Calculation Policy

Rationale

The 2011 OFSTED published report in *Good Practice in Primary Mathematics* states that "A feature of strong practice in the maintained schools is their clear, coherent calculations policies and guidance, which are tailored to the particular school's context. They ensure consistent approaches and visual images and models that secure progression in pupils' skills and knowledge lesson by lesson and year by year."

Aims

At Gosforth East Middle School, we aim for all children to become fluent at using written methods in all four operations by the end of Key Stage 2. They will use all written methods with confidence and understanding. The progression in calculation skills and expectations meets the needs of the National Curriculum for 2014. Although each operation is broken down into stages and identifies year group expectations, we recognise that children do not progress at the same rate. Therefore, children will be taught to their individual mathematical needs, working at the appropriate stage for their development.

We recognise the importance in using visual models and images throughout primary school to support children's understanding of new mathematical concepts and methods. Wherever possible, we will continue to use these aids to secure understanding and fluency of written methods.

We will ensure the development of mental maths skills continues to be a main focus and written methods will be taught to children as a tool to enable them to solve increasing complex problems with accuracy and efficiency. We recommend children make approximations before using a written method when solving calculations and they frequently use inverse operations to check their answers.

This policy is a working document and will be updated on a regular basis. It will be written and changed in line with government requirements, but most importantly, to meet the needs of the children at Gosforth East Middle School.

Home and school working together to support learning has been shown to have an immense impact on children's progress. Please encourage your child to practice and discuss maths at any opportunity. Asking questions during every day activities such as cooking, shopping or making a journey is an ideal way in which to engage your child in practical maths around them and practice their mental methods.
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+ Addition +

Stage 1

Children understand the concept of addition as the combining of 2 or more groups. Children use the + and = symbols accurately. Calculations should be written on either side of the equals sign so that = is not just interpreted as the answer.
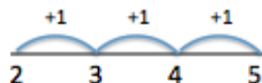
6 + 2 = 8   8 = 6 + 2

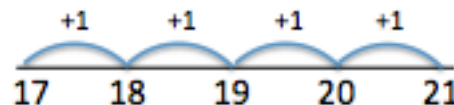Children use visual representations and concrete manipulatives to add 2 or more amounts.

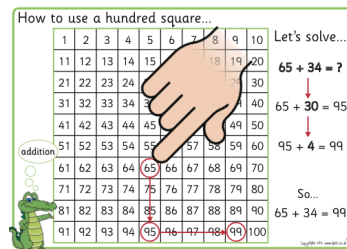🐝🐝 + 🐝🐝🐝 = 5

Extend to counting up in ones on a number line.

+1   +1   +1
2   3   4   5

Stage 2

Adding 2-digit numbers with single units, bridging through multiples of 10, using a *number line*.

17 + 4 = 21

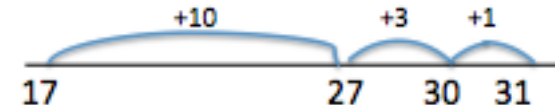+1   +1   +1   +1
17   18   19   20   21

Use *100 square* to begin to add two-digit numbers by counting in tens and ones.

How to use a hundred square...
Let's solve...
65 + 34 = ?
65 + 30 = 95
95 + 4 = 99
So...
65 + 34 = 99

Stage 3

The *number line* is extended to partitioning and adding tens then ones when faced with larger numbers.

17 + 14 = 31

+10   +3   +1
17   27   30   31

Leading to simple column addition of 2-digit numbers with no carrying using *Place Value Counters*.

Pupils must have a good understanding of place value and partitioning.

Partitioning numbers first   leading to
30 + 6   36
+ 10 + 2   + 12
  40 + 8 = 48   48

RECOMMENDED BY THE END OF YEAR 2

Stage 4

Column addition of 2, 3 and 4-digit numbers using expanded methods.

Partitioning numbers   leading   then introducing
first   to
600 + 40 + 3   643   600 + 40 + 3
+ 200 + 20 + 5   + 225   + 200 + 70 + 5
  800 + 60 + 8 = 868   868   800 + 110 + 8 = 918

RECOMMENDED BY THE END OF YEAR 3

Stage 5

Short written methods using 'carrying'. The carrying digit goes above the answer.

Using 4-digit numbers   leading to decimals
7893   31.76
+ 5385   + 18.07
  11   1
13278   49.83

RECOMMENDED BY THE END OF YEAR 4

Notes

In Years 5 and 6, pupils continue practising formal written methods with increasing large numbers, decimals and more than two numbers so they become fluent and precise.
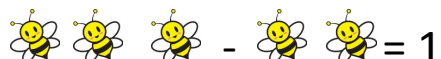
- Subtraction -

Stage 1

Children understand the concept of subtraction as the taking a number away from another. Children use the - and = symbols accurately. Calculations should be written on either side of the equals sign so that = is not just interpreted as the answer.
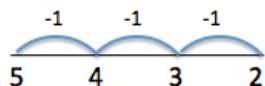
6 - 2 = 4   4 = 6 - 2

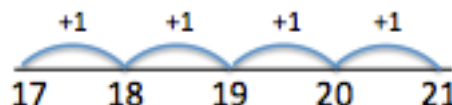Children use concrete manipulatives and other visual representations to subtract numbers.

🐝 🐝 🐝 - 🐝 🐝 = 1

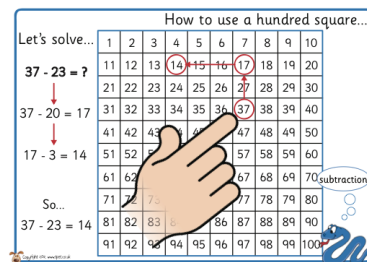Extend – counting backwards in ones on a number line.

Stage 2

Begin to 'find the difference' by counting on in ones using a **number line**.
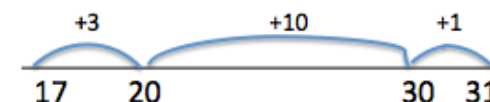
21 – 17 = 4

Use **100 square** to subtract two two-digit numbers by counting back in tens and ones.

Stage 3

The **number line** is extended to partitioning and adding tens then ones when faced with larger numbers.

31 – 17 = 14

Using empty number lines to find the difference by partitioning numbers and counting on in tens and ones.

Leading to simple column subtraction of 2-digit numbers using **Place Value Counters**.

Pupils must have a good understanding of place value and partitioning.

Partitioning numbers first   leading to

```
  30 + 6              36
- 10 + 2            - 12
  20 + 4 = 24         24
```

RECOMMENDED BY THE END OF YEAR 2

Stage 4

Column subtraction of 3 and 4-digit numbers using expanded methods using **Place Value Counters**.

Partitioning numbers first   leading to   then introducing

```
  600 + 40 + 3         643              80   13
+ 200 + 20 + 1       - 221        600 + 90 + 3
  400 + 20 + 2 = 422   422       + 200 + 70 + 5
                                   400 + 10 + 8 = 418
```

RECOMMENDED BY THE END OF YEAR 3

Stage 5

Short written methods using 'exchanging'.

Using 4-digit numbers   leading to decimals

```
   8 1                          5  16 1
  7893                        36 . 76
- 5385                       - 13 . 87
  2508                         22 . 89
```

RECOMMENDED BY THE END OF YEAR 4

Notes

In Years 5 and 6, pupils continue practicing formal written methods with increasing large numbers so they become fluent and precise.

x Multiplication x

Stage 1

Children begin to understand the concept of multiplication and recognise the 'x' symbol.

Children use manipulatives and other visual representations to show groupings of amounts.

3 lots of 2   3 x 2 = 6
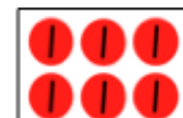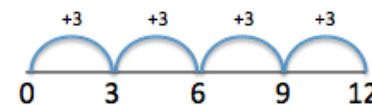

4 groups of 3   4 x 3 = 12

Stage 2

To describe multiplication as an array and begin to recognise multiplication can be done in any order. Use the 'x' symbol with confidence.

Using an array using *Place Value Counters.*

To use a *number line* to show multiplication as **repeated addition**.

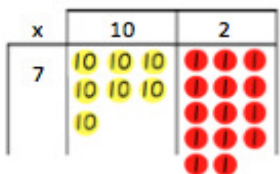4 x 3 = 12   or   3 + 3 + 3 + 3 = 12

RECOMMENDED BY THE END OF YEAR 2

Stage 3

To use 'grid method' as an informal method to carry out multiplication calculations using *Place Value Counters* as a visual representation. Use numbers appropriate to current level of attainment. Encourage children to estimate their answers first.
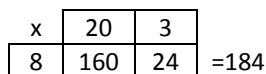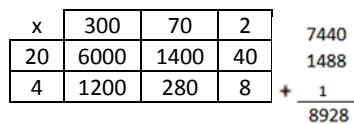
Using visual representation

12 x 7

E = 10 x 7 = 70

leading to

23 x 8

E = 20 x 10 = 200

x	20	3
8	160	24

=184

leading to

372 x 24

E = 400 x 20 = 8000

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

7440
1488
+   1
8928

RECOMMENDED BY THE END OF YEAR 4

Stage 4

To use formal written methods to multiply 4 digits by 1 or 2-digit numbers, extending to long multiplication.
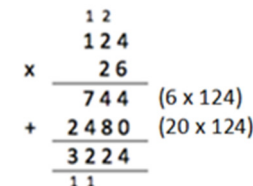
Short Multiplication   leading to   Long Multiplication
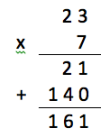
23 x 7

E = 20 x 10 = 200

```
    2 3
 x    7
    2 1
 +  1 4 0
    1 6 1
```

leading to

```
    2 3
 x    7
    1 6 1
    2
```

124 x 26

E = 100 x 30 = 3000

```
    1 2
    1 2 4
 x    2 6
    7 4 4   (6 x 124)
 + 2 4 8 0  (20 x 124)
    3 2 2 4
    1 1
```

CHILDREN SHOULD BE PRACTISING AND SECURING THESE FORMAL WRITTEN METHODS IN YEARS 5 AND 6

÷ Division ÷

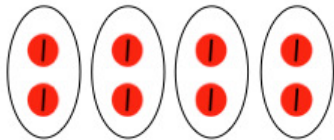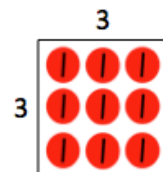| Stage 1	Stage 2	Stage 3
Children begin to understand the concept of division as 'grouping' and recognise the '÷' symbol. Use a range of model and images to show 'sharing' an amount equally.	To describe division as sharing an amount equally. To understand division within the multiplication tables U ÷ U and TU ÷ U	To use the short division method to divide numbers, initially using *Place Value Counters*. Then move onto finding remainders and then decimals.
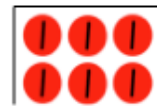
Stage 1

6 shared equally by 3 is 2 $6 ÷ 3 = 2$

Sharing using *Place Value Counters.*

8 shared equally by 4 is 2 $8 ÷ 4 = 2$

Stage 2

To use the ÷ sign

$6 ÷ 3 = 2$

$9 ÷ 3 = 3$

RECOMMENDED BY THE END OF YEAR 2

Stage 3

Using visual representation   leading to

$3 \overline{) 3 \; 6}$ → 1 2
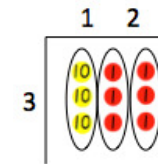
RECOMMENDED BY THE END OF YEAR 3

Stage 4	Stage 5	Notes
To use the short division method to divide 3-digit numbers, including decimals.	To use long division method to divide 3 and 4-digit numbers by 2-digit numbers	In Year 6, pupils continue practicing formal written methods with increasing large numbers so they become fluent and precise.

Stage 4

$411 ÷ 3$ $541 ÷ 5$

$3 \overline{) 4 \; ^11 \; ^21}$ = 1 3 7

$5 \overline{) 5 \; 4 \; ^41}$ = 1 0 8 r 1

RECOMMENDED BY THE END OF YEAR 4

Stage 5

$8640 ÷ 15$

```
            5  7  6
  15 | 8  6  4  0
       7  5
       1  1  4
       1  0  5
            9  0
```

RECOMMENDED BY THE END OF YEAR 5