Roxeth Primary School
Maths Calculation Policy

Addition Year 1

+ = signs and missing numbers

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

2 = 1+ 1

2 + 3 = 4 + 1

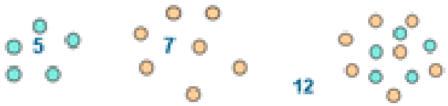
Missing numbers need to be placed in all possible places.

3 + 4 = □ □ = 3 + 4

3 + □ = 7 7 = □ + 4

Counting and combining sets of Objects

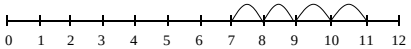
Combining two sets of objects (aggregation) which will progress onto adding on to a set (augmentation)



Understanding of counting on with a numbertrack.

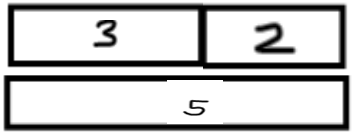
Understanding of counting on with a numberline (supported by models and images).

7+ 4



Children will use concrete bar modelling as a method of addition e.g

And progress to visual bar modelling



Addition Year 2

Missing number problems: 14 + 5 = 10 + □ 32 + □ + □ = 100 35 = 1 + □ + 5

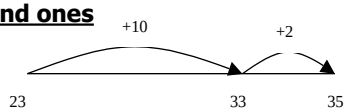
It is valuable to use a range of representations (also see Y1). Continue to use number lines to develop understanding of:

Counting on in tens and ones

23 + 12 = 23 + 10 + 2

= 33 + 2

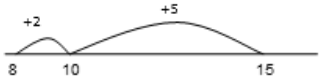
= 35



Partitioning and bridging through 10.

The steps in addition often bridge through a multiple of 10 e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5.

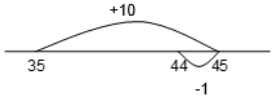
8 + 7 = 15



Adding 9 or 11 by adding 10 and adjusting by 1

e.g. Add 9 by adding 10 and adjusting by 1

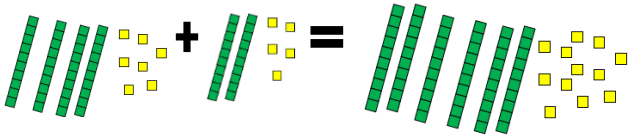
35 + 9 = 44



Partitioning in different ways and recombine

47+25

47 **25** **60 + 12**



Expanded written method

40 + 7 + 20 + 5 =

40+20 + 7 + 5 =

60 + 12 = 72

The bar model should continue to be used to help with problem solving.

Addition Year 3

Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

Partition into tens and ones

Partition both numbers and recombine.

Count on by partitioning the second number only e.g.

247 + 125 = 247 + 100 + 20+ 5

= 347 + 20 + 5

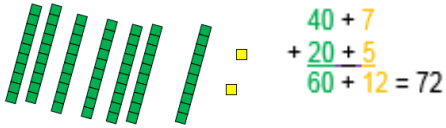
= 367 + 5

= 372

Children need to be secure adding multiples of 100 and 10 to any three-digit number including those that are not multiples of 10.

Exchanging:

72



Towards a Written Method

Introduce expanded column addition

200 + 40 + 7
100 + 20 + 5
300 + 60 +12 = 372

Leading to children understanding the exchange between tens and ones.

247
+125
12
60
300
372

Compact written method

Extend to numbers with at least four digits.

247
+125
12
60
300
372

The bar model should continue to be used to help with problem solving.

Addition Year 4

Children can solve missing number problems with increasingly large numbers.

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

Written methods (progressing to 4-digits)
Column addition methods progressing to calculations with 4-digit numbers.

Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

Extend to up to four decimal places and adding several numbers with different numbers of digits.

```
  72.8
+ 54.6
 127.4
   1
```

Addition Year 5

Children can solve missing number problems with increasingly large numbers in a variety of contexts such as money or length.

Mental methods should continue to develop, supported by a range of models and images, including the bar model The bar model should continue to be used to help with problem solving. Children should practise with increasingly large numbers to aid fluency e.g. 12,462 + 2300 = 14,762

Written methods (progressing to more than 4-digits)
When understanding of the column method is secure, children will move on to the formal column method for whole numbers and decimal numbers as an efficient written method.

```
  172.83
+  54.68
  227.51
  1  1 1
```

When adding using column addition, the numbers carried over to the next column should be written underneath the answer as it is calculated. However, if your child is already confident at column addition, placing the carried over numbers elsewhere, they should be allowed to continue to do so.

Addition Year 6

Children can solve missing number problems with increasingly large numbers in a variety of contexts, and represent them algebraically.

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

Written methods
As year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency with column method to be secured.
Continue calculating with decimals, including those with different numbers of decimal places

Mastery toolkits should be used alongside the column method to develop understanding of addition through the use of manipulatives.

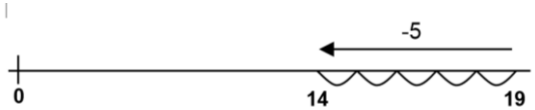
Problem Solving
Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems such as maths investigations.

Subtraction Year 1

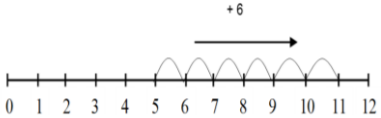
Missing number problems: 20 - □ = 9; 15 – 9 = □; 16 – 0 = □

Use concrete objects and pictures. If appropriate, progress from using number lines with every number shown to number lines with significant numbers shown.

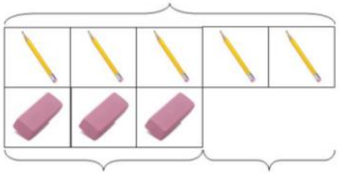
Understand subtraction as take-away:



Understand subtraction as finding the difference:



Bar modelling will be introduced with concrete objects which children can move (including cards with pictures) before progressing to pictorial representation. The use of other manipulatives are also valuable for modelling subtraction e.g. Dienes apparatus, multi-link cubes, bead strings and other objects found in the Mastery toolkits.

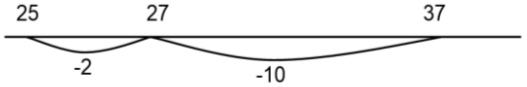


Subtraction Year 2

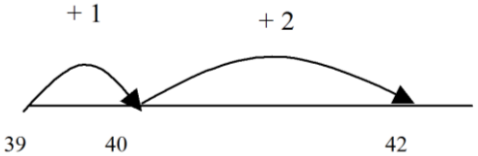
Missing number problems: 52 – 8 = □; □ – 20 = 25; 22 = □ – 6; 6 + □ + 3 = 11

It is valuable to use a range of representations (also see Y1). Continue to use number lines to count up to subtract, or work out the difference e.g.

37 – 25 =

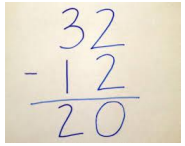


42 - □ =39



Towards written methods

Children will begin to learn the column method for subtraction without exchanging e.g.



The bar model should continue to be used to help children to subtract.

Subtraction Year 3

Missing number problems: □ = 43 – 27; 145 – □ = 138; 274 – 30 = □; 245 – □ = 195; 532 – 200 = □; 364 – 153 = □

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving (see Y1 and Y2).

Children should make choices about whether to use complementary addition (finding the difference) or counting back, depending on the numbers involved.

Written methods (progressing to 3-digits)

Introduction to column subtraction.

For some children this will lead to exchanging, which can be modelled using manipulatives such as dienes apparatus.

Some children may begin to use formal column method, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

Subtraction Year 4

Missing number/digit problems: 456 + □ = 710;
1□7 + 6□ = 200; 60 + 99 + □ = 340; 200 – 90 – 80 = □; 225 - □ = 150; □ – 25 = 67; 3450 – 1000 = □; □ - 2000 = 900

<u>Mental methods</u> should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

<u>Written methods (progressing to 4-digits)</u>
Column subtraction with decomposition, progressing to calculations with 4-digit numbers.

If understanding of the expanded method is secure, children will move on to the formal method of column subtraction.

$$\begin{array}{r} {}^{2}\cancel{2}\,{}^{1}3\,2 \\ -\ 1\,1\,4 \\ \hline 1\,1\,8 \end{array}$$

Progress to subtracting decimals.

Subtraction Year 5

Missing number/digit problems: 6.45 = 6 + 0.4 + □; 119 - □ = 86; 1,000,000 - □ = 999,000; 600,000 + □ + 1000 = 671,000; 12,462 – 2 300 = □

<u>Mental methods</u> should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

<u>Written methods (progressing to more than 4-digits)</u>
When understanding of the expanded method is secure, children will move on to the formal method of decomposition.

$$\begin{array}{r} {}^{5}\cancel{6}\,{}^{1}2\,{}^{2}\cancel{3}\,{}^{1}2 \\ -\ 4\,8\,1\,4 \\ \hline 1\,4\,1\,8 \end{array}$$

When subtracting using column addition, the numbers being decomposed should be written above the top line as the answer is calculated. However, if your child is already confident at column subtraction, placing the decomposed numbers elsewhere, they should be allowed to continue to do so.

Continue subtracting decimals, including those with different numbers of decimal places.

Subtraction Year 6

Missing number/digit problems: □ and □ each stand for a different number. □ = 34. □ + □ = □ + □ + □. What is the value of □? What if □ = 28? What if □ = 21?
10,000,000 = 9,000,100 + □
7 – 2 x 3 = □; (7 – 2) x 3 = □; (□ - 2) x 3 = 15

<u>Mental methods</u> should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

<u>Written methods</u>
As year 5, but progressing to larger numbers past 1 million, aiming for children to work through the stages of decomposition fluently.

Continue subtracting with decimals, including those with different numbers of decimal places..

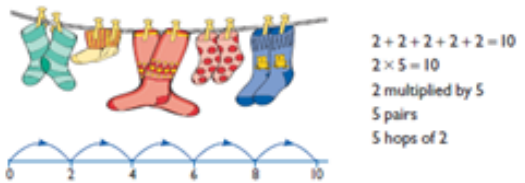
Mastery toolkits should be used alongside the column method to develop understanding of subtraction through the use of manipulatives.

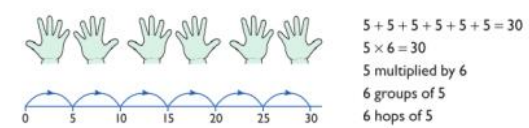
<u>Problem Solving</u>
Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems such as maths investigations.

Multiplication Year 1

Doubling and combining
Understand multiplication is related to doubling and combining groups of the same size (repeated addition)

Washing line, and other practical resources for counting, such as the manipulatives found in the Mastery toolkits.



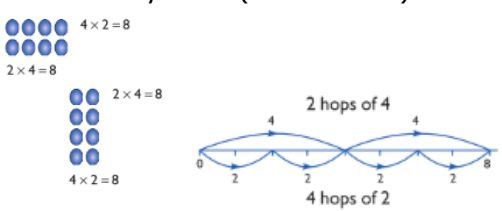


Children to count in 2s, 5s and 10s from zero.

Problem solving with concrete objects (including money and measures

Use bar modelling to develop the vocabulary relating to 'times' –
Pick up five, 4 times

Use arrays to understand multiplication can be done in any order (commutative)



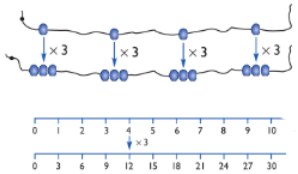
Multiplication Year 2

Expressing multiplication as a number sentence using x.
Missing number problems
Using understanding of the inverse and practical resources to solve missing number problems.

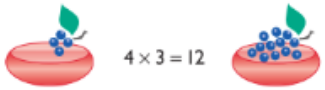
7 x 2 = □	□ = 2 x 7
7 x □ = 14	14 = □ x 7
□ x 2 = 14	14 = 2 x □

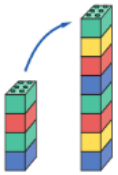
Develop understanding of multiplication using arrays and number lines. Include multiplications not in the 2, 5 or 10 times tables.

Children to recall and use facts from the 2, 5 and 10 times tables.



g of multiplication as scaling





Doubling numbers up to 10 + 10
Link with understanding scaling
Using known doubles to work out double 2d numbers
(double 15 = double 10 + double 5)

Use manipulatives where appropriate to secure children's knowledge in multiplication.

Multiplication Year 3

Missing number problems
Continue with a range of sums s as in Year 2 but with appropriate numbers.

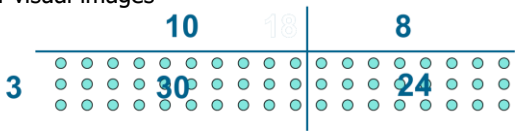
Mental methods
Doubling 2 digit numbers using partitioning

Demonstrate multiplication on a number line – jumping in larger groups of amounts

Explore different methods for larger numbers e.g. 13 x 4 = 10 groups of 4 and 3 groups of 4

Children to recall and use facts from the 3, 4 and 8 times tables.

Written methods
Developing written methods using understanding of visual images



Develop multiplying using the grid method.

	1 0	8
3	3 0	2 4

Give children opportunities for children to explore this and deepen understanding using Dienes apparatus and manipulative in the Mastery toolkits.
18 x 3 = 54

X	10	8
3	30	24

30 + 24 = 54

Multiplication Year 4

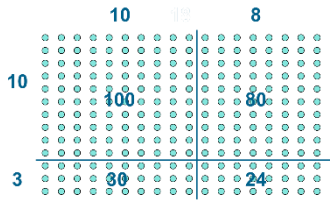
Continue with a range of equations as in Year 2 but with appropriate numbers. Also include equations with missing digits
□2 x 5 = 160

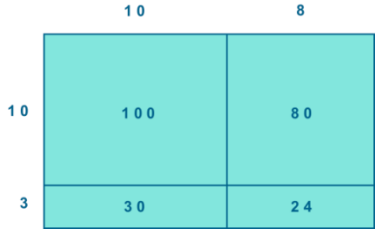
Mental methods
Counting in multiples of 6, 7, 9, 25 and 1000, and steps of 1/100.

Solving practical problems where children need to scale up. Relate to known number facts. (e.g. how tall would a 25cm sunflower be if it grew 6 times taller?)

Children to recall and use facts from all times tables up to 12 x 12.

Written methods (progressing to 3 digits x 2 digits)
Children to embed and deepen their understanding of the grid method to multiply 2 digits x 2 digits, progressing to 3 digits x 2 digits. Ensure this is linked back to their understanding of arrays and place value.





Multiplication Year 5

Missing number problems
Continue with a range of equations as in Year 2 but with appropriate numbers. Also include equations with missing digits

Mental methods
X by 10, 100, 1000 using moving digits ITP

Use practical resources and jottings to explore equivalent statements (e.g. 4 x 35 = 2 x 2 x 35)

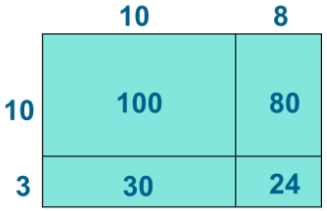
Recall of prime numbers up 19 and identify prime numbers up to 100 (with reasoning)

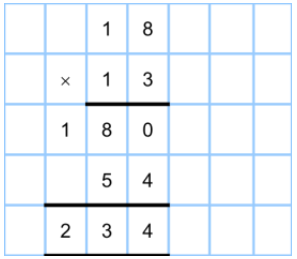
Solving practical problems where children need to scale up. Relate to known number facts.

Identify factor pairs for numbers

Written methods (progressing to 4 digits x 2 digits)

Long multiplication – children to explore how the grid method supports an understanding of long multiplication.





Multiplication Year 6

Missing number problems
Continue with a range of equations as in Year 2 but with appropriate numbers. Also include equations with missing digits

Mental methods
Identifying common factors and multiples of given numbers
Solving practical problems where children need to scale up. Relate to known number facts.

Written methods
Continue to refine and deepen understanding of written methods including fluency for using long multiplication.

```
  2 3 1
   1 3 4 2
x    1 8
 1 3 4 2 0
 1 0 7 3 6
 2 4 1 5 6
   1
```

ALL YEAR GROUPS

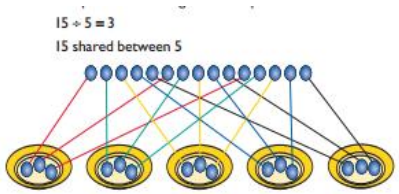
Mastery toolkits should be used alongside the column method to develop understanding of multiplication through the use of manipulatives.

Problem Solving
Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems such as maths investigations.

Division Year 1

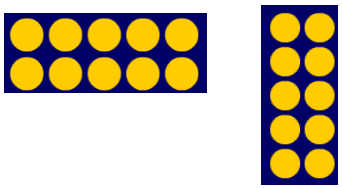
Children must have secure counting skills- being able to confidently count in 2s, 5s and 10s. Children should be given opportunities to reason about what they notice in number patterns.

Group AND **share small quantities- understanding the difference between the two concepts.**
Sharing



Children should be taught to share using concrete apparatus such as Mastery toolkits.
Grouping
Children should apply their counting skills to develop some understanding of grouping. 10 ÷ 2 = 5

Use of arrays as a pictorial representation for division. 10 ÷ 2 = 5 There are 5 groups of 2.
10 ÷ 5 = 2 There are 2 groups of 5.



Children should be able to find ½ and ¼ and simple fractions of objects, numbers and quantities.

Division Year 2

÷ = signs and missing numbers

6 ÷ 2 = □	□ = 6 ÷ 2
6 ÷ □ = 3	3 = 6 ÷ □
□ ÷ 2 = 3	3 = □ ÷ 2
□ ÷ ∇ = 3	3 = □ ÷ ∇

Know and understand sharing and grouping- introducing children to the ÷ sign.

Children should continue to use grouping and sharing for division using concrete apparatus, arrays and pictorial representations such as bar modelling.

Grouping using a number line

Group from zero in jumps of the divisor to find our 'how many groups of 2 are there in 10?'.

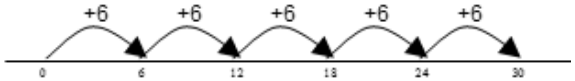
10 ÷ 2 = 5

Arrays
Continue work on arrays. Support children to understand how multiplication and division are inverse. Look at an array – what do you see?

Division Year 3

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

Grouping
How many 6s are in 30?
30 ÷ 6 can be modelled as:



Becoming more efficient using a numberline

Children need to be able to partition the dividend in different ways.
48 ÷ **4 = 12**

Remainders
49 ÷ 4 = 12 r1

Sharing – 49 shared between 4. How many left over?
Grouping – How many 4s make 49. How many are left over?

Place value counters can be used to support children apply their knowledge of grouping.

For example:
60 ÷ 10 = How many groups of 10 in 60?
600 ÷ 100 = How many groups of 100 in 600?

Division Year 4

÷ = signs and missing numbers

Continue using a range of equations as in year 3 but with appropriate numbers.

Sharing, Grouping and using a number line

Children will continue to explore division as sharing and grouping, and to represent calculations on a number line until they have a secure understanding. Children should progress in their use of written division calculations:

- Using tables facts with which they are fluent
- Experiencing a logical progression in the numbers they use, for example:

1. Dividend just over 10x the divisor, e.g. 84 ÷ 7
2. Dividend just over 10x the divisor when the divisor is a teen number, e.g. 173 ÷ 15 (learning sensible strategies for calculations such as 102 ÷ 17)
3. Dividend over 100x the divisor, e.g. 840 ÷ 7
4. Dividend over 20x the divisor, e.g. 168 ÷ 7

All of the above stages should include calculations with remainders as well as without.
Remainders should be interpreted according to the context. (i.e. rounded up or down to relate to the answer to the problem)

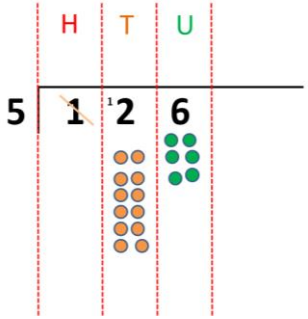
e.g. 840 ÷ 7 = 120

Jottings
7 x 100 = 700
7 x 10 = 70
7 x 20 = 140

Formal Written Methods

Formal short division should only be introduced once children have a good understanding of division, its links with multiplication and the idea of 'chunking up' to find a target number (see use of number lines above)

Short division to be modelled for understanding using place value counters as shown below. Calculations with 2 and 3-digit dividends.

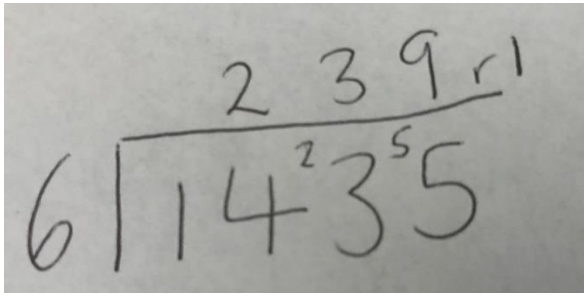


Division Year 5

Formal Written Methods

Continued as shown in Year 4, leading to the efficient use of a formal method. The language of grouping to be used (see link from Year 4)

E.g. 1435 ÷ 6



Children begin to practically develop their understanding of how express the remainder as a decimal or a fraction. Ensure practical understanding allows children to work through this (e.g. what could I do with this remaining 1? How could I share this between 6 as well?)

Division Year 6

÷ = signs and missing numbers

Continue using a range of equations but with appropriate numbers

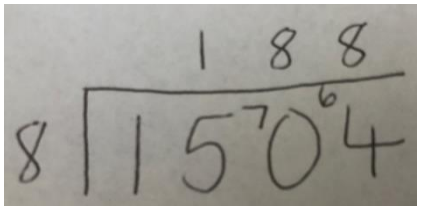
Sharing and Grouping and using a number line

Children will continue to explore division as sharing and grouping, and to represent calculations on a number line as appropriate.

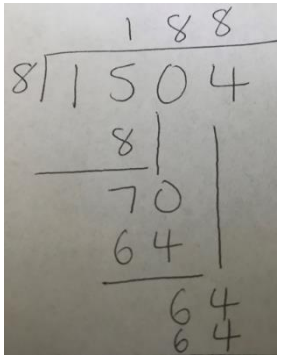
Quotients should be expressed as decimals and fractions

Formal Written Methods – long and short division

E.g. 1504 ÷ 8 (short)



E.g. 1504 ÷ 8 (long5506)



Division continued
ALL YEAR GROUPS

Mastery toolkits should be used alongside the column method to develop understanding of division through the use of manipulatives.

Problem Solving
Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems such as maths investigations.

Glossary

Algebra – Maths which uses letters and other symbols to represent numbers and quantities.
Arrays – an orderly arrangement of circles which represent numbers.

Bar modelling – a visual way to organize data for problem solving.

Glossary

Chunking - repeated subtraction of the divisor and multiples of the divisor – in other words, working out how many groups of a number fit into another number.
Commutative – when the operation means the quantities connected give the same result, no matter which order they are put in e.g. 3 + 4 = 7 and 4 + 3 =
Concrete objects/apparatus - physical objects your children can touch and use to represent numbers e.g. cubes, counters, dice etc.
Decomposition – breaking a number apart e.g. 347 = 300+40+7.
Dienes apparatus – blocks which represent 1, 10, 100 and 1000.
Dividend – the number you want to divide up.
Divisor – the number dividing the number you want to divide up.
Equation – a maths statement which expresses 2 equal mathematical expressions, indicated by the = sign.
Expanded method – showing working out in division a line at a time

Factor pairs – any 2 numbers multiplied to give a certain number e.g. 16 = 8 and 2, or 4 and 4 or 16 and 1.
Grid method – a way for children to solve multiplication problems as shown in the Multiplication section from Year 3 up.
Grouping – demonstrating division by putting objects into groups.
Manipulatives - physical objects your children can touch and use to represent numbers e.g. cubes, counters, dice etc.
Mastery toolkits – boxes of concrete objects and apparatus to manipulate.
Partitioning - a way of splitting large numbers into smaller units so they're easier to work with.
Pictorial representation – a picture used to show the numbers being calculated in a sum or problem.
Prime numbers – a number greater than 1 that can only be divided by itself and 1 e.g. 7