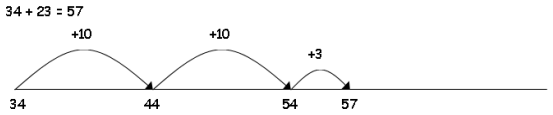
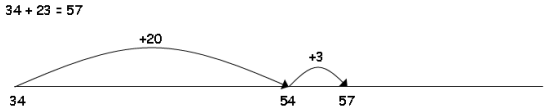
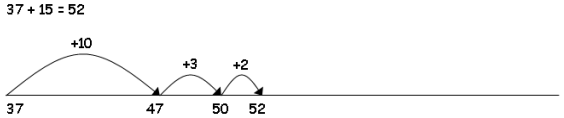
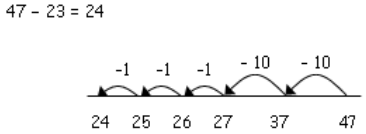
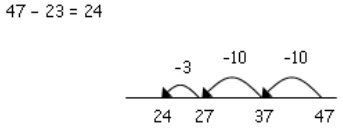
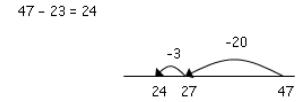
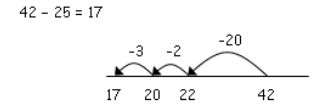
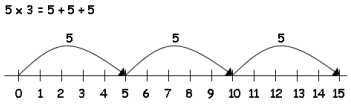
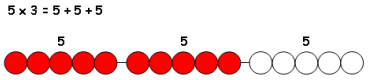
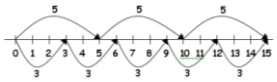
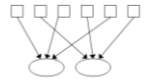
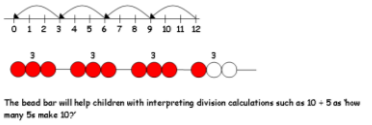
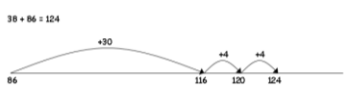
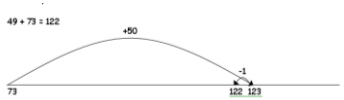
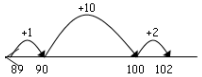
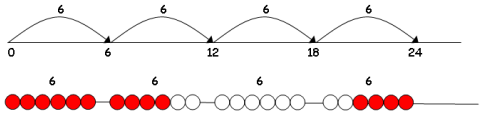
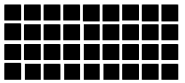
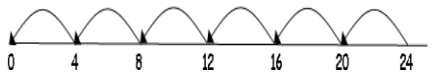
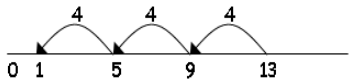
Broadlea Primary Calculation Policy 2014-2015

	Addition	Subtraction	Multiplication	Division
Rec	Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.  Bead strings or bead bars can be used to illustrate addition. EG. 8+2=10  They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.	Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.  Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2.  They use numberlines and practical resources to support calculation. Teachers *demonstrate* the use of the numberline.	Children will experience equal groups of objects. They will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups. 	Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s. 

	Addition	Subtraction	Multiplication	Division
Y1	**Using pictures**  Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3. EG.8+5=13  They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.  Childr en then begin to use numbered lines to support their own calculations using a numbered line to count on in ones. Use objects and pictures to solve one-step problems, including missing number problems such as 7= ? - 9	**Using pictures**  Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2.  Children then begin to use numbered lines to support their own calculations - using a numbered line to count back in ones. The numberline should also be used to show that 10 - 3 means the 'difference between 10 and 3' and how many jumps they are apart.  Use objects and pictures to solve one-step problems, including missing number problems such as 7= ? - 9	Children will experience equal groups of objects. They will count in 2s, 5s and 10s. They will work on practical problem solving activities involving equal sets or groups.  Use objects, pictures and arrays to solve one-step problems with support from an adult. This is an array of 5 rows of 4 =20 	Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s. 

	Addition	Subtraction	Multiplication	Division
Y2	Children will begin to use 'empty number lines' themselves starting with the larger number and counting on. ✓ First counting on in tens and ones.  ✓ Then helping children to become more efficient by adding the ones in one jump (by using the known fact 4 + 3 = 7).  ✓ Followed by adding the tens in one jump and the ones in one jump.  ✓ Bridging through ten can help children become more efficient.  **Lots of experience of partitioning eg. 34 is 30 +4, **20+14, 10+24.**	Children will begin to use empty number lines to support calculations. **Counting back:** ✓ First counting back in tens and ones.  ✓ Then helping children to become more efficient by subtracting the ones in one jump (by using the known fact 7 – 3 = 4).  ✓ Subtracting the tens in one jump and the ones in one jump.  ✓ Bridging through ten can help children become more efficient.  **Lots of experience of partitioning eg. 34 is 30 +4, **20+14, 10+24.**	Children will develop their understanding of multiplication and use jottings to support calculation: ✓ **Repeated addition** 3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x3 Repeated addition can be shown easily on a number line:  and on a bead bar:  ✓ **Commutativity** Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.  ✓ **Arrays** Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method. 	Children will develop their understanding of division and use jottings to support calculation ✓ **Sharing equally** 6 sweets shared between 2 people, how many do they each get?  ✓ **Grouping or repeated subtraction** There are 6 sweets, how many people can have 2 sweets each?  ✓ **Repeated subtraction using a number line or bead bar** 12 ÷ 3 = 4  ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations** □ ÷ 2 = 4 20 ÷ △ = 4 □ ÷ △ = 4

	Addition	Subtraction	Multiplication	Division
Y3	Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate. ✓ Count on from the largest number irrespective of the order of the calculation.  ✓ Compensation  Children will begin to use informal pencil and paper methods (jottings), record and explain partial mental methods building on existing mental strategies. Pupils will use formal written methods of columnar addition and subtraction. 60 + 7 20 + 4 80 + 11 = 91 67 24 11 (7+ 4) 80 (60+20) 91 267 + 85 12 (7 + 5) 140 (60+80) 200 352 Adding the least significant digits first. **Lots of experience of partitioning eg. 34 is 30 +4, **20+14, 10+24.**	Children will continue to use empty number lines with increasingly large numbers. Children will begin to use informal pencil and paper methods (jottings). ✓ **Partitioning and decomposition** • Partitioning – demonstrated using arrow cards • Decomposition - base 10 materials **NOTE** When solving the calculation 89 – 57, children should know that 57 **does NOT EXIST AS AN AMOUNT** it is what you are subtracting from the other number. Therefore, when using base 10 materials, children would need to count out only the 89. Pupils MAY BEGIN TO USE formal written methods of columnar addition and subtraction. 89 = 80 + 9 - 57 50 + 7 30 + 2 = 32 ✓ **Begin to exchange.** 71 = = - 46 Step 1 70 + 1 - 40 + 6 Step 2 60 + 11 - 40 + 6 20 + 5 = 25 The calculation should be read as e.g. take 6 from 1. This would be recorded by the children as ~~70~~ + ¹1 - 40 + 6 20 + 5 = 25 Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used. 102-89=13  	Children will continue to use: ✓ **Repeated addition** 4 times 6 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6 or 6 x 4 Children should use number lines or bead bars to support their understanding.  ✓ **Arrays** Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.  9 x 4 = 36 9 x 4 = 36 Correspondence problems. Eg. 3 hats, 4 coats, how many outfits? ✓ **Scaling** e.g. Find a ribbon that is 4 times as long as the blue ribbon  ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations** □ x 5 = 20 3 x △ = 18 □ x O = 32 ✓ **Partitioning** 38 x 5 = (30 x 5) + (8 x 5) = 150 + 40 = 190 Progressing to formal written methods in Year 4.	Ensure that the emphasis in Y3 is on grouping rather than sharing. Children will continue to use: ✓ **Repeated subtraction using a number line** Children will use an empty number line to support their calculation. 24 ÷ 4 = 6  Children should also move onto calculations involving remainders. 13 ÷ 4 = 3 r 1  ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations** 26 ÷ 2 = □ 24 ÷ △ = 12 □ ÷ 10 = 8 Progressing to formal written methods in Year 4.

Y4

Addition

✓ Carry below the line using a formal columnar method where appropriate.

```
 625       783       367
+ 48      + 42      + 85
 673       825       452
   1         1        11
```

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
- ✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*
- ✓ *add and subtract numbers with up to 4 digits.*
- ✓ *Estimate and use inverse operations to check answer to calculations.*

Subtraction

✓ **Partitioning and decomposition** using formal written methods of columnar subtraction where appropriate

```
  754  =
-  86

Step 1     700  +  50  +  4
         -          80  +  6

Step 2     700  +  40  + 14     (adjust from T to U)
         -          80  +  6

Step 3     600  + 140  + 14     (adjust from H to T)
         -          80  +  6
           600  +  60  +  8  =  668
```

This would be recorded by the children as

```
   600    140
   7̸00  +  5̸0  + ¹4
 -          80  +  6
   600  +  60  +  8  =  668
```

Decomposition

```
  614 1
  7̸5̸4
 -  86
   668
```

Children should:

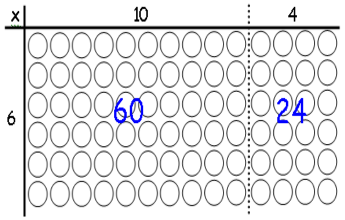
- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;*
- ✓ *know that decimal points should line up under each other.*

```
 £8.95  =    8  +  0.9  +  0.05                       leading to
-£4.38     - 4  +  0.3  +  0.08
                                                          1
        =    8  +  0.8  +  0.15   (adjust from T to U)   8.85
           - 4  +  0.3  +  0.08                         -4.38
             4  +  0.5  +  0.07

        = £4.57
```

Multiplication

Children will continue to use arrays where appropriate leading into the grid method of multiplication.



(6 x 10) + (6 x 4)

60 + 24

84

✓ **Grid method**

TO x O and HTO x O)

(Short multiplication – multiplication by a single digit)

23 x 8

Children will approximate first

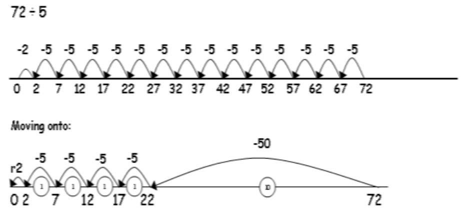
23 x 8 is approximately 25 x 8 = 200

x	20	3
8	160	24

```
  160
+  24
  184
```

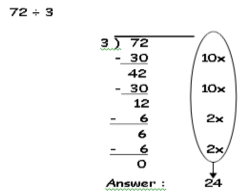
Division

Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

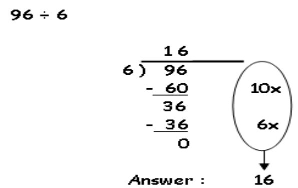


Then onto the vertical expanded method:

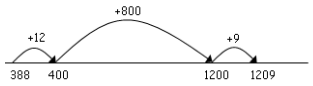
Short division TO ÷ O

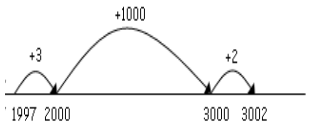


Leading to subtraction of other multiples.



Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2. Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division.

	Addition	Subtraction	Multiplication	Division
Y5	Children should extend the carrying method to numbers with at least four digits. 587 + 475 = 1062 (1 1) 3587 + 675 = 4262 (1 1 1) *Using similar methods, children will:* ✓ *add several numbers with different numbers of digits;* ✓ *begin to add two or more decimal fractions with up to three digits and the same number of decimal places;* ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m – 280 cm.*	**Partitioning and decomposition** Step 1: 754 = 700 + 50 + 4; − 286 = − 200 + 80 + 6 Step 2: 700 + 40 + 14 − 200 + 80 + 6 *(adjust from T to U)* Step 3: 600 + 140 + 14 − 200 + 80 + 6 *(adjust from H to T)* 400 + 60 + 8 = 468 This would be recorded by the children as 600 140 ~~700~~ + ~~50~~ + 14 − 200 + 80 + 6 400 + 60 + 8 = 468 **Decomposition** 614 1 ~~7~~~~5~~4 − 286 468 *Children should:* ✓ *be able to subtract numbers with different numbers of digits;* ✓ *begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;* *know that decimal points should line up under each other* Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used. *Eg. 1209-388=821*  	**Grid method** **ThHTO x O** (Short multiplication – multiplication by a single digit) 346 x 9 Children will approximate first 346 x 9 is approximately 350 x 10 = 3500 × 9: 300 → 2700; 40 → 360; 6 → 54 2700 + 360 + 54 = 3114 (1 1) **TO x TO** (Long multiplication – multiplication by more than a single digit) 72 x 38 Children will approximate first 72 x 38 is approximately 70 x 40 = 2800 × 30: 70 → 2100; 2 → 60 × 8: 70 → 560; 2 → 16 2100 + 560 + 60 + 16 = 2736 (1) Use formal written methods. *Using similar methods, they will be able to multiply decimals with one decimal place by a single digit number, approximating first. They should know that the decimal points line up under each other.* e.g. 4.9 x 3 Children will approximate first 4.9 x 3 is approximately 5 x 3 = 15 × 3: 4 → 12; 0.9 → 2.7 12 + 2.7 = 14.7	Children will continue to use written methods to solve short division TO ÷ O. Children can start to subtract larger multiples of the divisor, e.g. 30x **Short division HTO ÷ O** 196 ÷ 6 32 r 4 6) 196 − 180 (30x) 16 − 12 (2x) 4 Answer : 32 remainder 4 or 32 r 4 Non-interger answers to division should be interpreted in different ways according to context. Eg. 98÷4=24r2 or 24 1/2 or 24.5 Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. Progressing to dividing up to 4 digit numbers by a one-digit number using the formal written method of short division.

	Addition	Subtraction	Multiplication	Division
Y6	Children should extend the carrying method to number with any number of digits using the formal method of columnar addition. 7648 + 1486 = 9134 (1 1 1) 6584 + 5848 = 12432 (1 1 1) 42 + 6432 + 786 + 3 + 4681 = 11944 (1 2 1) *Using similar methods, children will* ✓ *add several numbers with different numbers of digits;* ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;* ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 401.2 + 26.85 + 0.71.*	**Decomposition using the formal method of columnar subtraction.** 5 13 1 ~~6~~ ~~4~~ 67 - 2684 3783 *Children should:* ✓ *be able to subtract numbers with different numbers of digits;* ✓ *be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;* ✓ *know that decimal points should line up under each other.* Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used. Eg.3002-1997=1005  	**ThHTO x O** (Short multiplication – multiplication by a single digit) 4346 x 8 Children will approximate first 4346 x 8 is approximately 4346 x 10 = 43460 x 8: 4000 300 40 6 → 32000 2400 320 48 32000 + 2400 + 320 + 48 = 34768 **ThHTO x TO** (Long multiplication – multiplication by more than a single digit) 372 x 24 Children will approximate first 372 x 24 is approximately 400 x 25 = 10000 x: 300 70 2; 20 → 6000 1400 40; 4 → 1200 280 8 6000 + 1400 + 1200 + 280 + 40 + 8 = 8928 Use the formal written method of long multiplication. *Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They should know that the decimal points line up under each other.* *For example:* 4.92 x 3 Children will approximate first 4.92 x 3 is approximately 5 x 3 = 15 x: 4 0.9 0.02; 3 → 12 2.7 0.06 12 + 0.7 + 0.06 = 12.76	Children will continue to use written methods to solve short division TO ÷ O and HTO ÷ O. **Long division up to ThHTO ÷ TO** 972 ÷ 36 27 36) 972 - 720 (20x) 252 - 252 (7x) 0 Answer: 27 Interpret remainders as whole numbers, fractions or by rounding, as appropriate for the context. Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other. 87.5 ÷ 7 12.5 7) 87.5 - 70.0 (10x) 17.5 - 14.0 (2x) 3.5 - 3.5 (0.5x) 0 Answer : 12.5

	Addition	Subtraction	Multiplication	Division
By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved. **Children should not be made to go onto the next stage if:** **they are not ready.** **they are not confident.** **Children should be encouraged to approximate their answers before calculating.** **Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.**				